United Utilities Water

Drainage and Wastewater Management Plan 2023

Main Document

Document Reference: DP1

May 2023

United Utilities

Water for the North West

Executive Summary

The Drainage and Wastewater Management Plan (DWMP) is a long-term plan, which sets out how United Utilities Water (UUW) proposes to ensure robust and resilient drainage and wastewater services for the North West. UUW has engaged with stakeholders and customers to develop a best value plan, which delivers a step change in performance against the backdrop of climate change. This plan proposes £21.8 billion (capex) of investment from 2025–2050 to meet key planning objectives and statutory requirements, including £16.5 (capex) billion needed to meet the government's Storm Overflows Discharge Reduction Plan requirements. Changes to surface water management will be key to ensuring long-term resilience, along with drainage regulatory reform and the partnerships needed to address drainage on a catchment basis. The plan will continue to adapt as targets and requirements evolve, and will be re-published every five years in line with statutory requirements.

Key Points

In summary the DWMP, and AMP8 WINEP, seek to deliver the following key benefits, despite the significant adverse pressure from climate change:

AMP8 WINEP 2025-2030

- **29,000 spills/annum reduction through AMP8 overflow programme to achieve 2030 SODRP trajectory;**
- **7,987 hectares of SSSIs improved;**
- **412 kilometres of rivers improved; and**
- **Reduced impacts on 27 shellfish waters and 30 bathing waters.**

DWMP 2025-2050

- **Full achievement of SODRP targets and trajectory;**
- **62% reduction in internal flooding;**
- **28% reduction in external flooding;**
- **57% reduction in pollution incidents; and**
- **36% reduction in sewer collapses.**

United Utilities Water (UUW) is committed to providing efficient, effective and resilient wastewater services to the customers of the North West at an affordable price. This document sets out a long-term plan for ensuring our drainage and wastewater services meet this high standard across the region now and in the future.

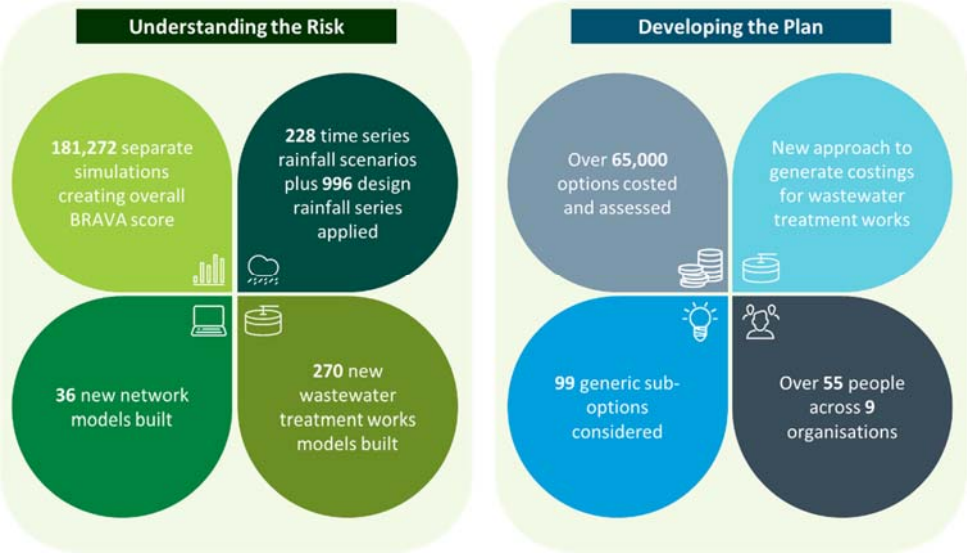
This is our first iteration of the Drainage and Wastewater Management Plan (DWMP) and it represents a step change in drainage and wastewater planning. Building on the new national framework[1], we have developed a range of tools and approaches to help us better understand the long-term risks and opportunities posed by factors such as population growth, behavioural change and climate change. The DWMP is a long-term tool to understand the scale and scope of future challenges. It will be used to ensure that decisions regarding future business plans are made in the context of the long-term challenges and opportunities.

The activity to understand the long-term risks and the potential solutions within DWMP is on a scale which has not been conducted previously, as outlined in Figure 1. Although wastewater planning over long design horizons has been done for many years, the scale of activity for the DWMP brings the planning process and our

[1] A framework for the production of Drainage and Wastewater Management Plans (Atkins, 2018). Accessed at: https://www.water.org.uk/policy-topics/managing-sewage-and-drainage/drainage-and-wastewater-management-plans/

understanding to a new level. This will provide a solid foundation for business plan development now and into the future.

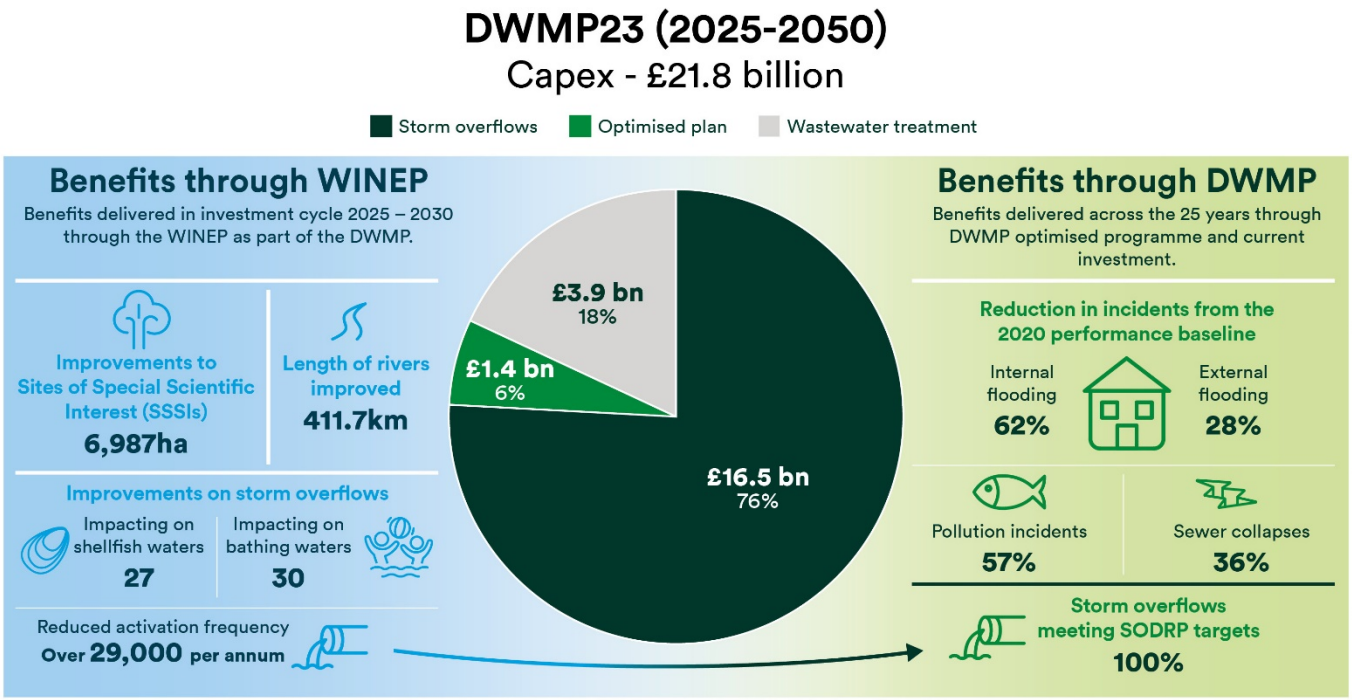
Figure 1 The scale of activity undertaken in developing the DWMP



Since privatisation, UUW has invested across the region to dramatically improve the service to customers and the environment of the North West, this has included significant improvements to bathing waters, protected habitats and rivers. UUW has also pioneered catchment work (known as Catchment Systems Thinking (CaST)) to deliver better outcomes and been at the leading edge of developing partnership and market solutions to catchment level problems. However, meeting the future challenges identified in this plan will require an even more ambitious and holistic approach; utilising new technology, regulatory reform, partnerships, innovation and natural solutions alongside building new systems and capacity. In the development of this plan we have considered over 65,000 different options to manage the risks, with particular focus on better surface water management and optimisation of our assets.

In total, we forecast £21.8 billion (capex) of investment is required to ensure we can achieve the planning objectives and statutory requirements set out in this plan from 2025–2050, with £16.5 billion (capex) required to meet the government's Storm Overflows Discharge Reduction Plan (SODRP) requirements (Figure 2).

Figure 2 Investment and benefits of DWMP23 (capex)



This plan reflects our commitment to innovation by considering the benefits that new approaches and technologies could deliver. For example, we are proposing over £3.5 billion (capex) of investment in green infrastructure and other nature-based solutions over the 25 years of the DWMP. Another key option selected in this plan is a wider role out of our Dynamic Network Management (DNM) strategy, which was highlighted as a key initiative in UUW's business plan submission for investment cycle 2020–2025. This uses artificial intelligence across the sewer network to enable proactive targeting and performance improvements; something which would not have been possible just ten years ago.

Since the development of this plan began in September 2018, there have been a number of changes in regulatory requirements. The most significant of these is the SODRP published in August 2022. This drives a step change in ambition and performance across the water industry to address the legacy of storm overflows and the pressure from climate change. As part of the WINEP submission in January 2023, UUW undertook extensive analysis to categorise 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. Our storm overflow plans meet the Defra trajectory targets within the SODRP. We believe this investment is right and needed.

We have developed an adaptive approach to this plan, which is critical to ensure the delivery of key planning objectives. With the rate of change across society and the industry, it is not always possible to foresee all potential risks and opportunities. Therefore, it is key that the plan can adapt and evolve to meet new unforeseen or changed challenges.

We recognise that the interconnected nature of drainage means that partnership and collaboration are fundamental in delivering long-term targets. We have developed the DWMP with support from stakeholders, regulators and customers from across the North West. Our Strategic Planning Groups (SPGs) have enabled a collaborative approach to planning. UUW has a proven track record of developing sustainable and innovative partnerships, such as in the Petteril and Wyre catchments. We will look to build on our many existing partnerships and develop new ones in order to achieve long-term objectives.

Since the DWMP will be a cornerstone of our drainage planning and feed our future business plans, UUW has commissioned external assurance on all major risk assessment methodologies. This assurance concluded that our process had exceeded the expectations of the national guidance. In addition to this, UUW has assured that all the 'guiding principles' have been comprehensively met. This combined assurance has been utilised to give the UUW board confidence to endorse the DWMP through a Board Assurance Statement (document C002).

The key points from our DWMP are outlined below and the remainder of this document provides a more detailed overview of our plan. This is supported by additional technical reports, which are referred to within the individual sections of this report and also listed in Appendix A.

Key Points

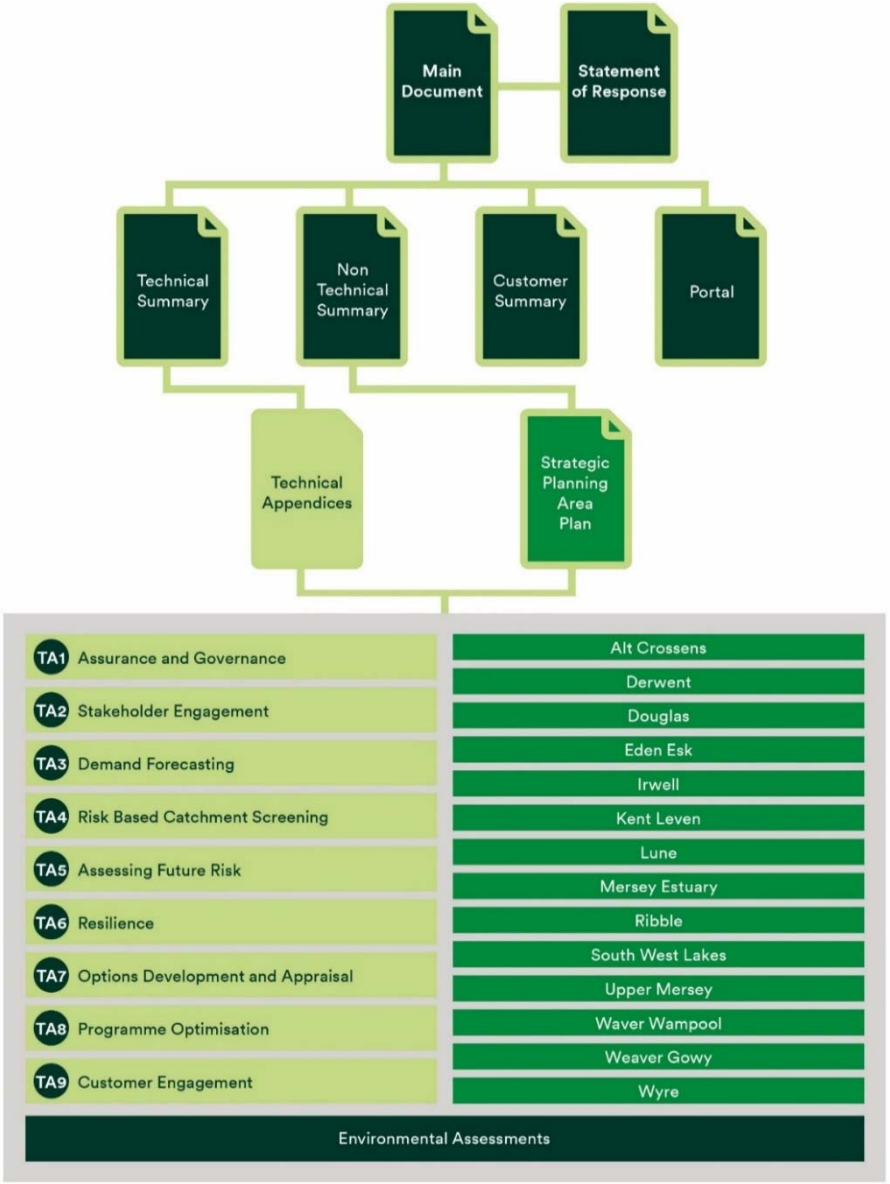
- **We have developed a robust, evidence-based approach to developing our DWMP. We have used best practice modelling techniques to assess our performance against a variety of future risks, accounting for climate change, growth and urban creep. A sector-leading approach using 2D hydraulic model outputs to assess flood risk has been employed.**
- **Our demand forecasts are based on industry-standard methodologies taking into account projected development and population growth, economic factors and climate change (as well as the residual effects of COVID-19 on patterns of water use).**
- **Our modelling highlights that drainage is a significant matter for the North West, which will be exacerbated by climate change. Delivering large performance improvements will drive significant cost and will require phasing to ensure best value and affordability. An adaptive approach is key to achieving long-term successes, being best placed to prepare for alternative futures, and identifying resilient phased improvements that are beneficial under all scenarios and where further innovation is needed around policy, regulation, behaviours, partnerships and technology.**

Key Points

- **The preferred plan sets out £21.8 billion (capex) of investment over 25 years for protecting, restoring and improving the natural environment, alongside significant reductions in flood risk, to offset the impact of climate change. This investment delivers cost-beneficial progress towards achieving the DWMP planning objectives and meets regulatory requirements, which are not subject to cost benefit.**
- **£16.5 billion (capex) of the preferred plan total is to meet the government's Storm Overflow Discharge Reduction Plan (SODRP) requirements.**
- **The preferred plan includes a wide range of different option types, including education, embracing technology and nature-based solutions, all of which customers highlighted as preferred solutions.**
- **Customers have told us that the environment is important to them. While engaging with customers, the environment and climate change have been consistently highlighted as high priority concerns.**
- **Affordability is a hugely important issue for many people in the region as four in ten of the most deprived neighbourhoods in the country are in the North West. We have strived to identify a best value plan, but are mindful that this is not necessarily equivalent of lowest cost, and a balance will need to be struck to ensure affordability for customers.**
- **Building sustainable partnerships is key to delivering stretching long-term targets, this takes time and requires flexibility. Enabling such partnerships needs the support of a regulatory approach that incentivises and promotes partnership working on both sides.**

Figure 3 summarises the full suite of documents published as part of the DWMP and how they support this overall main document, which, following feedback, has been made more concise and signposts more frequently the below.

Figure 3 Full suite of documents making up the UUW DWMP



Contents

Tables

Figures

Glossary

For the glossary, refer to document C003.

Disclaimer

Cautionary statement: This document contains certain forward-looking statements with respect to the operations, plans and objectives, performance and financial condition of the group. By their nature, these statements involve uncertainty since future events and circumstances can cause results and developments to differ materially from those anticipated. These forward-looking statements include without limitation any projections or guidance relating to the results of operations and financial conditions of the group as well as plans and objectives for future operations, expected future revenues, financing plans, expected expenditure and any strategic initiatives relating to the group, as well as discussions of our business plan and our assumptions, expectations, objectives and resilience with respect to climate scenarios. The forward-looking statements reflect knowledge and information available at the date of preparation of this document and the company undertakes no obligation to update these forward-looking statements. Nothing in this document should be construed as a profit forecast. Certain regulatory performance data contained in this document is subject to regulatory audit

1. Changes to the DWMP since draft publication

1.1 Overview

1.1.1 The draft Drainage and Wastewater Management Plan (DWMP) was published on 30 June 2022. Customers, stakeholders and regulators were able to engage with us through various channels such as an online survey and bespoke workshops. In total, we received over 50 responses to the online survey and over 40 organisations attended our three, independently facilitated workshops.

1.1.2 Our draft DWMP was well received among stakeholders and regulators as demonstrated by the positive feedback. There were also suggested improvements such as providing more clarity and detail on topics such as the options development stage of the process. Further detail on the draft consultation can be found within Technical Appendix 2 – Stakeholder Engagement (TA2), with a summary in section 4.2 of this document.

1.1.3 We have endeavoured that, for final DWMP, all feedback that is feasible to action within this cycle has been taken into account. In order to demonstrate the feedback received and the action that has been taken, we have produced our Statement of Response which can be found alongside our DWMP submission (https://www.unitedutilities.com/corporate/about-us/our-future-plans/Our-long-term-plans/dwmp-publication-may-2023).

1.1.4 On 24 January 2023 UUW submitted our Water Industry National Environment Programme (WINEP) for the five-year investment period 2025–2030. The nature and scale of UUW's proposed WINEP is fundamentally different to what has gone before and is substantially larger than UUW's current (2020-2025) WINEP and larger than the whole WINEP for England in the same period.

1.1.5 While there are a diverse range of regulatory needs, the Storm Overflow Discharge Reduction Plan (SODRP) along with changes to nutrient and sanitary limits in wastewater permits are the biggest drivers of investment.

1.1.6 For UUW in particular, the SODRP requirements and the Manchester Ship Canal in the WINEP are key investment drivers above and beyond those that other companies are likely to be facing. The scale of transition required to meet the targets set out in the SODRP is substantial as we collect proportionally more rainwater into our sewer systems than other companies. In the case of the Manchester Ship Canal, we have been required by the Environment Agency to plan for upgrading Davyhulme, Salford and Eccles Wastewater Treatment Works to Best Available Technology standards, as a result of proving it is practically infeasible to aerate the Manchester Ship Canal to achieve dissolved oxygen standards. This is a very significant change in permit requirements for treatment works serving a significant part of Greater Manchester.

1.1.7 UUW's final Drainage and Wastewater Management Plan for 2025-2050 includes all of the relevant wastewater requirements contained within the latest WINEP submission (January 2023) which results in a significant change in the proposed investment in our June 2022 draft DWMP submission.

1.1.8 Table 1 provides the key themes from the consultation feedback and where they can be found within the suite of DWMP documents.

Table 1 Summary of the feedback received during the draft DWMP consultation and where it can be found across the suite of DWMP documents

Key theme	Key topic	Relevant documentation	Location
Options development, programme optimisation and the preferred plan	Options development and programme optimisation	Technical Appendix 7 – Options Development and Appraisal	5.2 – 5.9
	The preferred plan	Technical Appendix 8 – Programme Optimisation	5.6
	Adaptive planning	Main Document	10.5
	WINEP and legal obligations	Main Document	10.3
Stakeholder engagement and partnership solutions	Partnership solutions	Technical Appendix 2 – Stakeholder Engagement	2 3 4
	Stakeholder engagement	Technical Appendix 2 – Stakeholder Engagement	3 4
	Strategic Planning Area DWMPs	Strategic Planning Area DWMPs (SPA_01 – SPA_14)	
	Alignment with other long-term strategies	Technical Appendix 2 – Stakeholder Engagement	2.3 3 4
Customer acceptability	Bill impact and customer affordability	Technical Appendix 9 – Customer Engagement	10
	Customer views	Technical Appendix 9 – Customer Engagement	9 10
	Base versus enhancement	Technical Appendix 8 – Programme Optimisation	5.8
Storm overflows	Timescales, milestones and costs	Main Document	10.3
	Water quality monitoring	Statement of Response	5.3.2
Wider strategic ambition of the DWMP	Planning objectives	Main Document	5
	Data and methodologies for assessing the risk	Statement of Response	6.3.2
	Water quality	Statement of Response	6.3.3
	Strategic Environmental Assessments (SEA)	C004 DWMP Strategic Environmental Assessment (SEA): Environmental Report Post Adoption Statement	
	Other considerations of the DWMP	Statement of Response	6.3.5
DWMP document structure and content	Structure, content and accessibility of the plan	Statement of Response	7.3.1
	Our approach and response to consultation	Statement of Response	7.3.2
	Assurance and governance processes	C003 Board Assurance Statement	

2. Introduction

- United Utilities Water (UUW) has followed the Drainage and Wastewater Management Plan (DWMP) framework, building on existing processes, to develop the draft DWMP.
- This is an iterative process, which will be used to provide long-term context to business plan development.
- The Board has provided assurance on the DWMP that it meets the expectations set out by Defra, the Environment Agency and Ofwat.

2.1 Background

2.1.1 UUW is one of the largest water and wastewater providers in the UK. Our purpose is to 'provide great water for a stronger, greener and healthier North West. From Crewe to Carlisle, we provide essential water and wastewater services to over seven million people every day. Our purpose drives us to deliver our services in an environmentally sustainable, economically beneficial, and socially responsible manner and create sustainable long-term value for all. Active engagement and strong constructive relationships help us understand and respond to the things that matter most to our stakeholders. The North West is facing significant challenges, both environmentally and socially. With a changing climate and a growing population, the future is uncertain. We need to plan now, to mitigate any impact on our wastewater services and the experience customers have.

2.1.2 As a result we have developed a long-term plan, the DWMP, in collaboration with a broad range of stakeholders. Through the DWMP we aim to ensure that we will continue to meet customers' needs in the future by delivering robust and resilient wastewater services, while at the same time meeting regulatory requirements and wider environmental objectives.

2.1.3 The DWMP is a key iterative tool in:

- Building the long-term plan;
- Working with others to deliver where partnership working is needed;
- Facilitating innovation and the development of affordable, sustainable plans;
- Supporting adaptive planning processes and decision-making with long-term context; and
- Informing the near-term investment needs for the five-yearly wastewater business plan submissions such as the business plan for investment cycle 2025–2030.

2.1.4 The DWMP framework has been designed to help water companies, in collaboration with others, to produce a plan that complies with relevant statutory obligations, government and regulators' policy expectations and customers' priorities for drainage and wastewater services.

2.2 Requirement for the DWMP

2.2.1 Drainage and wastewater management planning has been an evolving process since water industry privatisation in the 1990s. The production of the first DWMP builds on historic processes including Drainage Area Plans, Sewerage Management Plans and the Drainage Strategy Framework (DSF). These planning processes have underpinned billions of pounds of investment since the turn of the century.

2.2.2 However, the scale of future challenges, the uncertainty surrounding global issues such as climate change, and the integrated nature of drainage problems across sectors/organisations mean new approaches are needed to tackle the uncertainties of the future. The industry and regulators identified that a step change would be required in the approaches to planning and managing drainage, flood and environment risk, to drive more partnership solutions, consistency and transparency.

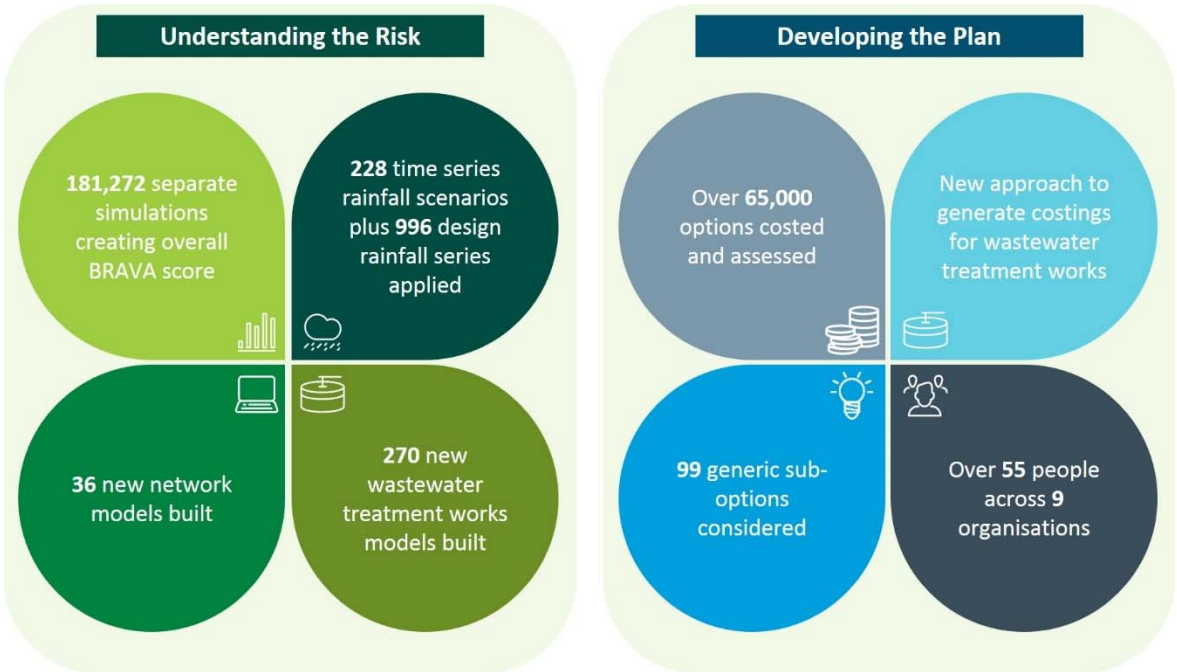
2.2.3 To respond to the scale of future challenges on wastewater and drainage, we have been working since 2018 with nearly 30 organisations – including regulators, local authorities, environmental charities and other water and sewerage companies – to define a framework for the delivery of the first DWMP. Within this first iteration of DWMP we have followed, throughout development, the guidance set out in the Water UK document 'A framework for the production of Drainage and Wastewater Management Plans' published in September 2018. We look forward to continuing to build on this collaborative work across the industry, sharing best practice and defining key principles and common methodologies between cycle one (DWMP23) and cycle two (DWMP28). It will also be important to share learning about what works best within the DWMP framework and what can be evolved for future plan iterations.

2.2.4 We support the enactment of DWMP into statutory law and believe this will enable the step change required for the ongoing delivery of long-term planning in the water industry. The Environment Act (2021) contains a new statutory duty on water and sewerage companies to create DWMPs and to update these every five years. The Environment Act states that DWMPs "will enable better risk-based assessments of current drainage and wastewater issues, impacts on the environment, and long-term planning, improving our resilience to extreme weather events and risks of sewer/surface water flooding". Whilst long term planning is not new for wastewater, we support the focus brought by the DWMP and the potential to engage the necessary partners in sustainable solutions.

2.3 Developing the plan

2.3.1 Although wastewater planning over long design horizons has been done for many years, the scale of activity for the DWMP brings the planning process and our understanding to a new level. This will provide a solid foundation for business plan development now and into the future. Figure 4 highlights the scale of activity that has been undertaken when developing the plan.

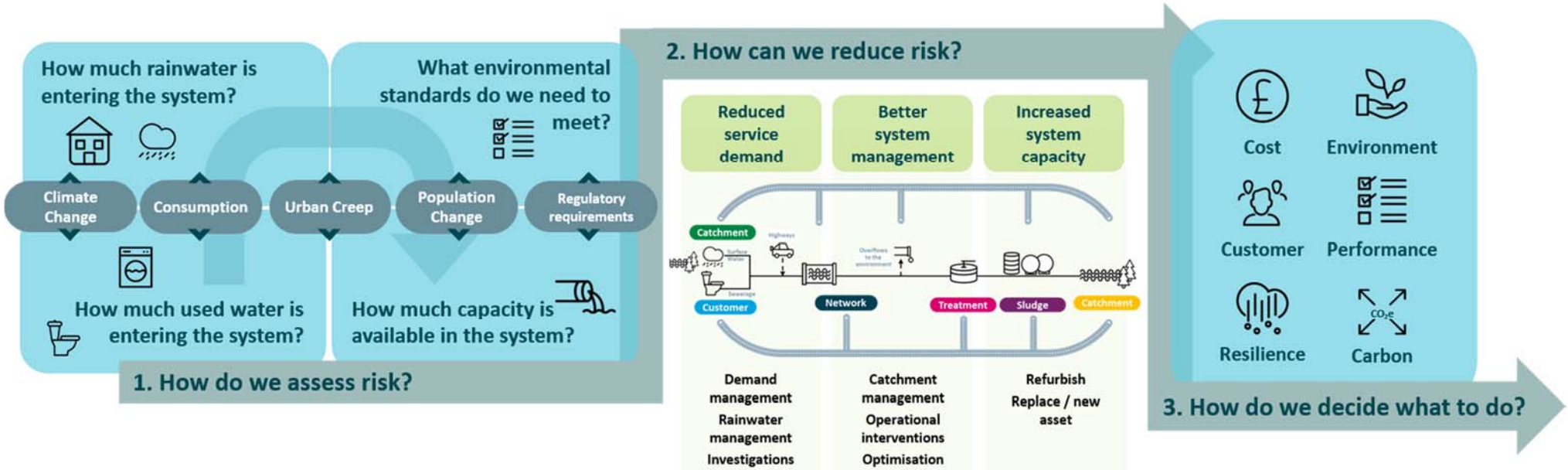
Figure 4 The scale of activity undertaken in developing the DWMP



2.3.2 We have produced forecasts of demand and capacity across the wastewater system, taking into account a range of factors across the short, medium and longer term, including the impacts of climate change, population growth and expanding urban environments (urban creep). Forecasts are compared against long-term performance targets, herein referred to as 'planning objectives'. Where there are projected risks, or changes required to meet regulatory requirements, UUW has assessed a range of options against a series of criteria and selected from these a preferred suite of options. These options are considered in the context of affordability and customer and stakeholder aspirations in order to inform our final, best value plan. This process is outlined in Figure 5.

2.3.3 The DWMP is an iterative process, which will be undertaken on a cyclical basis every five years, setting out what may be required to deliver robust and resilient wastewater services over the next 25 years. This approach supports adaptive planning and will allow us to continuously review risks using the best available tools, methodologies and data. The DWMP then informs our Business Plan proposals, which are next being prepared for the Price Review 2024 (PR24), for the investment cycle 2025–2030. As such the DWMP is a long-term view of risk and investment need - a planning tool, which supports decision-making rather than an investment plan. The business plan for investment cycle 2025–2030, which will be submitted in autumn 2023 post publication of the DWMP, will set out our detailed investment plan for the next five-year period. This investment will be considered and supported in the context of the long-term risks, needs and uncertainties identified through the DWMP.

Figure 5 Developing the DWMP



2.4 Board assurance

2.4.1 To manage the development of the first ever iteration of the DWMP, UUW has adopted a tiered approach to governance to provide internal scrutiny on plan development, promote alignment with wider processes, and support the internal team in developing the plan. The analysis underpinning our plan has also been subject to rigorous third-party audits such as:

- Assurance to confirm that UUW has met all of the requirements set out in the Defra Guiding Principles;
- Undertaken by Jacobs at two stages across the development of UUW DWMP: Baseline Risk and Vulnerability Assessment (BRAVA) and Options Development;
- Undertaken by Deloitte across the development of the UUW DWMP programme to ensure consistency with the WINEP programme and assurance of the building blocks of the DWMP submission (optimised programme, wastewater treatment works and storm overflow programme);
- Undertaken by PWC across the DWMP data table submission requirements; and
- Final aggregate assurance undertaken by Turner and Townsend to review the combined assurance activities whether internal or external.

2.4.2 The business governance and audit processes feed into and support final endorsement by the board.

2.4.3 More detailed information can be found in Technical Appendix 1 – Assurance and Governance (TA1), and within the Board Assurance Statement (C002).

3. An overview of the DWMP

- The DWMP is a plan for the end-to-end wastewater system across the UUW operating region.
- It has been developed across 14 Strategic Planning Areas (SPAs) and 567 Tactical Planning Units (TPUs) in line with the framework.
- All key stages identified in the framework have been carried out including: Strategic Context, Risk Based Catchment Screening (RBCS), Baseline Risk and Vulnerability Assessment (BRAVA), Problem Characterisation, Options Development, and Programme Appraisal.

3.1 Introduction

3.1.1 Our drainage and wastewater assets are under increasing stress. Climate change, population growth and an ageing infrastructure all have negative consequences on asset health and performance. Through producing the DWMP, UUW is developing the long-term context for decisions to secure robust and resilient drainage and wastewater services at an affordable price for customers. The DWMP also supports adaptive planning, ensuring the right actions can be taken at the right time. There are a number of challenges and opportunities facing the North West of England from climate change to the establishment of the government's Levelling Up programme. A drainage system fit for the 21st century is required to meet these challenges and support the realisation of regional ambitions. This requires an evolution in our approach to drainage. The North West has a normalised urban rainfall 40% higher than other regions[2], a higher proportion of combined sewers (54% versus an average of 33%) and consequentially higher numbers of storm overflow activations.

3.1.2 UUW has taken a comprehensive approach to the first DWMP, recognising the importance of long-term planning to adapt to climate change and meet the demands of population growth. In developing this plan, our aim is to:

- Set out our assessment of long-term challenges to drainage and wastewater, the key drivers underpinning this and the risks and uncertainties;
- Provide a clear, transparent and consistent planning approach with sufficient adaptability to respond to future challenges;
- Provide a systematic understanding of service and system risks and vulnerability;
- Provide confidence to customers, stakeholders and regulators that short-term decisions are being made in the context of long-term needs and uncertainties;
- Create opportunities to allow for integrated and partnership working and the co-creation of innovative solutions;
- Identify options which offer best value to customers to ensure robust and resilient drainage and wastewater services; and
- Develop an approach which supports a long-term adaptive plan to enable us to adapt to multiple future scenarios.

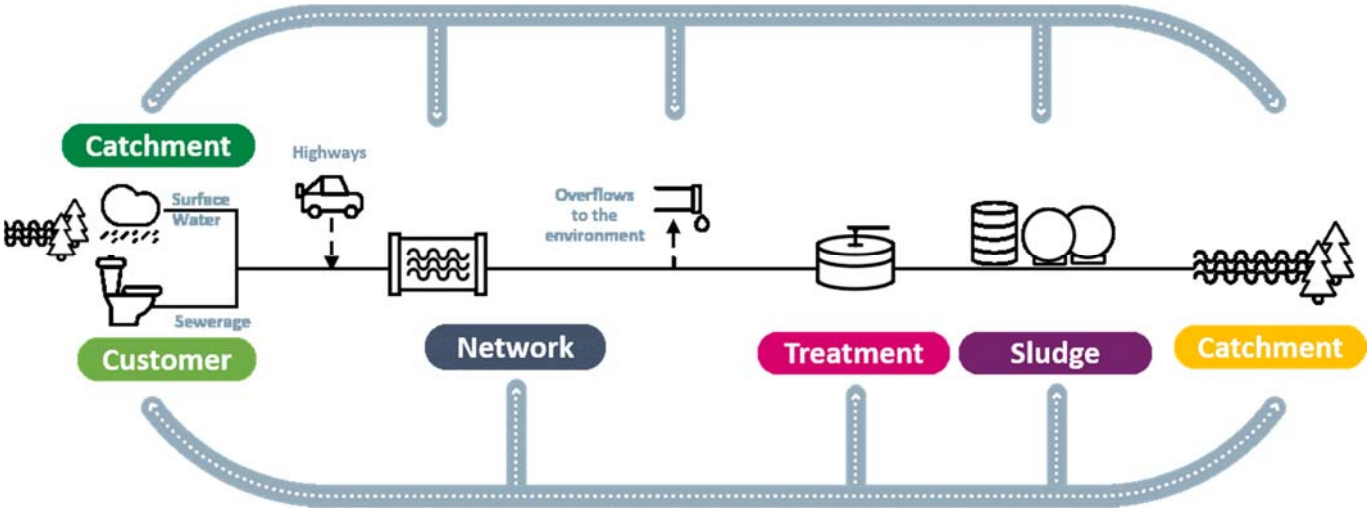
3.1.3 The plan covers the end-to-end wastewater system (Figure 6):

- Inputs to the system: domestic and commercial used water as well as trade effluent, and rainwater which drains from gutters and roads into combined sewer systems;
- Processes across the system: transport of wastewater through the sewers and treatment to the required standard at wastewater treatment works; and

[2] Ofwat's Urban rainfall derivation v2.0. Accessed on 26.05.23 at: https://www.ofwat.gov.uk/publication/urban-rainfall-calculations/

- Outputs from the system: returning recycled water to rivers, lakes and the sea.

Figure 6 Overview of the end-to-end wastewater system



3.2 The structure of the DWMP

3.2.1 The plan has been established over three levels to maximise the potential for partnership working and for effective engagement between regulators and stakeholders at both a company-wide level and more locally (Figure 7).

Figure 7 Geographical scales applied for planning and collaboration within DWMP

3.2.2 Level 1 North West

3.2.2.1 At this level, the Independent Challenge Group (ICG) has been engaged with through 'Your Voice Environmental and Social Capital Sub Group', held strategic discussions with regulators through the joint 'Planning Together Group' to ensure alignment with other regional strategic plans, and engaged with other organisations who operate across the North West, such as the North West Regional Flood and Coastal Committee (RFCC), Network Rail and National Highways.

3.2.3 Level 2 Strategic Planning Area (SPA)

3.2.3.1 This level is aligned with the River Basin District and there are 14 across the North West (Figure 8). We have created our 'Strategic Planning Groups' (SPGs) which have allowed us to effectively engage and collaborate with other stakeholders, such as the Environment Agency, lead local flood authorities (LLFAs), Natural England and the Catchment Based Approach (CaBA) catchment hosts, throughout the development of the DWMP.

3.2.3.2 Accompanying documents are available for each SPA (SPA_01 to SPA_14) which detail the background of the SPA, the risk assessments undertaken and the preferred options.

Figure 8 UUW 14 SPAs across the North West

3.2.4 Level 3 Tactical Planning Unit (TPU)

3.2.4.1 This level is the wastewater treatment works and its contributing catchment (foul, combined and surface water sewers, ancillaries and sewage treatment works facilities). Local level planning and data has underpinned engagement with the Strategic Planning Groups. Engagement at this level has been supplemented by existing arrangements, such as the Catchment Based Approach catchment partnership meetings, Local Planning Authority engagement and tactical and strategic flooding forums, led by the lead local flood authorities. The number of SPA and TPU units are reviewed annually throughout the development of the DWMP.

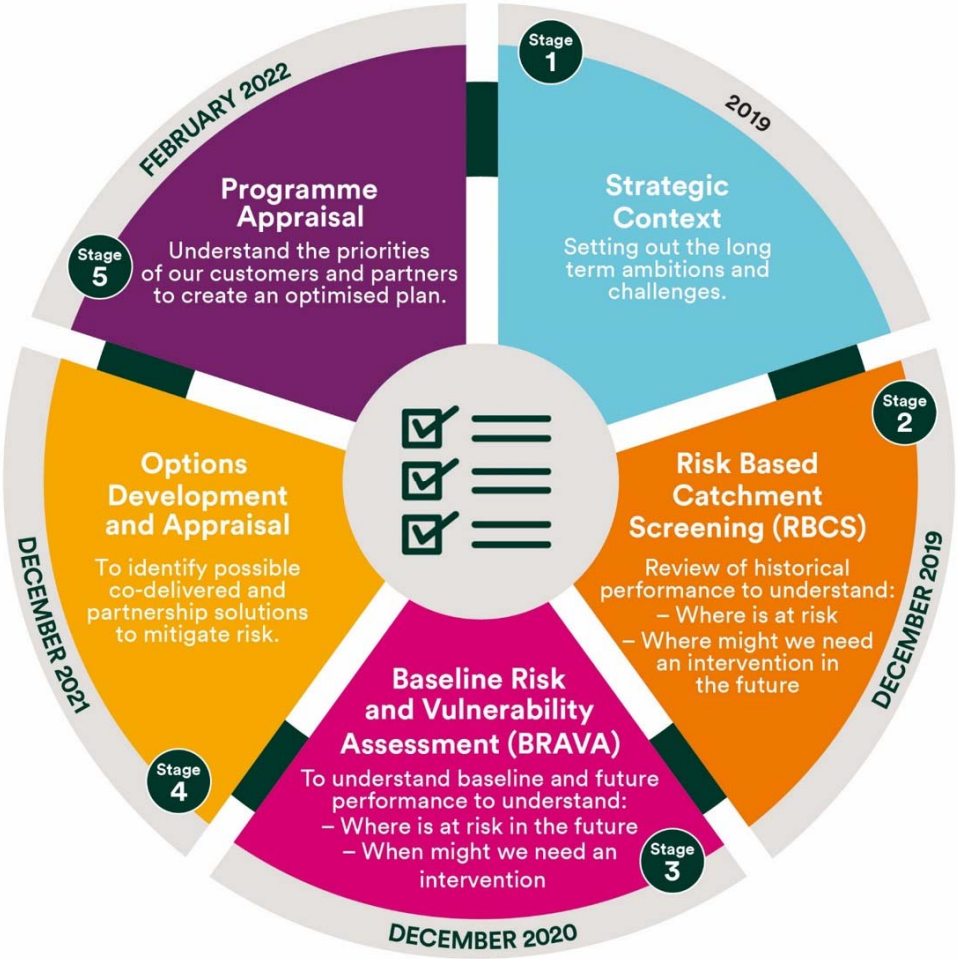
3.3 Approach to developing the DWMP

3.3.1 In developing the first iteration of our DWMP, UUW has followed the guidance set out in the DWMP framework. The development of the plan is broken down into five key stages summarised in Figure 9. These phases of planning have allowed for a process of defining drivers and objectives followed by developing an understanding of potential risks in an area. Activity to understand risk was followed by a process to develop options to mitigate the risk, then appraising and optimising the programme at a regional level.

3.3.2 The methods and data used to assess future risk within the UUW serviced area are described in detail within our Technical Appendices. The process was informed by, and closely adhered to, the guidance detailed within Appendices A, B, C and D of the document '*A framework for the production of Drainage and Wastewater Management Plans*' published in September 2018.

3.3.3 The following sections of this document detail our approach to developing the DWMP, from modelling and identifying risks, to optioneering, proposing solutions and presenting the preferred investment plan, in collaboration with customers and stakeholders.

Figure 9 Stages of the DWMP process



4. Co-developing the plan

More detailed information can be found in:

- Statement of Response;
- Technical Appendix 2 – Stakeholder Engagement (TA2);
- Technical Appendix 9 – Customer Engagement (TA9); and
- The fourteen SPA documents (SPA_01 to SPA_14).

4.1 Introduction

4.1.1 The number of different interactions between drainage and other systems means that collaboration is key in managing long-term risk. The drainage and wastewater system is an open system. There are multiple points of interaction with other risk management authorities: drainage of rainwater from roads and paved areas often connects to the combined sewer system; storm overflows in combined systems can, in heavy rainfall, discharge to rivers; finally, recycled water from wastewater treatment works is safely returned to lakes, rivers and the sea.

4.1.2 As well as the sewer system, other activities taking place across a catchment can have both positive and negative effects on the environment. For example, land management practices can influence flood risk and water quality as a result of diffuse pollution, and local authorities and developers can influence the amount of rainwater entering sewer systems and rivers.

4.1.3 In order to plan for the long term effectively, engagement and collaboration with customers, stakeholders and other organisations is key when developing and shaping the DWMP.

4.1.4 Key themes

4.1.4.1 This section outlines the need for collaboration and co-development to manage drainage and environmental risks. It outlines how the DWMP has been co-created with inputs from customers and a range of stakeholders, and describes the impact of the engagement on our DWMP. This has been done through a range of activities such as the:

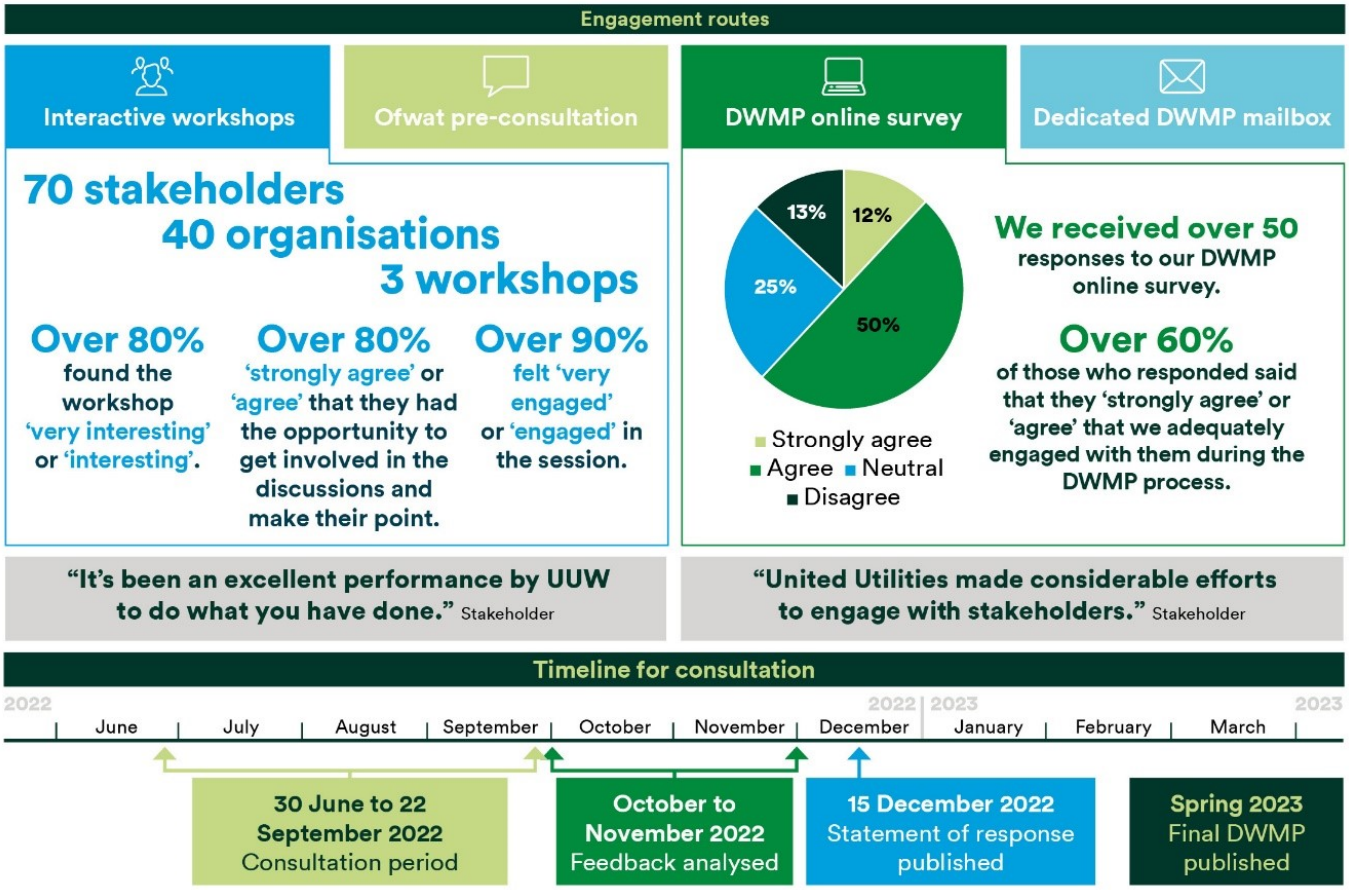
- Consultation on the draft DWMP;
- Customer engagement;
- Stakeholder engagement including the development of the DWMP partnership opportunity pipeline;
- Creation of the 14 SPA plans; and
- Alignment with other management plans.

4.2 Consultation on the draft DWMP

4.2.1 Following the publication of the draft DWMP in June 2022, we encouraged feedback through our consultation process. Customers, stakeholders and regulators were able to engage with us through various channels as summarised in Figure 10. In total, we received over 50 responses to the online survey and over 40 organisations attended our three, independently facilitated workshops.

4.2.2 **Note:** All of the customer feedback was via the online survey with varying levels of detail that could be used to inform the Statement of Response. As a result, the document is more heavily influenced by stakeholder and regulator perspectives. Customer engagement has been an integral part of plan development to ensure that their views, priorities and opinions are considered. For more detail see section 4.3 below and Technical Appendix 9 – Customer Engagement (TA9).

Figure 10 Overview of the consultation process on the draft DWMP



4.2.3 In order to review and respond to the feedback, we produced our draft statement of response which was published in December 2022. The document summarised the feedback on the draft DWMP across a range of topic areas, our response, and how comments might be incorporated within the final plan.

4.2.4 The feedback received has been categorised into the following key themes:

- Options development, programme optimisation and the preferred plan;
- Stakeholder engagement and partnership solutions;
- Customer acceptability;
- Storm overflows;
- Wider strategic ambition of the DWMP; and
- DWMP document structure and content.

4.2.5 Our draft DWMP was well received among stakeholders and regulators as demonstrated by the positive feedback received as highlighted in Figure 11. Equally, there were suggested improvements such as providing more clarity and detail on topics such as the options development stage of the process.

4.2.6 Since the publication of our initial Statement of Response in December 2022, we have produced a more detailed Statement of Response to support the final DWMP publication. This details all feedback and documents where in the DWMP we have made changes as a result.

4.2.7 The full Statement of Response document can be found alongside our DWMP submission. Some examples of feedback are given below.

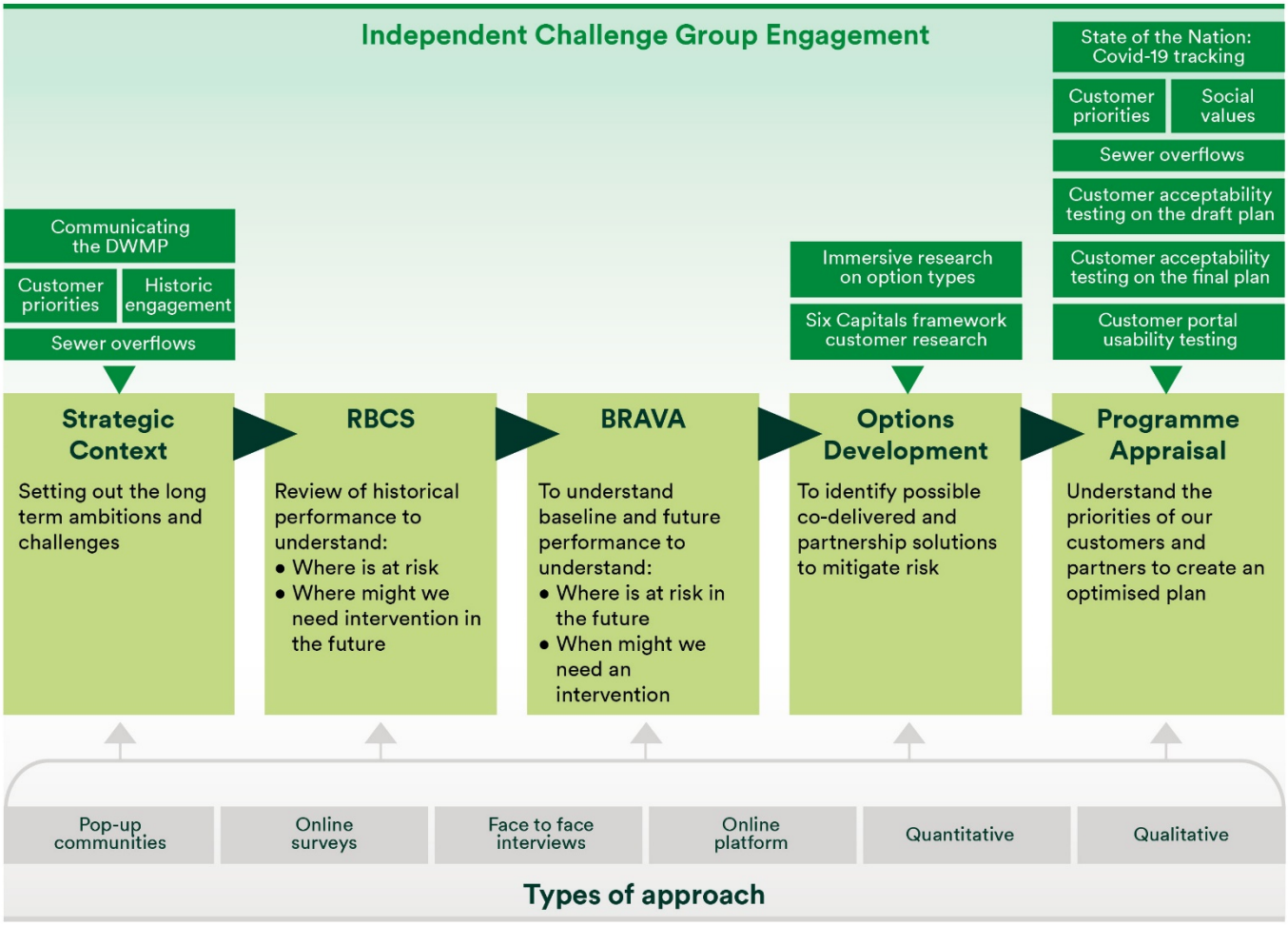
Figure 11 Examples of feedback received across stakeholders and regulators

4.3 Customer engagement

4.3.1 Customers' priorities and needs are central to our decision-making. Throughout the DWMP process we have engaged with customers across the North West and their feedback allows us to ensure that wastewater services are able to adapt and be resilient to future risks, while meeting the performance expectations of customers, stakeholders and communities today.

4.3.2 We have gained endorsement from customers at key milestones through several different channels as summarised in Figure 12.

Figure 12 Overview of DWMP customer engagement



4.3.3 This engagement has influenced how we identify and assess the priorities and risks; and how we prioritise opportunities that the plan will propose. Our approach to developing the DWMP has ensured that the plan is co-designed and co-developed, and can be used to inform decision-making. Some examples of how customers have shaped the DWMP are shown in Table 2.

Table 2 Customer engagement activities

Stage of the DWMP process/topic area	Customer engagement summary
Strategic Context	When developing our long-term objectives, we have considered a wide range of key performance indicators. It is essential that these objectives adequately reflect our long-term ambition as a company but are also built around the priorities and feedback of our customers and stakeholders. To inform our long-term targets we have conducted bespoke research to understand customers' general priorities in terms of services and more in-depth research to deep dive on important but complex topics such as sewer overflows. Three key pieces of research informed our strategic context and the development of planning objective targets: • Customer priorities for wastewater services; • Customer views on storm overflows; and • Engaging customers on DWMP. The outputs led to consideration of our planning objectives, which objectives should be most stretching and where there is customer support for high prioritisation of improvements in performance.
Options Development	We recognise that long-term planning is challenging to ascertain meaningful engagement on and that customers don't differentiate between 'water' and 'wastewater' services. Consequently, a joint approach to engaging on long-term planning across WRMP and DWMP was established. From this piece of research, we wanted to understand: • Which service areas and options/solutions customers prioritise; • How customers prioritise each option and the factors that come into play during prioritisation; and • Views on the potential benefits/challenges of options. Across the research groups there was a similar pattern for customers' preferences on approaches to meeting long-term challenges. We found there is appetite for more education, innovation and smart ways of working before the more traditional grey measures – this also fits well with targeting more resilient, surface water separation and nature-based solutions, in the early phases of delivery. This was developed into the solutions hierarchy we have adopted.

Stage of the DWMP process/topic area	Customer engagement summary
Programme Appraisal	In order to inform customer views on different scenario outputs from programme appraisal a piece of triangulation work was undertaken, taking consideration of the feedback customers had given us across a suite of engagement activity undertaken during 2021 and 2022. This included: • State of the Nation COVID-19 tracking – September 2021; • UUW customer priorities, November 2021; • WRMP and DWMP options research – April 2021; • Sewer overflows – November 2021; and • Social value, insight synthesis – February 2022. Economic uncertainty and incomes falling in real terms throughout 2021 led to increasing concern about affordability of water bills. We consider this concern is set to continue through into investment cycle 2025–2030 and should be a key consideration in programme appraisal and continue through to development of the business plan for investment cycle 2025–2030. In addition, the following conclusions could be drawn about services provided: pollution and reducing activation events from overflows have a higher priority than flooding; internal flooding has a higher priority than external and public space flooding; solutions with a lower carbon footprint or delivering environmental benefits should have a high priority. In terms of sewer overflow performance, sewer litter was the main concern raised by customers.
Storm Overflows	The activation of storm overflows and their impact on river health has been an area of increasing scrutiny and concern for customers. Therefore, we conducted research on this area, using immersive techniques to better understand customer views. At the time that this research was conducted, there was an ongoing background of uncertainty surrounding legislative and regulatory requirements for overflows, but provided us with a strong set of data points, which we used to try and quantify the impact in view of the government's consultation on reducing the impact of storm overflows during 2022, ahead of publication of the SODRP.

4.3.4 Customer acceptability testing on the draft DWMP

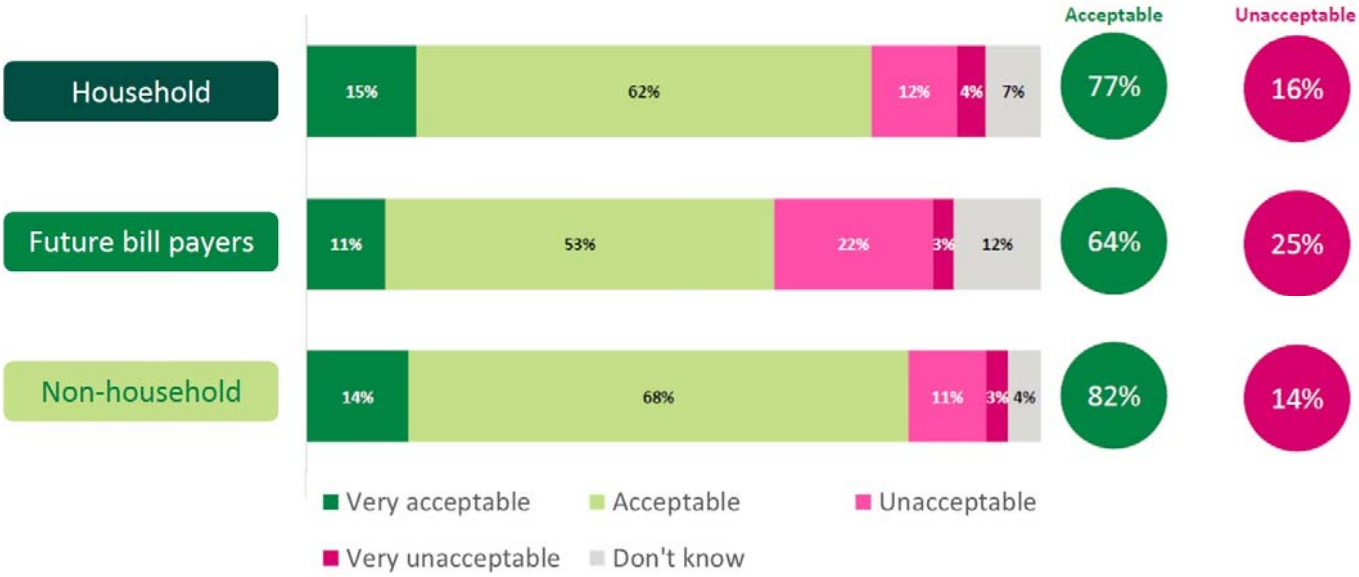
4.3.4.1 It is important that the DWMP is supported by customers which is why we have conducted customer acceptability testing on both the draft and final DWMP. The aim of the research is to understand what, if any, amendments are required to ensure that the DWMP provides the best outcome for customers and communities.

4.3.4.2 With this in mind, the results of the research showed that there was a strong level of acceptability for the UUW proposed level of investment (Figure 13). The reasons for this were that customers felt that the UUW proposed plan is the best option and that the bill impact was worth it for the improvements.

4.3.4.3 Feedback from customers showed that some want to see a higher level of investment in some intervention categories such as sewer upgrades, stating they were happy to pay more because they believe sewer separation is a worthy endeavour.

4.3.4.4 Additionally, raising customer awareness was of high value among customers stating that the environmental and social benefits are worth the small increase in price and that educating younger generations in schools through campaigns should be a priority for investment as it will increase public knowledge and help in the long term.

Figure 13 Responses to "how acceptable do you think United Utilities' proposed plan is?"



4.3.4.5 Customers were also asked how reasonable they think the proposed bill increases are. The majority of customers felt that the proposed bill increases are reasonable (Figure 14) because of the benefits to service they would receive from the investment and compared to other bill increases that they have experienced recently as a result of the cost of living crisis, which was ongoing at the time the research was undertaken.

Figure 14 Customer responses to how reasonable they think the proposed bill increases are

4.3.5 Customer acceptability testing on the final DWMP

4.3.5.1 Since publication of the draft DWMP in June 2022, we have undertaken further work and made improvements to the plan based on the insights gained through the customer acceptability testing and the feedback received across customers, stakeholders and regulators as part of our draft consultation process.

4.3.5.2 The customer insight gathered between draft and final allowed us to champion customer's voices and give ourselves opportunity to reflect and incorporate them by making informed improvements to the plan and ensure it was co-developed with our customers and stakeholders. In order to test the acceptability of the revised plan, we have conducted further customer acceptability testing.

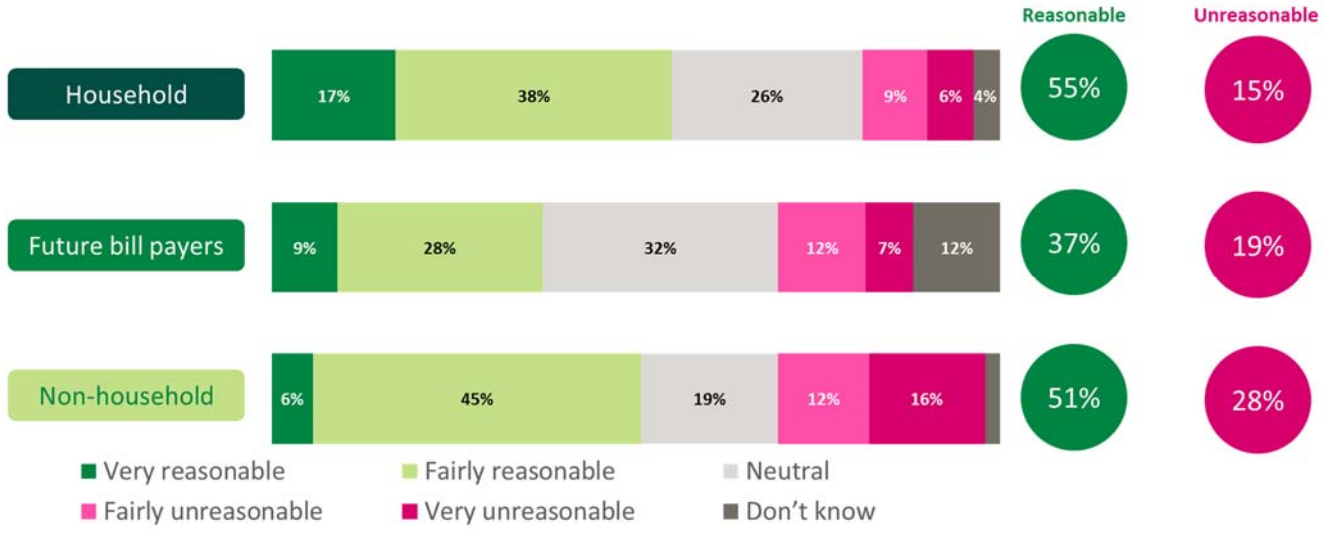
4.3.5.3 Note: Testing was conducted on an early version of the plan that was similar to, but not identical to the final DWMP. Maximum annual bill impacts presented to customers (£14.81) were slightly lower than the maximum bill increases projected for the final DWMP (£16.68, section 11). Additionally, the proposed level of service improvements presented as part of the survey varied from those included in the final DWMP.

4.3.5.4 Similarly to the customer acceptability testing of the draft plan, the results of the research showed that there was a strong level of acceptability for the UUW proposed level of investment (Figure 15). Although this is mainly driven by 'acceptable' rather than 'very acceptable' ratings. Non-households are most likely to feel the plan is unacceptable (Figure 15). The main reasons for this were a feeling that it is the best option and that the price increases are worth it for the improvements. The minority who feel it is unacceptable tend to feel more should be done for the environment or do not approve of the cost implications.

Figure 15 Customer responses to "How acceptable do you think United Utilities' proposed plan is?"

4.3.5.5 Customers were also asked how reasonable they think the proposed bill increases are (Figure 16). More than half of household and non-household customers feel that the bill increases proposed are reasonable given the other bill increases they have experienced recently. Agreement with this is lower among future bill payers due to more neutral (or don't know) responses.

Figure 16 Customer responses to "Taking into account other bill increases you may have experienced recently (e.g. energy bills), how reasonable do you feel that the bill increases mentioned in the exercise were?"



4.3.5.6 Whilst acceptability testing was conducted on an early version of the final DWMP, which differed from our final proposed plans in terms of bill impact and service levels, we can nevertheless draw a number of important conclusions as to customers views of the final DWMP.

4.3.5.7 The results of this acceptability testing have been considered alongside other DWMP customer research projects, including customer acceptability testing of the draft DWMP, six capitals customer research, research supporting options appraisal and customer preference research. Taken together we believe we can safely conclude there is clear support from customers for the service improvements within the final DWMP, with an acceptance of bill increases of the general magnitude required to deliver these improvements. Further information on the bill impact of the plan can be found in section 11.2.

4.3.5.8 More detailed information on how customer engagement has shaped the DWMP can be found in Technical Appendix 9 – Customer Engagement (TA9).

4.4 Stakeholder engagement

4.4.1 Interconnectivity between different drainage systems is present in many areas across the North West, resulting in a multitude of interconnected issues for all drainage asset owners. Working collaboratively is key in identifying integrated solutions and ways of working across organisations which support the delivery of system-wide benefits.

4.4.2 Stakeholder engagement through the creation of SPGs has provided a space to:

- Share DWMP progress updates and to challenge and endorse approaches;
- Discuss and identify priority areas of shared risks both thematically and geographically; and
- Develop a partnership opportunity pipeline for each catchment, identifying potential opportunities for co-delivery and co-funding.

4.4.3 Working closely with other risk management authorities and stakeholders through the SPGs has been key to identifying shared priorities and, importantly for DWMP, developing a suite of opportunities, which can be considered for partnership funding in the future.

4.4.4 The North West covers an extensive geography, which means there are a large and diverse group of stakeholders. Through the development of our SPGs which include members such as the Environment Agency, LLFAs, Natural England and the CaBA catchment hosts, feedback and endorsement has been provided at a variety of stages throughout the DWMP.

4.4.5 To help structure the delivery of SPG engagement with stakeholders, a framework was established (Figure 17), aligned to the key stages of the DWMP. Since draft DWMP publication in June 2022, we have also held further engagement sessions to ensure that feedback can be considered and addressed.

Figure 17 UUW stakeholder engagement framework

4.4.6 Through the input from our SPGs we have:

- Incorporated additional objectives, such as the impact of sewer flooding on highways and open spaces;

- Made our long-term targets more ambitious and stretching;
- Changed the way we consider the 'benefits' delivered to incorporate wider environmental and social criteria; and
- Developed an opportunity pipeline, which can be shared with partners and will be fed into our plan for investment cycle 2025–2030.

4.4.7 A summary of the key stakeholder engagement activity is summarised below. Additionally, we have conduced bespoke engagement to widen the opportunity to involve other more strategic partners in managing these risks. This has included organisations such as Network Rail and National Highways and other large-scale infrastructure providers in the North West to investigate funding mechanisms, risk management and partnership opportunities.

4.4.8 Figure 18 highlights the breadth of engagement across the development of the DWMP.

Figure 18 Breadth of engagement across the development of the DWMP

4.4.9 Setting the long-term ambitions

4.4.9.1 When developing our long-term planning objectives, stakeholders were invited to workshops across three strategic areas across the five counties; Cumbria, Lancashire, Cheshire, Merseyside and Greater Manchester. These preliminary SPG workshops were held in October 2019, draft targets were developed in advance and presented for feedback.

4.4.9.2 Each workshop aimed to gather and understand the views of organisations responsible for risk management on their vision for the future of the North West in terms of drainage and wastewater management and receive feedback on UUW's initial draft objectives. In addition, it was also important to understand what partners' views were on the current and future shared risks and the potential opportunities. The strong partnership theme, which runs through the DWMP, meant that it was also key to identify any methods for collaborative and partnership working to develop joint solutions and proposals for co-delivery. This was key to shape the plan and will be key to subsequent delivery of the agreed DWMP outcomes.

4.4.9.3 Key findings to influence the plan were:

- The majority of attendees believed targets could be more ambitious for reducing the number of pollution incidents and enhancing the natural capital of the North West;
- The initial draft UUW targets for permit compliance and recycled biosolids were considered to be 'about right' for over 80 per cent and 70 per cent of attendees, respectively. However, many considered that, as UUW already operates at, or near to, 100 per cent in these areas, the targets for

these activities need to incorporate some more stretching objectives for the 25+ year timescale and go beyond just complying with legislative requirements. Discussions about how this could be done included supporting other polluters in the catchment through investment into diffuse pollution and treating and disposing of other organisations' biosolids;

- There was a greater variety in how attendees at the different workshops responded to the initial draft objectives for internal and external sewer flooding, with the majority split between either agreeing with the targets or otherwise considering that UUW could be 'more ambitious' in relation to sewer flooding (and particularly for internal flooding). Additionally, many comments were raised surrounding external flooding and questioning why there were no targets being proposed that included sewer flooding of public spaces (as opposed to private gardens/driveways that are included as UUW's external sewer flooding objective);
- When asked to prioritise the initial draft objectives, internal sewer flooding was consistently the greater priority for participants compared to external sewer flooding; and
- Enhancing natural capital was selected as being of paramount importance at the Cumbria and Lancashire workshops, whereas reducing internal sewer flooding was the most significant for those attending the Manchester, Merseyside and Cheshire workshops.

4.4.10 The development of the DWMP partnership opportunity pipeline

4.4.10.1 Between January and March 2021, workshops were held in each SPA to discuss the catchment, present the BRAVA and resilience results and to document stakeholder risks and shared opportunities to work collaboratively.

4.4.10.2 The DWMP partnership opportunities pipeline was consequently created using the outputs of this engagement. The pipeline includes opportunities at a range of different levels of maturity and confidence in development, as such these are not confirmed or funded schemes at this time. However, they provide an indication of areas where we may be able to work collaboratively with stakeholders in the future when more certainty is available on the need and funding.

4.4.10.3 From the initial suggestions made during the SPG workshops, the DWMP partnership opportunity pipeline has undergone various refinements as summarised below and in Figure 19:

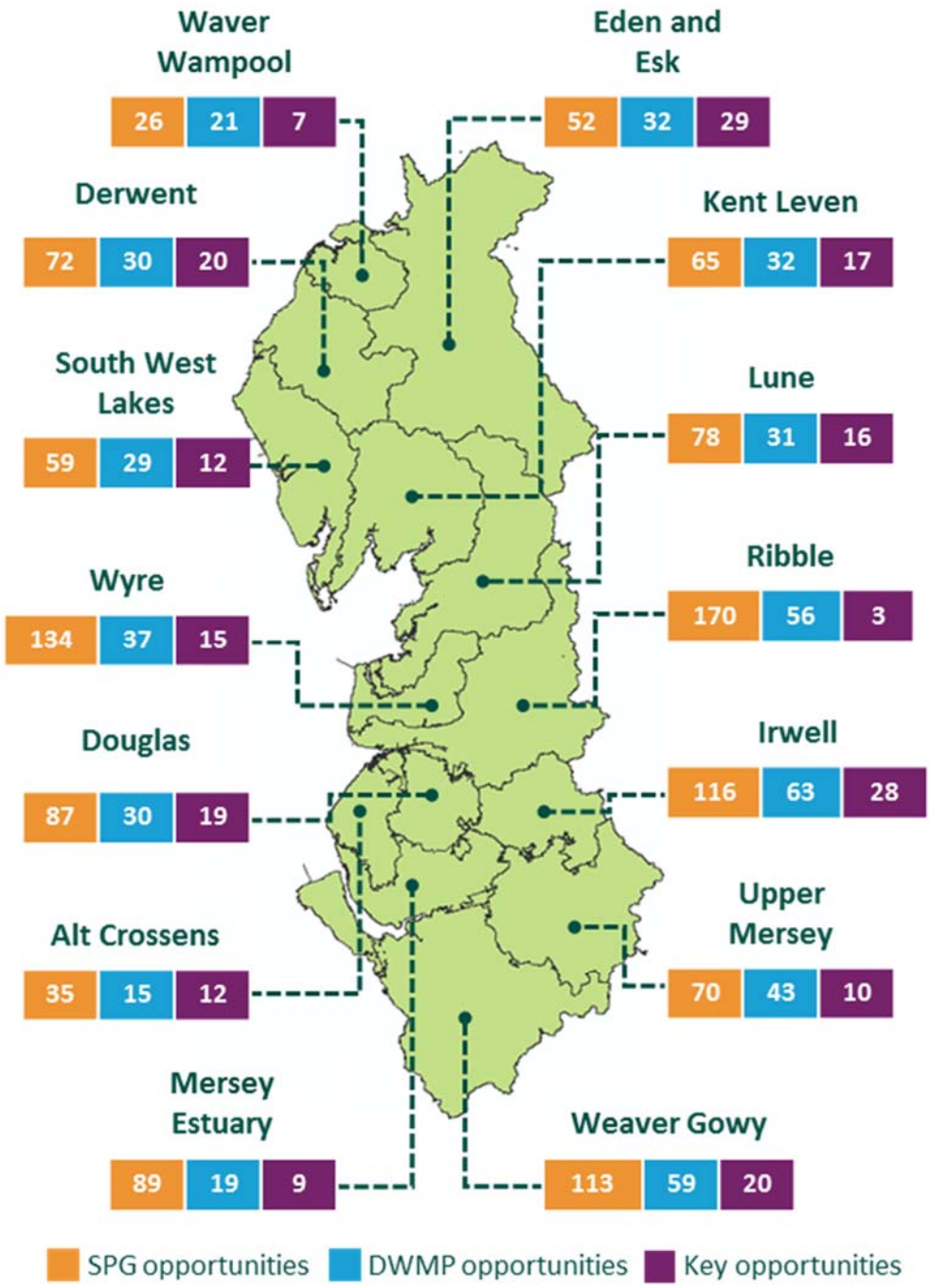
- Where possible, the potential partnership opportunities were mapped and this created over 1,000 opportunities for further investigation. The suggestions were screened depending on the opportunities' timescales, proximity to UUW assets and the level of detail. This allowed UUW to refine the opportunities that were believed to have the most potential;
- This refined list was presented back to the SPGs for updates, review and discussion between September and December 2021. This further discussion allowed additional benefits to be identified and better mapping. This was particularly important for potential integrated drainage partnership opportunities as it helps to understand the holistic picture of the flooding mechanism. This refined the list further to approximately 500 potential partnership opportunities;
- Following the SPG events, UUW mapped the updated DWMP partnership opportunities against asset locations and UUW areas of interest i.e. flooding clusters and mutual natural flood management (NFM) to identify those most suited to the DWMP. This produced the list of key DWMP partnership opportunities; and
- The key list of opportunities has been reviewed against the wider DWMP options development process.

4.4.10.4 The remaining opportunities that did not make it into the key DWMP partnership opportunity pipeline, for example in areas with no wastewater assets, were captured in our organisation-wide partnership opportunity pipeline where they are considered alongside all other partnership opportunities. Another key reason for opportunities not being included in the DWMP partnership opportunity pipeline is where projects may be more imminent as the DWMP is a longer-term plan.

4.4.10.5 UUW is further developing the organisation-wide partnership opportunity pipeline and is developing a central partnership prioritisation process which comprises two elements: the partnership solution identification stage and a specific partnership assessment activity that aims to support decision-making for partnership schemes against a set of specific criteria. This will allow UUW to harness scheme-specific collaboration opportunities as we recognise the need for more strategic partnerships, and we will build on successes from historic partnerships in the North West.

4.4.10.6 More detailed information on how we have engaged with stakeholders can be found in Technical Appendix 2 – Stakeholder Engagement (TA2), and more detailed information for each SPA can be found in SPA_01 to SPA_14.

Figure 19 The DWMP partnership opportunity pipeline



4.4.11 Embedding of the DWMP partnership opportunity pipeline

4.4.11.1 In addition to supporting the development of the organisation-wide partnership opportunity pipeline, the DWMP partnership opportunity pipeline has fed into a number of UUW partnership projects such as green recovery, the Fylde Hub and the Greater Manchester Integrated Water Management Plan (IWMP) as summarised in Table 3.

Table 3 Examples of how the DWMP partnership opportunity pipeline has fed into UUW projects

UUW partnership project	Partnership summary
Green Recovery	In 2020 Defra and the water sector regulators invited water companies to make proposals to help deliver a green economic recovery. As part of UUW's 'Accelerating Partnerships to Deliver Natural Solutions', we managed to agree circa £15 million of accelerated investment, of which £9 million was allocated to delivering Sustainable Drainage Systems (SuDS) and Natural Flood Management (NFM) in three strategic catchments. These catchments are Greater Manchester Combined Authority (GMCA), Irwell, Fylde Coast and Eden. UUW opened green recovery funding opportunities to stakeholders for applications in August 2022 and November 2022. This funding allowed UUW to co-develop its systems, tools and processes as a partnership. This way, we can select schemes in an opportunistic way and deliver a diverse set of schemes ranging from small to large and ones delivered through UUW and through third-party local communities to larger-risk management authorities. The DWMP partnership opportunity pipeline was used to identify potential partnership application for the green recovery funding. UUW screened these opportunities against the application criteria for the green recovery funding to highlight the projects with most potential. Working in partnership with the relevant stakeholders, UUW was able to produce a number of green recovery funding applications from the DWMP partnership opportunity pipeline. The green recovery funding has resulted in a number of successful schemes already being agreed to be explored further, including the Ignition Funding Stream 1 project to explore SuDS in schools and other local authority owned sites, permeable paving and pocket parks in Bolton and neighbourhood SuDS in Walkden, Salford.

UUW partnership project	Partnership summary
Fylde Hub	Natural Course is the UK's only EU-funded Life Integrated Project to assist in the delivery of the Water Framework Directive obligations, notably the achievement of 'good ecological status' in the North West River Basin. Meeting Water Framework Directive commitments is a significant task for the UK, with challenges such as capacity, affordability, technical feasibility, stakeholder engagement and adoption of innovative approaches. Overcoming these barriers will not be achievable without coordinating the efforts of all stakeholders. The Fylde Hub is an action that makes up part of the Phase 4 Natural Course programme of work. The Fylde Hub aims to form a centralised group with representatives from United Utilities, Natural England, Environment Agency, Wyre Rivers Trust, and Ribble Rivers Trust as well as key local authority representatives, to form a cohesive understanding of the Fylde catchment. The objective is to collaboratively develop interventions related to both water quality and water quantity challenges at a place level, alongside funding mechanisms to finance the identified interventions. A number of task teams have been established including; misconnections, NFM (including SuDS and wetlands), monitoring and data, and agricultural engagement (including sustainable soil management). The DWMP is engaged in this process and the DWMP partnership opportunity pipeline has been fed into the Fylde Hub work streams for potential development.
Greater Manchester IWMP	The Trilateral Partnership between the Greater Manchester Combined Authority (GMCA), the Environment Agency and UUW was established in September 2021 and aims to improve collaborative working. Building on the foundations of the strategic partnership, it was agreed at a roundtable event held by the Mayor of Greater Manchester on 30 September 2022 that an Integrated Water Management Plan for Greater Manchester would be co-developed. The IWMP will focus on all aspects of Greater Manchester water cycle and bring together various strategic plans into an overall framework and ambition for Greater Manchester. It is a collaborative approach to the way we plan for and manage all elements of the water cycle (reflecting and managing issues specific to place). It is a multidisciplinary approach relating to planning, development, operational and tactical decisions to influence the water cycle and deliver shared outcomes. The IWMP is being co-developed by the GMCA, Environment Agency and UUW aiming for sustainable water management approaches to be applied holistically across Greater Manchester to enhance water quality, manage flood risk and increase biodiversity - this benefits people, prosperity and place. The DWMP partnership opportunity pipeline has fed into the Greater Manchester IWMP providing potential partnership opportunities for consideration within the plan.

4.5 The creation of the 14 SPA plans

4.5.1 The DWMP produces a wealth of information with varying levels of detail. In order to facilitate better partnership working, we have created 14 SPA plans, one for each area across the North West.

4.5.2 These documents contain locally based information to allow stakeholders to better understand areas that matter to them. They contain information such as the results from the risk identification stages (Figure 20), potential partnership opportunities (Figure 21), and potential interventions in the near and longer term across environmental and flooding activities. The documents also contain possible adaptive pathways, where possible, to support our ambition to more explicitly embed long-term planning into business planning cycles.

4.5.3 More detailed information for each SPA can be found in SPA_01 to SPA_14.

Figure 20 Results from the risk identification stage of the Mersey Estuary SPA

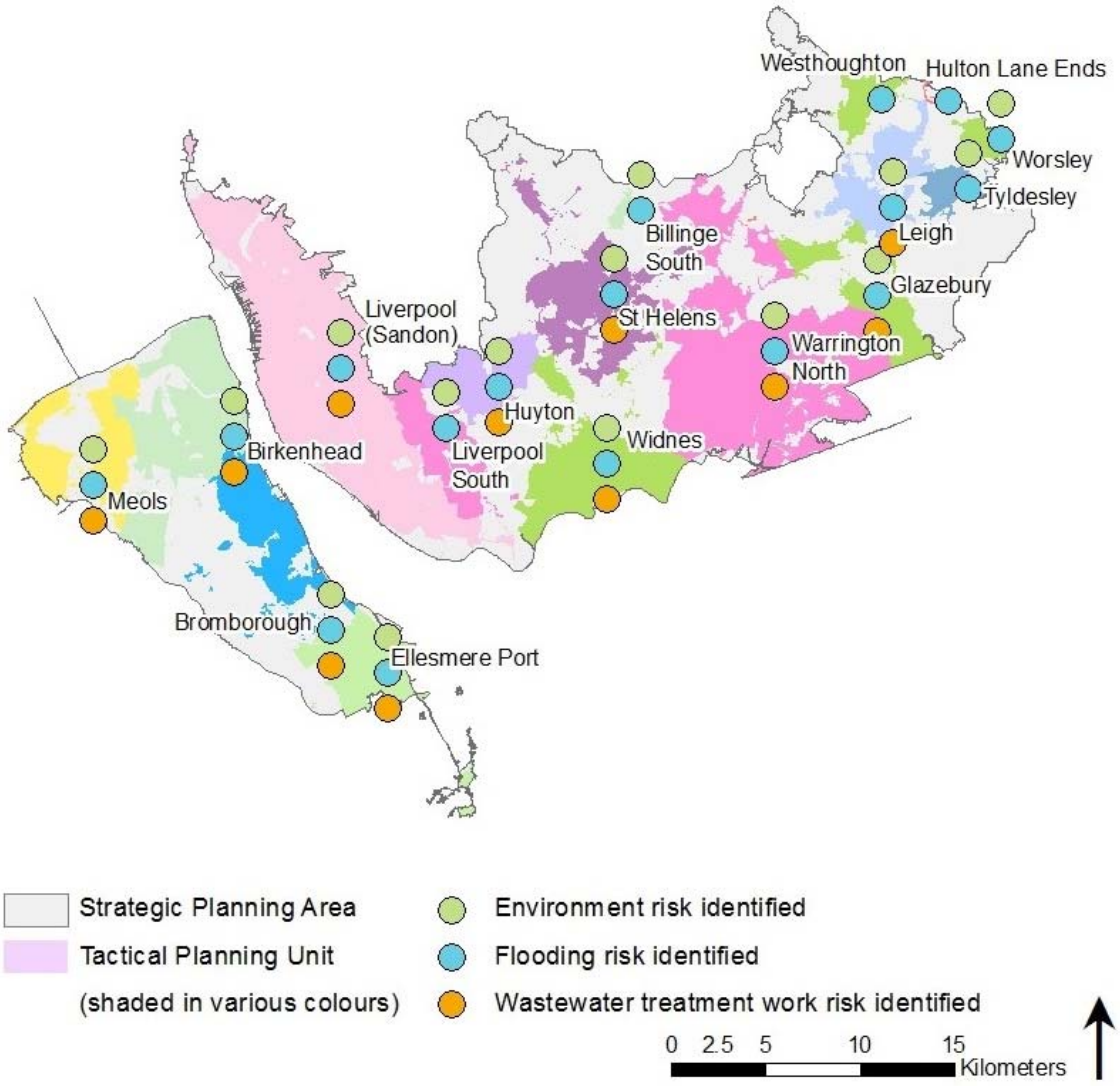
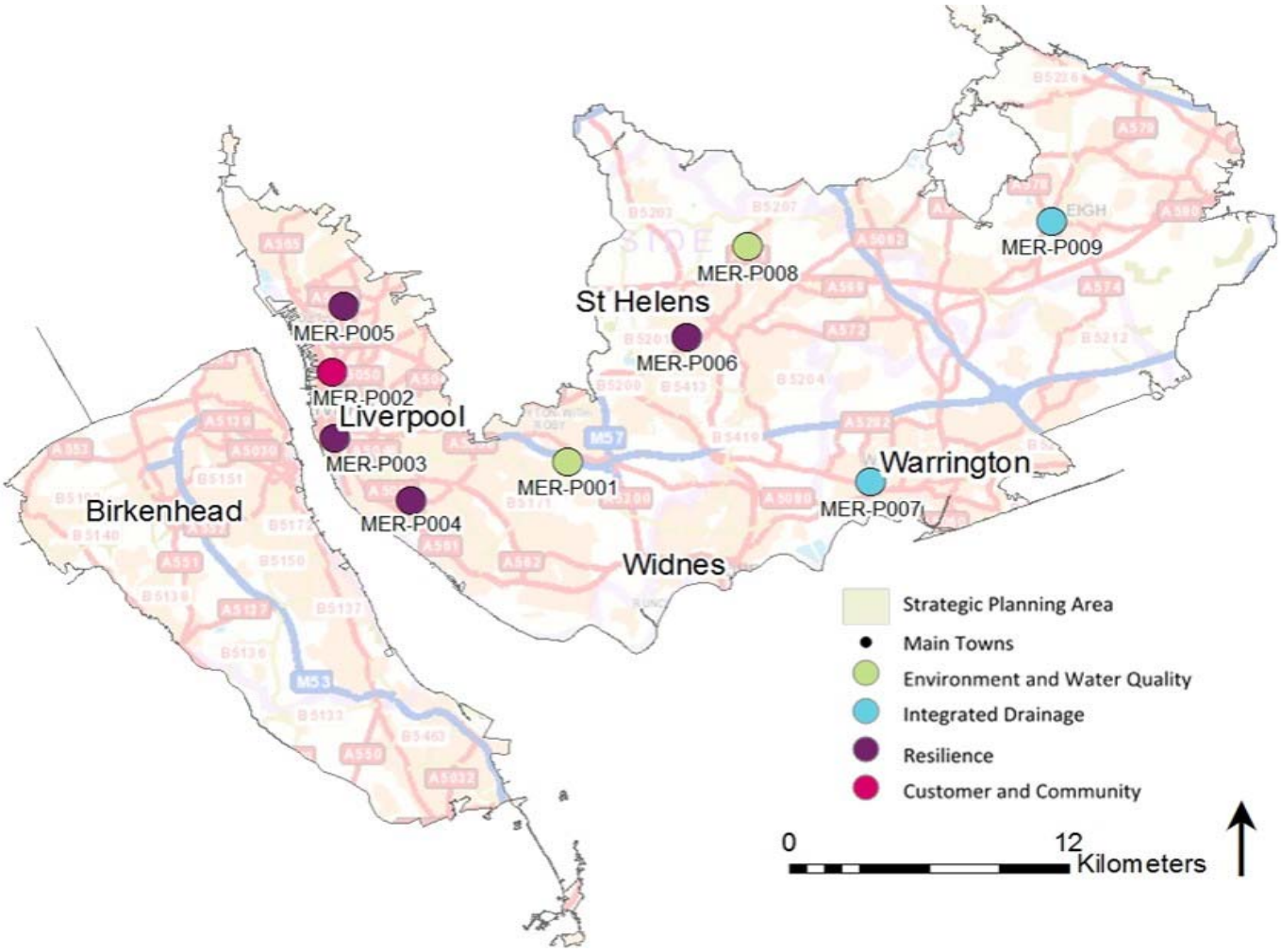


Figure 21 Potential partnership opportunities identified within the Mersey Estuary SPA



4.6 Alignment with other management plans

4.6.1 Across the North West, there are already numerous strategic management plans owned by various other organisations with a focus on managing particular risks relating to drainage and wastewater (Figure 22).

4.6.2 In order to ensure that this plan has the best chance of success, we have worked closely with partners to understand their plans. For example, to ensure alignment between this plan and the Flood Risk Management Plan (FRMP), we have worked closely with the Environment Agency through the Planning Together Group, first established for the DWMP, with a focus on identifying shared strategic measures and delivering joint communications to partners.

4.6.3 We continue to assess national policies and statements, published by regulators, and changes that drive performance across the sector. For our draft submission we have ensured that the main goals and objectives of Defra's 25-year environment plan and the Water Industry Strategic Environmental Requirements (WISER) are complemented by our submission and that we can continue to meet the ambitions outlined in these plans through delivery of the DWMP. We will continue to ensure that future strategies and policies can be delivered through the DWMP, and where this is not the case, we will adapt our approach reflecting changing requirements in future iterations of the DWMP.

Figure 22 Examples of other Strategic Management Plans

4.7 Opportunities for collaborating in the long term

4.7.1 As highlighted above, the number of different interactions across drainage and other systems provides numerous opportunities for collaboration and managing risk in the long term. There are multiple points of interaction with other risk management authorities: drainage of rainwater from roads and paved areas often connects to the combined sewer system; storm overflows in combined systems can, in heavy rainfall, discharge to rivers; finally, recycled water from wastewater treatment works is safely returned to lakes, rivers and the sea.

4.7.2 As well as the sewer system, other activities taking place across a catchment can have both positive and negative effects on the environment. Land management practices in farming and agriculture influence water quality as a result of diffuse pollution of nutrients and water quantity as a result of soil management and run-off. Planning authorities and developers influence the amount of rainwater entering sewer systems and rivers. Land management and planning activities can support rainfall attenuation through the delivery of sustainable drainage systems and natural flood management approaches. In addition, there is a direct impact of customer action on the performance of the system – through awareness about their 'water footprint' and 'what not to flush' customers play a significant role in meeting future challenges.

4.7.3 Greater transparency and consistency across the industry is required, underpinned by a framework to derive future actions, while balancing competing needs. It is also the case that regulatory reform is required to ensure that future challenges are addressed and that planning objectives can be met. The key areas of regulation which, if reformed, would support the delivery of wider drainage objectives are outlined in Table 4.

4.7.4 The timing and impact of such reforms can be considered through adaptive planning processes. We have considered the potential implications of policy changes as part of our options development process detailed in Technical Appendix 7 – Options Development and Appraisal (TA7).

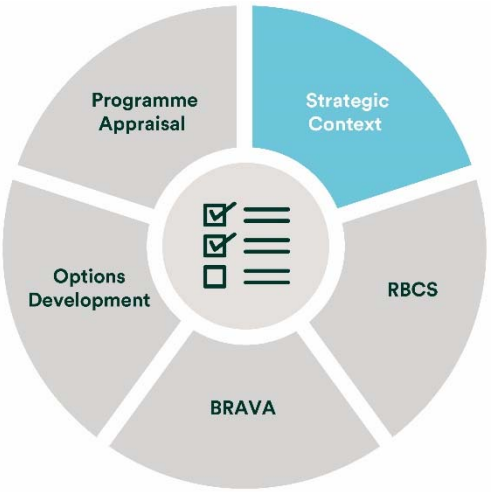
Table 4 An overview of potential regulatory reform measures, which are needed to support the management of long-term risks

Measure	Description
Rainwater and greywater harvesting policy	Standardisation and ownership models for the installation and maintenance of rainwater/greywater harvesting technology.
Flood and Water Management Act (FWMA) 2010	• Influencing the implementation of Schedule 3 of the FWMA 2010 • Influencing the implementation of Section 42 of the FWMA 2010 • Sustainable Drainage Systems (SuDS) Adoption Capabilities under the FWMA 2010 Right of Connection (Surface Water to Combined Sewers) under the FWMA 2010.
Source control measures	Product formulation (source control) measures to manage the substances which wastewater systems cannot treat at their source.
Working with developers to reduce new surface water connections	Review of infrastructure charges to incentivise developers not to connect surface water to the existing public sewer. Potential creation of the right to discharge surface water.
Working with local councils to embed change	Engagement with planning teams to create guidance, supplementary planning documents and design codes to specify requirements for sustainable drainage.
Working with other infrastructure providers to agree strategic drainage plans	Drainage planning with other infrastructure providers (e.g. National Highways, Network Rail) to identify opportunities to collaborate and build resilience to climate change across all infrastructure in the North West.

5. Strategic context

More detailed information can be found in:

- 'Our ambitions for the future' (https://www.unitedutilities.com/globalassets/documents/pdf/dwmp-strategic-context-may-22-update.pdf);
- Technical Appendix 2 – Stakeholder Engagement (TA2); and
- Technical Appendix 9 – Customer Engagement (TA9).



5.1 Introduction

5.1.1 Strategic context is the first stage in the DWMP process, which involved setting out our long-term ambitions and challenges. The output of this stage of the process was to develop long-term targets, termed planning objectives. Planning objectives are used throughout the remainder of the plan to test current and future performance against, and aim towards when developing options.

5.1.2 Key themes

5.1.2.1 This section outlines how the DWMP planning objectives were developed in collaboration with customers and stakeholders and the drivers for change that are considered in the plan.

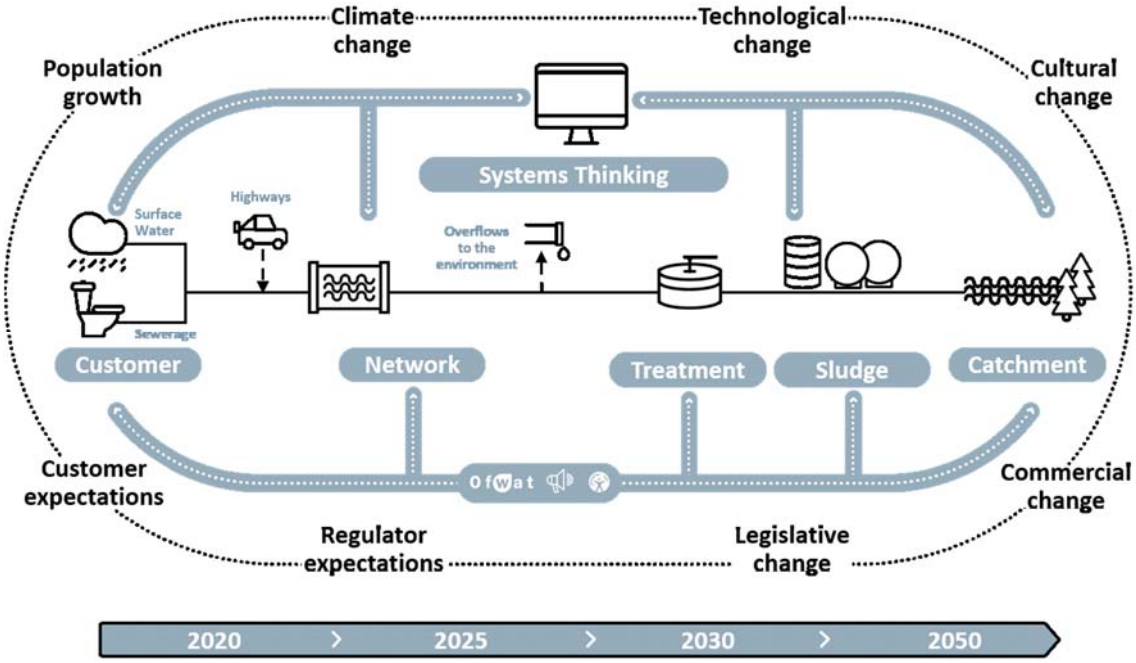
5.2 Drivers for change

5.2.1 When planning for the future, there are many trends, drivers and exogenous factors to consider, which influence the future context in which we will operate. In developing the DWMP, we have considered which trends are likely to be most impactful for UUW.

5.2.2 Trends take into account social, technological, environmental, economic and political/legal domains and consider change at global, national and local level (Figure 23).

5.2.3 The wastewater system is particularly exposed to external shocks and stresses, not least from climate change, population growth and increasing service and environmental expectations. All of these external drivers add pressure on our ability to continue to improve our services. Understanding the drivers for change is a critical step in scenario development and testing uncertainties in long-term planning.

Figure 23 Overview of the drivers for change



5.3 Developing the long-term targets

5.3.1 We have considered the above drivers for change when developing our long-term objectives alongside key performance indicators. It is important that, when planning for the long-term, these objectives adequately reflect our long-term ambition as a company but are also built around the priorities and feedback of our customers and stakeholders. This approach has ensured a clear line of sight between our DWMP planning objectives and wider business goals.

5.3.2 When developing the planning objectives, we conducted bespoke research to understand customers' general priorities in terms of services and more in-depth research to deep dive on important but complex topics such as sewer overflows.

5.3.3 Additionally, the planning objectives were extensively tested with stakeholders during workshops. This exercise allowed us to test how stretching the objectives were and ensured that the objectives covered the breadth of different wastewater issues.

5.3.4 By taking this joint approach, it has allowed us to co-develop planning objectives for the North West that are both ambitious and stretching (Figure 24). Additionally, two bespoke planning objectives were also created as a result of the engagement with customers and stakeholders. The targets set out our performance aims across three key themes in our wastewater service delivery:

- Collecting, treating and recycling wastewater;
- Protecting, restoring and improving the natural environment; and
- Sustainably reducing the risk of sewer flooding.

5.3.5 Beneath each of these sit a number of more specific metrics that were used to quantify the planning objective. The planning objectives are aligned and consistent with the business planning process to ensure long-term improvements across the North West. The planning objectives and long-term targets will be further developed in future cycles of the DWMP to ensure alignment with the business planning process and to ensure that stakeholder and customer priorities are reflected.

5.3.6 More detailed information can be found in 'Our ambitions for the future' (https://www.unitedutilities.com/globalassets/documents/pdf/dwmp-strategic-context-may-22-update.pdf), Technical Appendix 2 – Stakeholder Engagement (TA2), and Technical Appendix 9 – Customer Engagement (TA9).

Figure 24 The DWMP planning objectives

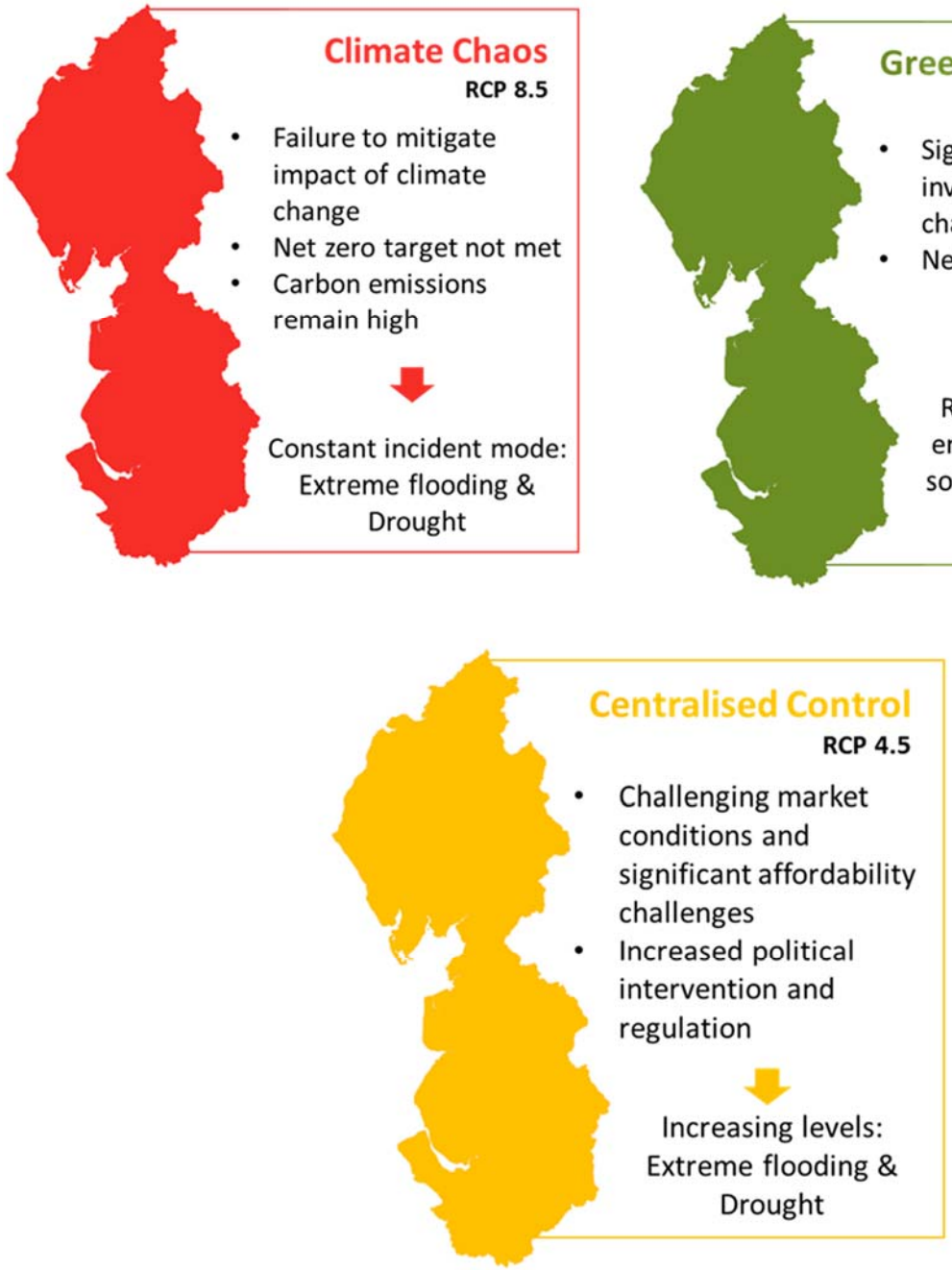
5.4 Scenarios

5.4.1 By understanding the future drivers for change and our ambitions for the future, this has allowed the development of a number of scenarios, which explore a spectrum of future uncertainty, with some scenarios more probable and others more preferable.

5.4.2 The scenarios that have been developed for DWMP articulate three compelling and divergent possible futures. The scenarios were developed to support the assessment of our resilience to the different ways the external operating context could change over time. There are some metrics within the scenarios that can be quantified and used for sensitivity analysis. For many metrics, the level of uncertainty of the key factors in the scenarios means there are few detailed alternative projections with metrics that could be used for modelling.

5.4.3 The scenarios identified are Climate Chaos; Green Guardianship; and Centralised Control, as outlined in Figure 25.

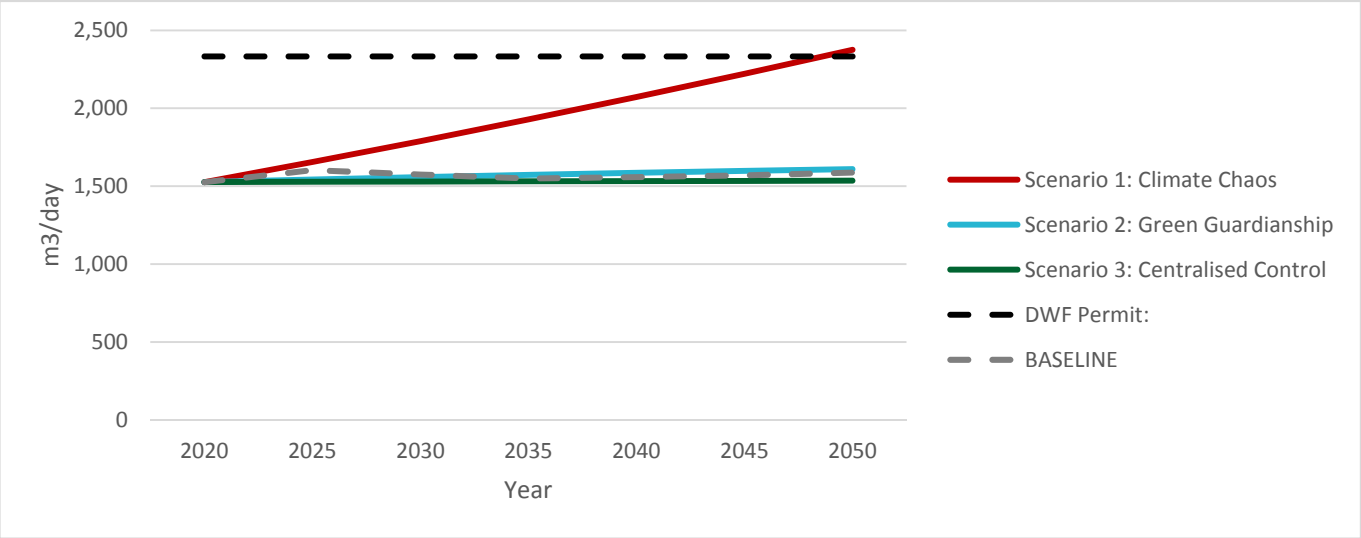
Figure 25 The three scenarios developed to support planning for uncertainty



5.4.4 The scenarios worked within a 2050 design horizon and developed assumptions on population growth, consumption rates, infiltration and trade effluent applied to dry weather flow (DWF), multiples of flow and no deterioration models.

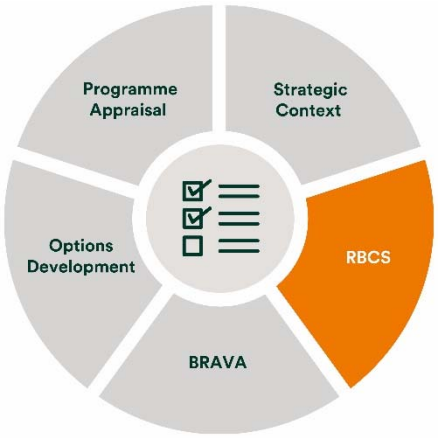
5.4.5 An example of how the three scenarios lead to variation in forecast flows is outlined in Figure 26.

Figure 26 Applying different assumptions to elements of demands to forecast future dry weather flow under three scenarios



5.4.6 As forecasting future conditions is inherently uncertain due to the many different possible combinations of the drivers for change, a central, most likely scenario has underpinned our BRAVA where factors could be quantitatively assessed. An approach was employed to take into account the best available data and evidence to determine a central, most likely scenario to plan against. Further detail on our approach to BRAVA can be found in section 7.

6. Risk Based Catchment Screening



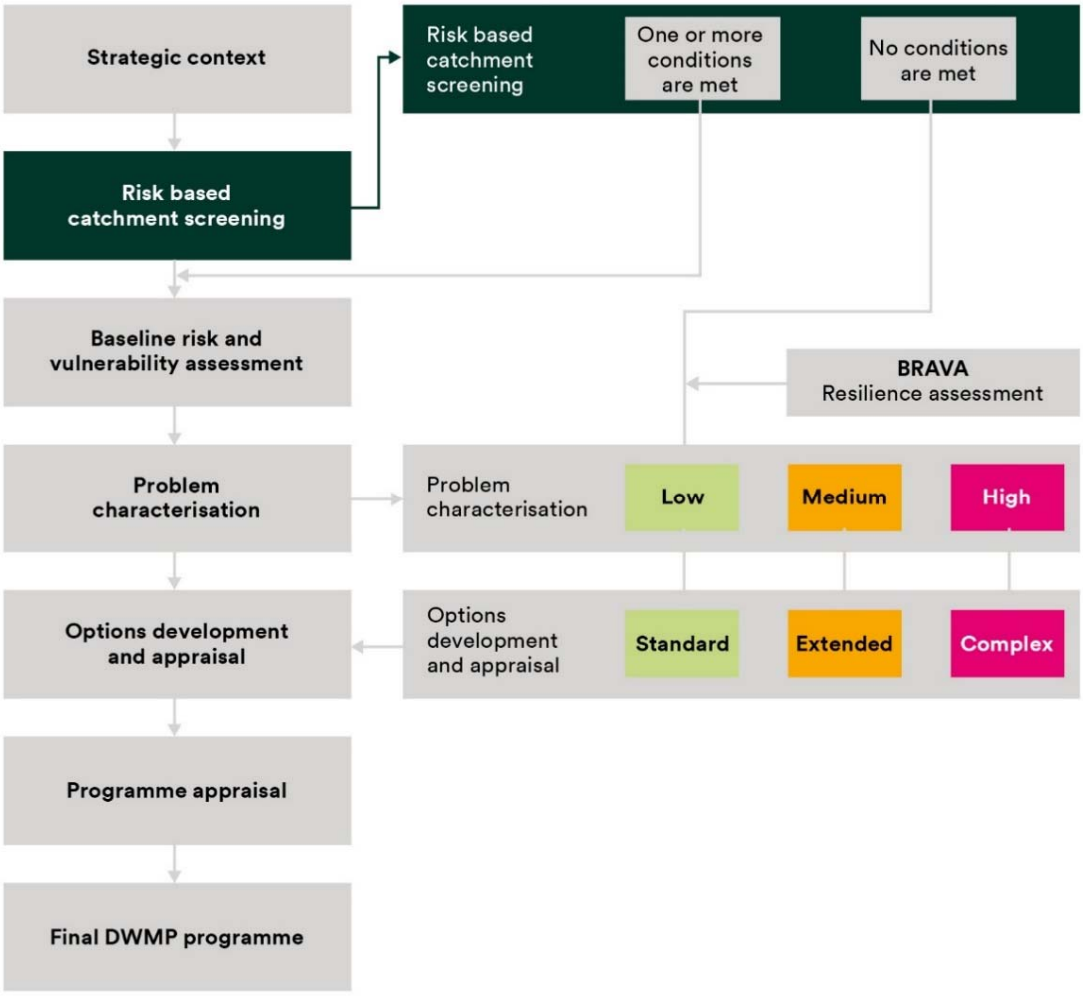
More detailed information can be found in Technical Appendix 4 – Risk Based Catchment Screening (TA4).

6.1 Introduction

6.1.1 The Risk-Based Catchment Screening (RBCS) process sits between Strategic Context, and BRAVA (Figure 27).

6.1.2 RBCS underpinned our approach to understanding risk and prioritising areas across the region. This included a series of high-level assessments linked to the planning objectives set out in the Strategic Context (section 5). The RBCS uses historic data to prioritise TPUs, which required further investigation to understand how future pressures will impact on performance.

Figure 27 The process from RBCS to BRAVA



6.1.3 In RBCS, the network draining to, and the wastewater treatment works itself are assessed against a range of indicators. These assessments are high level and draw on mainly historic data from already established reporting systems and processes.

6.1.4 Without undertaking a detailed risk assessment across all sites, RBCS allowed us to understand which of our TPUs are at the highest risk of experiencing issues in the future to prioritise where forecasts for future risk should be run. RBCS aims to shortlist sites for the BRAVA stage, focusing effort in areas where there is vulnerability in the system.

6.1.5 This stage showed that around 70 per cent of TPUs would proceed to BRAVA. This represents over 99 per cent of the population within the company area. These percentages require monitoring, particularly when there are new sites identified as proceeding to BRAVA during the annual updates (Table 5).

6.1.6 More detailed information on the results and assessments can be found in Technical Appendix 4 – Risk Based Catchment Screening (TA4).

Table 5 Company area RBCS results for UUW

		Percentage population across the company area living in a TPU which breaches the RBCS indicator					
Company area	**Total population equivalent**	Catchment Characterisation (Tier 2)	**Bathing or shellfish waters**	**Discharge to sensitive waters (part A)**	Discharge to sensitive receiving waters (part B) (Tier 2)	**SOAF**	**CAF**
United Utilities	**8,918,802**	100%	24%	4%	0%	95%	62%

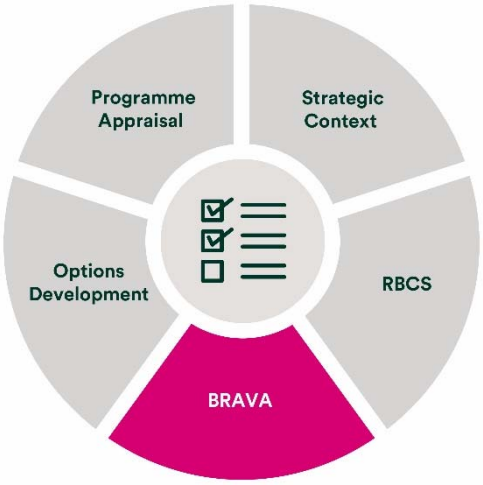
	Percentage population across the company area living in a TPU which breaches the RBCS indicator						
Company area	**Internal Sewer Flooding**	**External Sewer Flooding**	**Pollution Incidents**	**WwTW Q compliance**	**WwTW DWF compliance**	**Storm overflows**	**Other RMA systems**
United Utilities	97%	99%	71%	16%	3%	54%	51%

	Percentage population across the company area living in a TPU which breaches the RBCS indicator					
Company area	**Planned residential development**	**WINEP**	**(Sewer Collapses)**	**(Sewer Blockages)**	Sludge Facilities	WwTW close to breaching permit
United Utilities	99%	80%	71%	83%	78%	54%

Grey text	This is a Tier 2 indicator. A breach against a Tier 2 indicator would not trigger BRAVA if it is the **only** indicator breached.
(Grey text in brackets)	This is an unclassified indicator. A breach against an unclassified indicator will not influence whether a TPU proceeds to BRAVA.

0-33%	0-33% of the population in the company area live in a TPU which breaches this indicator
33-66%	33-66% of the population in the company area live in a TPU which breaches this indicator
66-100%	66-100% of the population in the company area live in a TPU which breaches this indicator

7. Baseline Risk and Vulnerability Assessment



More detailed information can be found in:

- Technical Appendix 3 – Demand Forecasting (TA3);
- Technical Appendix 5 – Assessing Future Risk (TA5); and
- Technical Appendix 6 – Resilience (TA6).

7.1 Introduction

7.1.1 Following completion of RBCS, the next stage of the DWMP framework is to carry out a Baseline Risk and Vulnerability Assessment (BRAVA) for all drainage areas identified as 'at risk'.

7.1.2 The aim of BRAVA is to understand how future changes might impact on our ability to achieve planning objectives and understand potential resilience risks. This enables the planning for, and mitigation of the risk before there is an impact on UUW's wastewater service to customers and the receiving environment. Some risks are within UUW's control, but others are beyond that, so there is a need to plan for and include them where possible in order that the plan can be adapted as required in the future.

7.1.3 This element of the DWMP process has demonstrated the challenge of protecting the environment, supporting economic growth, and dealing with the pressures of new development, climate change and population growth, and the resulting pressures on infrastructure.

7.1.4 Key themes

7.1.4.1 This section provides an overview of the different components of this stage of the DWMP process which includes the approach to BRAVA, demand forecasting and resilience.

7.1.4.2 Details can be found relating to key themes such as:

- Climate change;
- Population growth; and
- Measuring performance against the planning objectives.

7.2 Developing BRAVA

7.2.1 BRAVA allowed us to model baseline (2020) and future performance (2030 and 2050), taking into account factors such as climate change and population growth, to understand where we are likely to see a deficit in achieving our long-term planning objectives if no action is taken.

7.2.2 The assessments were conducted at a TPU level, representing a wastewater treatment works and the sewer network which drains to it.

7.2.3 Within BRAVA, we ran a suite of assessments across key metrics aligned to the planning objectives (Figure 28) to inform where there is a forecast risk preventing us from achieving the targets.

Figure 28 The DWMP planning objectives

7.2.4 Under the guidance of the DWMP framework, we have developed a range of approaches and tools in order to build the plan; these tools will continue to be refined, developed and re-run as new or better information becomes available. These tools include approaches to forecasting demand (section 7.6), application of climate change uplifts, optimisation of solution blends, and modelling across UUW's wastewater network, wastewater treatment sites and the environment.

7.2.5 This enables us to plan for and mitigate the risk before there is an impact on our wastewater service to customers and the receiving environment. Some risks are within our control, but others are beyond that, so we account and plan for these to enable us to adapt, mitigate risk and identify where shortfalls require new knowledge or approaches.

7.2.6 As discussed in section 5.4, BRAVA is underpinned by a central, most likely scenario. The criteria and assumptions are highlighted below in Table 6.

Table 6 Criteria used within the central scenario for BRAVA

Criteria	Approach within the central scenario
Population growth	Residential: the local housing plan trajectory forecast is used to represent residential population changes. Non-household (e.g. business use): consumption is assumed to be stable. Trade effluent: historic trade discharge values are used, unless there is certainty about a future change.
Urban creep (the expansion of non-permeable surfaces in urban areas)	Aligned to approach set out in the UKWIR Research document 'Impact of Urban Creep on Sewerage Systems'.
Infiltration (surface water and ground water entering the sewer)	Infiltration is applied using a standard assumption for future developments of 55 l/hd/day.
Per capita consumption (water usage per person)	Per capita consumption (PCC) is applied in line with the most recent WRMP as 95 per cent of the average value.

Criteria	Approach within the central scenario
Climate change	The UKWIR 2017 report 'Rainfall Intensity for Sewer Design, 17/CL/10/17' is the basis of all climate change uplifts applied to the hydraulic network models for BRAVA. For both the 2030 and 2050 planning horizons the central estimate values are used.
Discharges (both intermittent and continuous)	Where there are confirmed environmental drivers in the investment cycle 2020–2025 WINEP, it has been assumed these improvements will be delivered before 2025.
Maintenance	Stable performance is assumed simulating maintaining a broadly stable service, in line with our recent historic experience.

7.2.7 Climate change scenarios

7.2.7.1 Ten-year time series rainfall simulation outputs are used to calculate annual overflow activation performance at the baseline 2020 scenario and then used to forecast future change in overflow activation performance due to growth and climate change. Risk of hydraulic flooding is assessed through simulating all network models for a range of return periods (1, 10, 20 and 50-year) using 2D models and design rainfall.

7.2.7.2 The UKWIR 2017 report 'Rainfall Intensity for Sewer Design, 17/CL/10/17' is the basis of all climate change uplifts applied to the hydraulic network models for BRAVA. Therefore, the basis for both the 2030 and 2050 planning horizons is the RCP8.5 high emissions scenario. The projections are based on the UKCP09 models and additionally, the REDUP tool associated with the UKWIR paper was used to perturb long-time series rainfall. For both the 2030 and 2050 planning horizons, the Central Estimate values are used for standard BRAVA with the High Estimate values used for complex catchments. These scenarios represent the core scenario, as the most likely trajectory based on current projections and an upper bound to stress test the plan respectively.

7.2.7.3 UKCP18 outputs were not available within the timescales of this project, however, UKCP18 data has since been tested to undertake a comparison against UKCP09 impacts in a small number of catchments where a reduction in uplift from UKCP09 was suggested in UKCP18. A high-level comparison of UKCP09 scenarios compared to UKCP18 scenarios can be seen in Table 7. Time series rainfall data to account for UKCP18 projections for overflows are still in development so have not been tested – this is a common issue across the industry. The testing undertaken indicated little change in flood numbers and evidences that the approach taken to model climate change is robust and appropriate.

Table 7 Representative concentration pathways compared to SRES scenarios[3]

Representative concentration pathway	Increase in global mean surface temperature (°C) by 2081–2100 (average and range)	Most similar SRES scenario (in terms of temperature)
RCP 2.6	**1.6** (0.9–2.3)	None
RCP 4.5	**2.4** (1.7–3.2)	SRES B1 (low emissions scenario in UKCP09)
RCP 6.0	**2.8** (2.0–3.7)	SRES B2 (between the low and medium emissions scenarios in UKCP09)
RCP 8.5	**4.3** (3.2–5.4)	SRES A1F1 (high emissions scenario in UKCP09)

[3] Fung F and Gawith M (2018). 'UKCP18 for UKCP09 Users', UKCP18 Guidance. Met Office Hadley Centre, Exeter.

7.2.8 Common reference scenarios

7.2.8.1 Within the DWMP, we have considered uncertainty primarily in high climate change scenarios and within demand forecasts to inform our risk assessments. In some cases, this has been qualitatively assessed, in others the impact has been quantified.

7.2.8.2 Scenario testing within wastewater modelling is a challenging exercise due to the number of potential metrics requiring consideration, complexity and scale of modelling; consequently guidance on common scenarios has been incorporated into our planning where it was viable to do so.

7.2.8.3 A summary of the common planning scenarios and how these have been incorporated into the DWMP is outlined in Figure 29.

Figure 29 Common reference scenarios and their application within DWMP

Parameter	Scenario		Scenario
Climate Change	RCP2.6	-	RCP8.5

High emissions data has been gathered as assessed for flooding BRAVA. Tools to utilise UKCP18 data for overflows are in development – this is common across the industry.

Parameter	Scenario	Scenario
Demand	High	Low

High and low demand scenarios have informed BRAVA. The high scenario has also been used to inform options development.

Parameter	Scenario	Scenario
Technology	High	Low

Considered a range of technologies, worked with Innovation team to embed new ideas into BAU, the plan is based on current technology

Parameter	Scenario		Scenario	
Environmental	High	-	Low	-

Guidance only for water

7.2.9 Interpreting BRAVA results

7.2.9.1 The strategic need score is part of the method set out in the framework to identify whether there is a problem and how big it is. It has two components: supply (capacity) and demand. The results derived from BRAVA help us to understand our supply (capacity) score for each TPU.

7.2.9.2 For each TPU the applicable assessments are scored. The scoring definitions applied are outlined:

- 0: No concern;
- 1: Potential area of focus;
- 2: Area of focus; and
- N/A: No assessment required.

7.2.9.3 The next step was to conduct preliminary problem characterisation, which is a process used to understand whether a TPU requires additional BRAVA assessments to test alternative future scenarios. The output of this stage determined a ‘standard’, ‘extended’ or ‘complex’ BRAVA.

7.2.9.4 An overview of these assessments is below:

- Standard BRAVA - is applied to all TPUs where an assessment need has been identified. The scenario used for standard BRAVA uses a central, most likely, estimate of growth and standard assumptions on permit requirements based on environmental guidance where available;
- Extended BRAVA - additional testing is required to understand the extent of risk and the uncertainty. Population growth and rainfall projections are increased by a standard amount in all TPU requiring an extended assessment. This helps to understand potential variations in risk in the future; and
- Complex BRAVA - a wider range of additional testing is required to understand the extent of risk and the uncertainty. A wide range of uncertainties were tested for complex scenarios, these include

variations in growth, consumption and rainfall events and were dependent on the individual characteristics of each TPU assessed.

7.2.9.5 The outputs from the standard, extended and complex BRAVA assessments were used to inform our adaptive planning approach (section 10.5).

7.2.9.6 The BRAVA results are presented in sections aligned to the planning objectives below.

7.2.9.7 More detail and the results from the assessments can be found in Technical Appendix 5 – Assessing Future Risk (TA5).

7.2.10 Uncertainty

7.2.10.1 There are a range of factors affecting the future demand for water and the changing patterns of demand. In recent years, we have seen unexpected changes due to the COVID-19 pandemic, economic and migration factors and climate change. Such impacts mean it is challenging to forecast future demand.

7.2.10.2 While we employ the best available data and methodologies to forecast future demand, there is uncertainty inherent within our forecasts. Consumption is only one element of the inflows to the sewer network, and while it is important to accurately reflect the rate within the forecast, uncertainties can be mitigated by refreshing baseline measured data and monitoring the forecast against updated values, which we will continue to do in planning for the production of future DWMPs.

7.3 BRAVA outputs: we will provide excellent wastewater services, reducing our impact on the environment

7.3.1 The following assessments contribute to assessing against the theme to 'collect, treat and recycle wastewater in compliance with our permits, now and in the future', this comprises of assessments for wastewater quality compliance and pollution.

7.3.2 A range of different models were used to quantify the risks for the different assessments (Table 8).

Table 8 Model types used to assess compliance risk

Model	Used to assess against planning objective?	
	Wastewater Quality Compliance	Pollution
Demand forecasting model	Yes	Not applicable
Wastewater treatment works model	Yes	Not applicable
2D hydraulic model (design rainfall)	Not applicable	Yes
Asset health model (PIONEER)	Not applicable	Yes

7.3.3 Wastewater quality compliance

7.3.3.1 The standard BRAVA results were generated using individual treatment works' models that assess the capacity available to treat future flow and load to meet final effluent permit limits.

7.3.3.2 Bespoke BRAVA assessments are undertaken to understand dry weather flow compliance risk and theoretical pass forward flow implications (i.e. to determine whether an increase in dry weather flow permit is required to treat a defined proportion of the incoming flow).

7.3.3.3 Additionally, a review of additional storm tank requirements and the likelihood of changes in final effluent permit conditions due to growth were completed to compile the full extent of potential risk at each wastewater treatment works assessed. This enabled solutions to be developed for the overarching combination of risks at each wastewater treatment works. Table 9 provides a summary of the BRAVA results.

Table 9 Risk of wastewater treatment works final effluent compliance BRAVA results (number of TPUs)

	Wastewater Treatment Works Final Effluent Compliance		
	0	1	2
2020	150	110	16
2030	142	114	20
2050	126	129	21

7.3.3.4 Results from the compliance assessment indicate that the risk category for 31 wastewater treatment works deteriorates over the planning horizon.

7.3.3.5 Challenges for compliance include changing regulation, leading to tighter final effluent permit limits – for example, to reduce phosphorus and ammonia. Projects to mitigate this risk are identified through the WINEP.

7.3.3.6 In addition to the assessment of future final effluent quality compliance, bespoke theoretical hydraulic assessments were completed to understand where DWF forecasts are likely to exceed the permit requirements, where treatment works may be required to treat additional volume (to ensure the required proportion of incoming flow is treated before activating to storm or via an overflow). These assessments give an indication of where an increase in treatment capacity may be required to protect the environment.

7.3.3.7 Compliance results have been reviewed in combination with the assessment of deterioration in receiving watercourse, to understand where investment may need to be prioritised.

7.3.3.8 Assumptions on consumption volumes have been used for all the assessments, so some sensitivity testing was carried out at more complex locations to understand the range of risk.

7.3.3.9 Results, summarised below in Table 10, showed that changes in the impact were not significant until later in the DWMP planning timescale, so monitoring to get better understanding of changes would be beneficial to accommodate changes from the forecast risk as part of an adaptive pathway approach.

Table 10 Complex and extended BRAVA results for wastewater treatment works (including deterioration assessment)

Assessment	Results
Wastewater Treatment Works Compliance Assessment	'Extended' BRAVA results showed an increase in risk by 2050 with four additional extended TPUs at high risk in comparison to baseline. 'Complex' assessments showed one TPU at higher risk under the 'climate chaos' scenario and one using detailed local authority planning data. All others remain at the same or reduced level of risk.
Dry Weather Flow (DWF)	'Extended' (+30 per cent population increase) BRAVA results identified two additional TPU locations at risk (1, 2) by 2050. 'Complex' BRAVA results showed five locations at greater risk in the 'climate chaos' scenario with no change under 'green guardianship' and two locations at greater risk under the 'centralised control' scenario. The differences do not have an impact until later in the DWMP timescale. Therefore, monitoring to inform an adaptive approach should be used to manage the uncertainty.
Pass Forward Flow (PFF)	'Extended' (+30 per cent population increase) BRAVA results identified one additional TPU location identified at risk by 2050. 'Complex' BRAVA results indicate three TPUs at greater risk under 'climate chaos' scenario. Nine TPUs remain at the same low risk across 'climate chaos', 'green guardianship' and 'centralised control' scenarios.
No Deterioration	'Extended' BRAVA results showed fourteen more TPUs at risk with a +30 per cent population increase. 'Complex' BRAVA results showed greater risk for nine TPUs identified by 2050 under the 'climate chaos' scenario with 'green guardianship' showing improvements and the 'centralised control' scenario forecasting a slight increase in risk at some locations.

7.3.4 Pollution

7.3.4.1 This assessment considers the risk of category three and serious pollution incidents (category one and two), as defined in the EPA guidance[4]. Risk calculated is made up of three components:

- Risk from failure of point assets (for example pumping stations, overflows) from our asset deterioration model (PIONEER);
- Risk from failure of linear assets (sewers) from our asset deterioration model; and
- Risk from hydraulic flooding.

7.3.4.2 Results for this assessment are shown in Table 11. Despite having good historic performance around pollution, by 2050 an ambition to eliminate pollution within UUW's control results in a significant shift of all TPUs having a risk score of two due to the ambitious planning objective.

[4] EPA Metric Guide for 2020. Accessed at: https://www.gov.uk/government/publications/water-and-sewerage-companies-in-england-environmental-performance-report-2020/water-and-sewerage-companies-in-england-environmental-performance-assessment-epa-metric-guide-for-2020.

Table 11 Pollution BRAVA results (number of TPUs)

	Pollution		
	0	1	2
2020	65	49	283
2030	10	60	327
2050	0	0	397

7.4 BRAVA outputs: we will protect, restore and improve the natural environment of the North West through our actions

7.4.1 To assess the risk of not achieving the ambition of 'protect, restore and improve the natural environment of the North West through our actions', assessments for storm overflow performance were run alongside ongoing development of the WINEP. A summary of the models used in these assessments is shown in Table 12.

Table 12 Model type used to assess risk for environmental assessments

Model	Used to assess against planning objective?	
	Storm overflow performance	WINEP development
Demand forecasting model	Yes	Yes
Hydraulic model (10-year time series rainfall)	Yes	Not applicable
SimCat	Not applicable	Yes

7.4.2 Throughout the assessments within this theme we see increases in risk by the 2050 planning horizon across all planning objectives. This increase in risk is mainly being driven by increased surface water resulting from climate change, a factor which far surpasses the impacts of growth and urban creep by the 2050 planning horizon. A significant proportion of the North West's sewer network is combined, consequently sewage and 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.

7.4.3 The increase in pressure on the system resulting from climate change leads to a 30 per cent increase in average annual activation volume from network overflows, and a 15 per cent increase in average annual activation volume from wastewater treatment works overflows between 2020 and 2050.

7.4.4 Storm overflow performance

7.4.4.1 The storm overflows assessment detailed in this section, and results presented below, relate to the approach outlined within the DWMP framework and align to both the Capacity Assessment Framework and Storm Overflow Assessment Framework (SOAF). This work was carried out in 2020, and thus pre-dates both the government's consultation on storm overflows, and the subsequent publishing of the Storm Overflows Discharge Reduction Plan (SODRP), both in 2022. The proposed storm overflows investment detailed within the final plan has been derived in order to meet all target dates within the SODRP, rather than the SOAF. The below section has been included for completeness.

7.4.4.2 This assessment looked at the impact of climate change and growth on storm overflows operating. Storm overflows are emergency release points in the sewer network designed to prevent the sewer from backing up and causing flooding in customer homes during extreme weather. UUW is undertaking an ongoing investigations programme to assess the harm caused by overflows across the North West. The investigations will be completed throughout 2020 to 2025 and will identify overflows where there is a need for investment to improve performance based on the Storm Overflow Assessment Framework definition of harm. Subsequent improvement projects will be undertaken through the WINEP.

7.4.4.3 Using the national DWMP guidance, risk scores for all overflows were aggregated for each TPU using a weighted-points score. A summary of the results is shown in Table 13.

Table 13 Overflow BRAVA results (number of TPUs)

	Overflows		
	0	1	2
2020	74	90	131
2030	79	94	122
2050	77	92	126

7.5 BRAVA outputs: we will sustainably reduce the risk of sewer flooding

7.5.1 The following assessments contribute to assessing against the theme 'sustainably reduce the risk of sewer flooding in the North West', comprised of assessments for internal flooding, external flooding, flooding of open spaces, sewer collapses and risk during a 1 in 50-year storm. Full details of each assessment can be reviewed in Technical Appendix 5 – Assessing Future Risk (TA5).

7.5.2 The extent of the risk is calculated for each TPU using a number of different models. The models considered within each assessment are outlined in Table 14.

Table 14 Model type used to assess risk for wastewater network assessments

Model	Used to assess against planning objective?				
	Internal flooding	External (curtilage) flooding	External (open space) flooding	Risk during a 1 in 50-year storm	Sewer collapses
Demand forecasting model	Yes	Yes	Yes	Yes	Not applicable
2D hydraulic model (design rainfall)	Yes	Yes	Yes	Yes	Not applicable

Model	Used to assess against planning objective?				
	Internal flooding	External (curtilage) flooding	External (open space) flooding	Risk during a 1 in 50-year storm	Sewer collapses
Asset health model (PIONEER)	Yes	Yes	Yes	Not applicable	Yes

7.5.3 Throughout the assessments within the sewer flooding theme we see increases in risk by the 2050 planning horizon across all planning objectives. This increase in risk is mainly being driven by additional surface water resulting from climate change, a factor which far surpasses the impacts of growth and urban creep by the 2050 planning horizon. A significant proportion 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.

7.5.4 Section 42 of the Flood and Water Management Act (FWMA) (2010) modified the right to connect to the public sewer under section 106 of the Water Industry Act (1991). Modifications under the FWMA meant it would only be possible for developers to connect surface water drainage systems if both:

- The drainage system was approved; and
- The approved proposals included connection with the public sewer.

7.5.5 In order for the drainage system to be approved, any plan or development should evidence connection of surface water to the combined sewer as a last resort in favour of more sustainable options, based on a hierarchy for SuDS. While this change has focused attention towards more sustainable drainage, a step change is required across risk management authorities (RMAs), highways, planning and development to come together to mitigate the impacts of climate change.

7.5.6 In financial year 2022, approximately 80 per cent of internal sewer flooding incidents could be attributed to 'flooding other causes'. Flooding other causes accounts for flooding incidents that are not hydraulically driven, instead these may result from inappropriate items being flushed, (e.g. fats, oils and greases) or tree roots leading to blockages or collapses within the sewer network and consequent flooding. Working with customers to engage on 'what not to flush' is an important part of our plan, alongside uptake of new technologies to help identify and remedy any blockages in the sewer quickly.

7.5.7 Internal flooding

7.5.7.1 Internal flooding relates to sewer flooding inside domestic properties or businesses.

7.5.7.2 A summary of the results for this assessment can be seen in Table 15. A significant amount of the region is identified as having some level of risk forecast against internal flooding in a 'no mitigation' scenario. Overall, there is an increase in the number of TPUs identified as being an area of focus by 2050, this is reflected in reduced numbers of those TPUs scoring for either no concern (0) or potential area of focus (1). Through our modelling assessment, we have identified that some areas are more affected by climate change than others, in particular, coastal areas and the Lake District are projected to see greater increases in rainfall. The Upper Mersey SPA is identified as having the highest risk for this planning objective.

Table 15 Internal flooding BRAVA results (number of TPUs)

	Internal Sewer Flooding		
	0	1	2
2020	21	148	163
2030	18	123	191
2050	14	106	212

7.5.8 External (curtilage) flooding

7.5.8.1 External (curtilage) flooding relates to sewer flooding outside of the building but within the curtilage of a customer property. Generally, this consists of flooding of gardens and driveways.

7.5.8.2 A summary of the results for this assessment can be seen in Table 16. Baseline (2020) performance for external (curtilage) flooding shows fewer TPUs in the 'potential area of focus' category (scoring 1) compared to internal flooding, this is counterbalanced by more TPUs at both 'no concern' and 'area of focus' categories. Throughout the design horizons, the majority of the risk remains due to flooding other causes and the significant increase in the proportion of hydraulic incidents is not seen as in internal flooding risk.

Table 16 External (curtilage) BRAVA results (number of TPUs)

	External (Curtilage) Sewer Flooding		
	0	1	2
2020	81	62	189
2030	71	25	236
2050	43	5	284

7.5.9 External (open space) flooding

7.5.9.1 Flooding open spaces relates to sewer flooding that doesn't affect properties or gardens but does affect highways and public open spaces (such as parks).

7.5.9.2 A summary of the results for this assessment can be seen in Table 17. Baseline (2020) performance for external (open space) flooding shows fewer TPUs in the 'potential area of focus' category (scoring 1) compared to external (curtilage) flooding, this is offset by more TPUs at 'no concern'. Throughout the design horizons, the majority of the risk remains due to flooding other causes and the significant increase in the proportion of hydraulic incidents is not seen as in internal flooding risk. The amount of deterioration over the design horizons is less significant for open space flooding in comparison to external curtilage flooding.

Table 17 External (Open Space) BRAVA results (number of TPUs)

	External (Open Space) Sewer Flooding		
	0	1	2
2020	108	18	206
2030	100	5	227
2050	70	9	253

7.5.10 One in 50-year flooding

7.5.10.1 This assessment measures the percentage of properties at risk of sewer flooding during a 1 in 50-year storm from the hydraulic model outputs. A summary of the results for this assessment can be seen in Table 18. By 2050 just under an additional half a million people are projected to be at risk of flooding in a 1 in 50-year event. The worst performing catchments are the Derwent, Eden and Esk and Douglas.

7.5.10.2 It should be noted that, unlike the common outcome delivery incentive measure for investment cycle 2020–2025, this assessment included TPU with less than 2,000 population equivalent, consequently, the baseline DWMP results do not align to the values reported in the UUW annual regulatory reporting.

Table 18 Risk during a 1 in 50-year storm BRAVA results (number of TPUs)

	Risk of Sewer Flooding (1 in 50-year)		
	0	1	2
2020	196	45	91
2030	159	60	113
2050	164	7	161

7.5.11 Risk of sewer collapses

7.5.11.1 This is an assessment that does not assess hydraulic risk and is calculated based solely on outputs from our asset deterioration model (PIONEER). It considers a range of factors, such as asset age, material type, and historic incidents to understand risk of sewer collapses. A summary of the results for this assessment can be found in Table 19.

Table 19 Sewer collapse BRAVA results (number of TPUs)

	Risk of Sewer Collapse		
	0	1	2
2020	87	54	256
2030	69	16	312
2050	36	3	358

7.6 Demand forecasting

7.6.1 In order to understand how the future may change, we have created the demand forecast model to assess the historic and future demand for the wastewater system.

7.6.2 The model includes assumptions such as population, consumption, infiltration and trade effluent, and the impact this has on continuous flow and load received at our wastewater treatment works.

7.6.3 Our demand forecast shows that during the period to 2050, water use is projected to increase. This increase results in an increase in DWF of 15.9 per cent. The projected increase takes into account demand reduction assumptions associated with options applied in our WRMP. The increase in total household consumption is mainly due to additional new population. Individual consumption rates are more variable depending on household and customer type, and with changes over time such as behaviour, appliance use and other indirect influences (customer awareness, building regulations, and technological advances).

7.6.4 Population growth forecast (Residential)

7.6.4.1 In line with Environment Agency guidance and the Water Resources Management Plan, a local housing plan trajectory forecast is used. This forecast was updated for the draft WRMP after BRAVA had been published, so a review of the differences at a TPU level was completed and additional risk-based screening (based on population increase) applied to identify locations where additional assessments are required.

7.6.4.2 Plan-based assumptions on housing growth (instead of ONS trend-based population) is expected to be more representative of growth as they take into account known approved future developments in specific locations. In addition to this, more detailed assessments of local planning data and applications are completed for drainage areas to understand specific impacts. This approach is shared with all LLFAs. A limitation of this methodology is that the assumptions on location, timing and extent of new properties can change over time.

7.6.5 Population growth forecast (Non-residential)

7.6.5.1 Trade effluent forecasts (by trader type) are used to understand likely regional trends but are not reliable at TPU level due to individual trader characteristics. Historic trade discharge values are used, and this is verified with trade effluent teams to understand if there is likelihood of a significant change in the future (from discussion with individual traders). Where there is certainty that a trade volume or composition will change, this is included in the forecast. Likewise, non-household consumption (business premises with a discharge that doesn't require a trade permit) are assumed to be stable and, therefore, the volumes and composition are within the baseline assumption.

7.6.5.2 The model also includes sensitivity testing and an evaluation of uncertainty to allow us to build an as complete a picture as possible of future risk.

7.6.5.3 More detail can be found in Technical Appendix 3 – Demand Forecasting (TA3).

7.7 Resilience

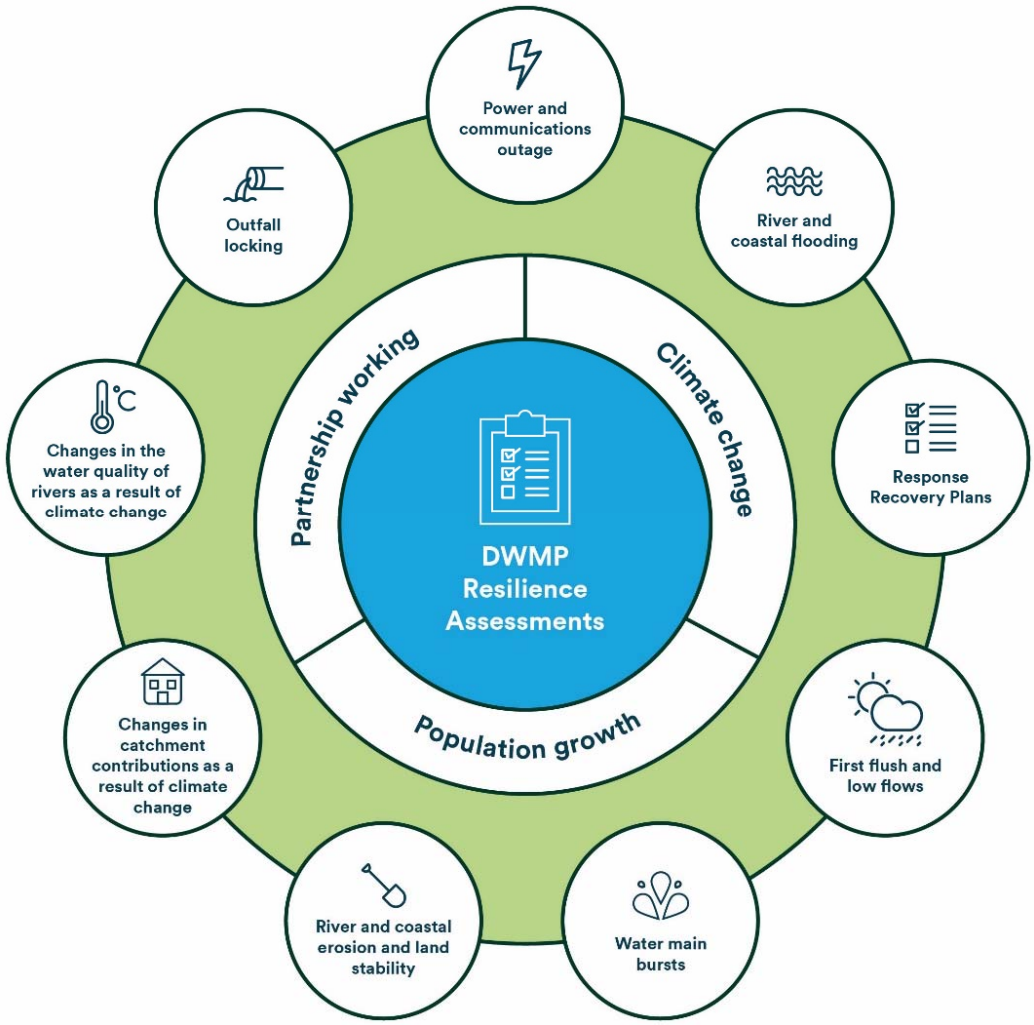
7.7.1 In order to assess risks and opportunities across the North West in a holistic way, we have also conducted a suite of resilience assessments to develop a robust understanding of wider catchment resilience issues that are not directly linked to systems' characteristics (Figure 30).

7.7.2 Many of the assessments demonstrate that factors such as climate change are not risks solely to UUW. Where we have shared risk, we also have a shared responsibility to manage these risks and opportunities in collaboration with wider organisations and landowners.

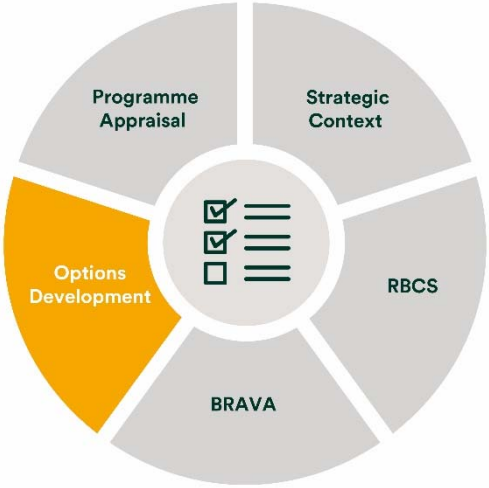
7.7.3 UUW is prepared to co-create and co-fund schemes, where appropriate, in order to protect assets and continue to maintain robust and resilient service for our customers, while creating spaces for communities to enjoy and to protect the environment.

7.7.4 More detail and the results from the assessments can be found in Technical Appendix 6 – Resilience (TA6).

Figure 30 Overview of the resilience assessments



8. Options development and appraisal



More detailed information can be found in Technical Appendix 7 – Options Development and Appraisal (TA7).

8.1 Introduction

8.1.1 The options development and appraisal stage of the DWMP process is designed to promote interventions to meet the exceedances identified through BRAVA. Options development and appraisal aims to ensure that appropriate, plausible and innovative options were considered in the planning process to deliver robust and resilient drainage across 2025–2050, and ensures that shorter-term decisions are made within the context of long-term challenges and needs.

8.1.2 Key themes

8.1.2.1 This section outlines the structured approach taken to identifying, developing and screening options in order to deliver a robust plan. Key themes in this section are:

- How options were considered;
- The development of the option hierarchy;
- Best value and lowest whole life cost; and
- Our approach to six capitals.

8.2 Identifying options

8.2.1 The first step in understanding the best route to mitigate risk is to understand what potential interventions and options are most suitable. This involves a range of approaches to address exceedances through the management of demand on or capacity of the system

8.2.2 The initial list of options originated from the cross-industry 'DWMP Options Task and Finish Group (TFG)' which we shared with our DWMP Steering Group for endorsement.

8.2.3 In developing this list further, we have considered our own options, such as Dynamic Network Management (DNM, Figure 31), which is a keystone of our systems thinking approach. DNM will be a key option within our next business plan for investment cycle 2025–2030.

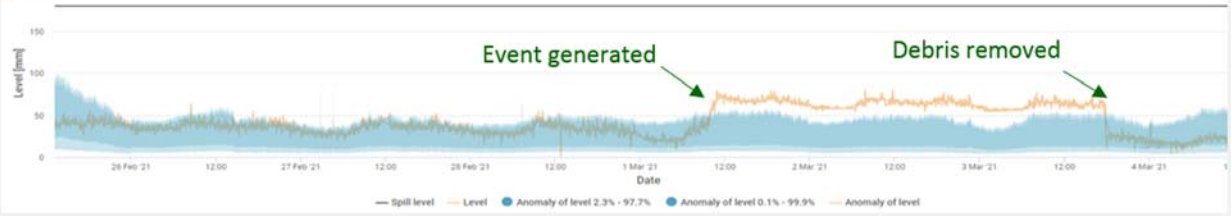
Figure 31 Case study of Dynamic Network Management (DNM)

Dynamic Network Management

Dynamic Network Management (DNM) is an innovative monitoring approach which has been developed to enable us to become more proactive in managing our drainage system. The aim of this was to reduce the risk of flooding and pollution incidents.

Sensors have been installed at key points in the system to allow us to monitor performance in real time. They are first used to determine the baseline performance of the system. Once this is understood, the sensors are then used to recognise when the drainage system is not operating as expected given the conditions being experienced. They then send an alert back to a central system called the 'DNM Platform'. An operational team risk assess the alerts and, where necessary, send out a proactive response team to further investigate. This allows us to be able to proactively manage any issues in the drainage system before it impacts customers or the environment.

Case Study 1
Monitors identified a potential blockage downstream of a storm overflow. An alert was generated indicating the network level was 100% higher than normal operating level but below spill level. Further investigation found a partial blockage. Once this was removed there was an immediate drop in network levels. If this had not been identified through DNM monitoring this could have resulted in a pollution incident.



Graph shows the level of flow in the storm overflow for case study 1

Case Study 2
A monitor identified a restriction in a storm overflow. An alert was automatically generated as the levels increased. Upon inspection a drain rod and piece of wood were found stuck on the outlet of the storm overflow causing a partial blockage. The debris was removed and levels upstream of the storm overflow dropped. DNM monitoring allowed us to respond proactively and therefore prevent a pollution incident.

So far...

Over **17,000 sensors** have been installed across the drainage system

Nearly **5,000 operational issues** identified and addressed so far

Over **50 new DNM specific roles** and over **150 colleagues** trained to support

8.2.4 Alongside our own options we have developed and appraised external options that could be implemented to mitigate risks identified through BRAVA. Through market engagement we have invited third parties to submit proposals for ideas (e.g. managing surface water flows or diffuse pollution management) to be evaluated alongside those developed internally. We recognise that market engagement can drive innovative solutions and delivery mechanisms, and believe it is key to engage stakeholders in this process to ensure that opportunities to address risks in partnership and through alternative delivery routes are identified.

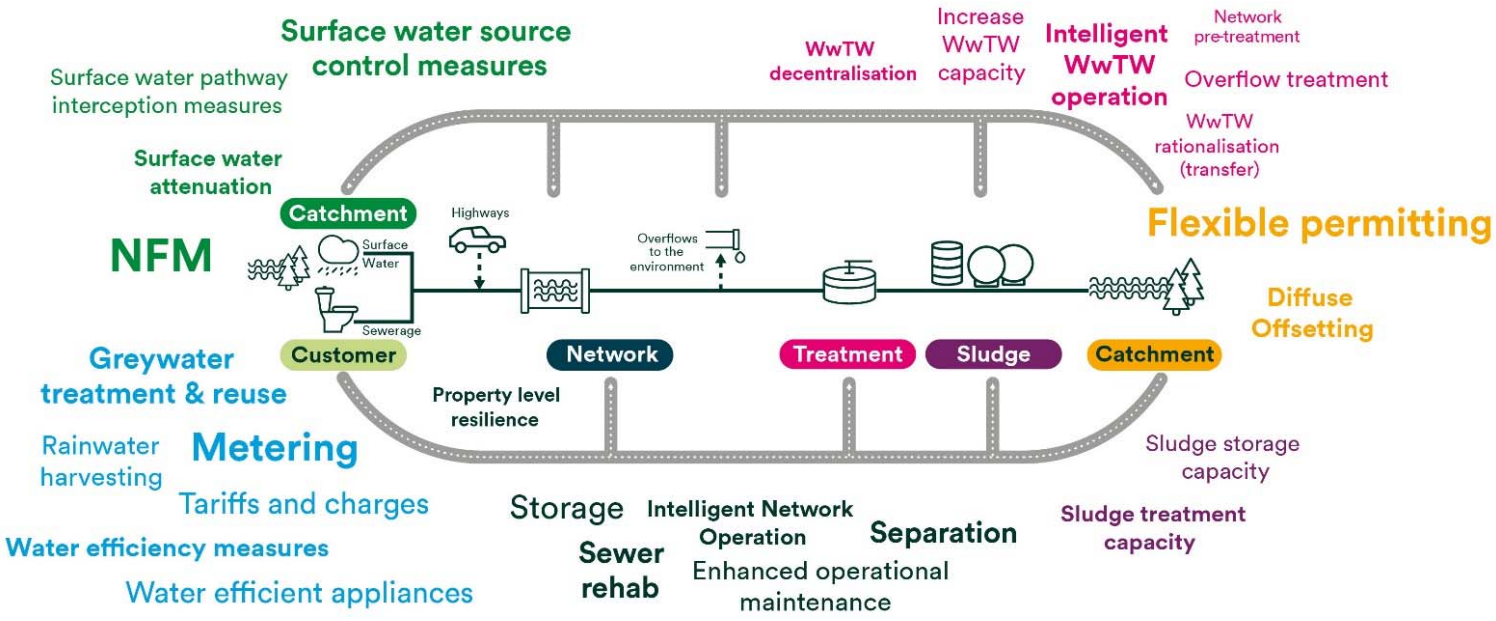
8.2.5 To ensure that we are considering all possible options in a holistic way, a review was undertaken with the UUW Water Resources Management Plan (WRMP) to identify shared opportunities and linked options.

8.2.6 A wide range of stakeholders and partners in the North West have contributed to our plan, to drive understanding of where there may be opportunity to work collaboratively or deliver more benefit for customers. Further information can be found in section 4, as well as within Technical Appendix 2 – Stakeholder Engagement (TA2) and Technical Appendix 9 – Customer Engagement (TA9).

8.2.7 A summary of all the considerations at this stage of options development is shown in Figure 32 below.

8.2.8 In addition to the process taken above to identify the list of potential options and interventions, we continue to search out new and innovative ways to manage our service by deploying new processes, technology and data to optimise performance further. Proactive management of the wastewater network through continued adoption of Artificial Intelligence (AI), machine learning, automation and new data analytics through programmes such as our dynamic network management programme are key to managing asset health and improving the service provided to customers.

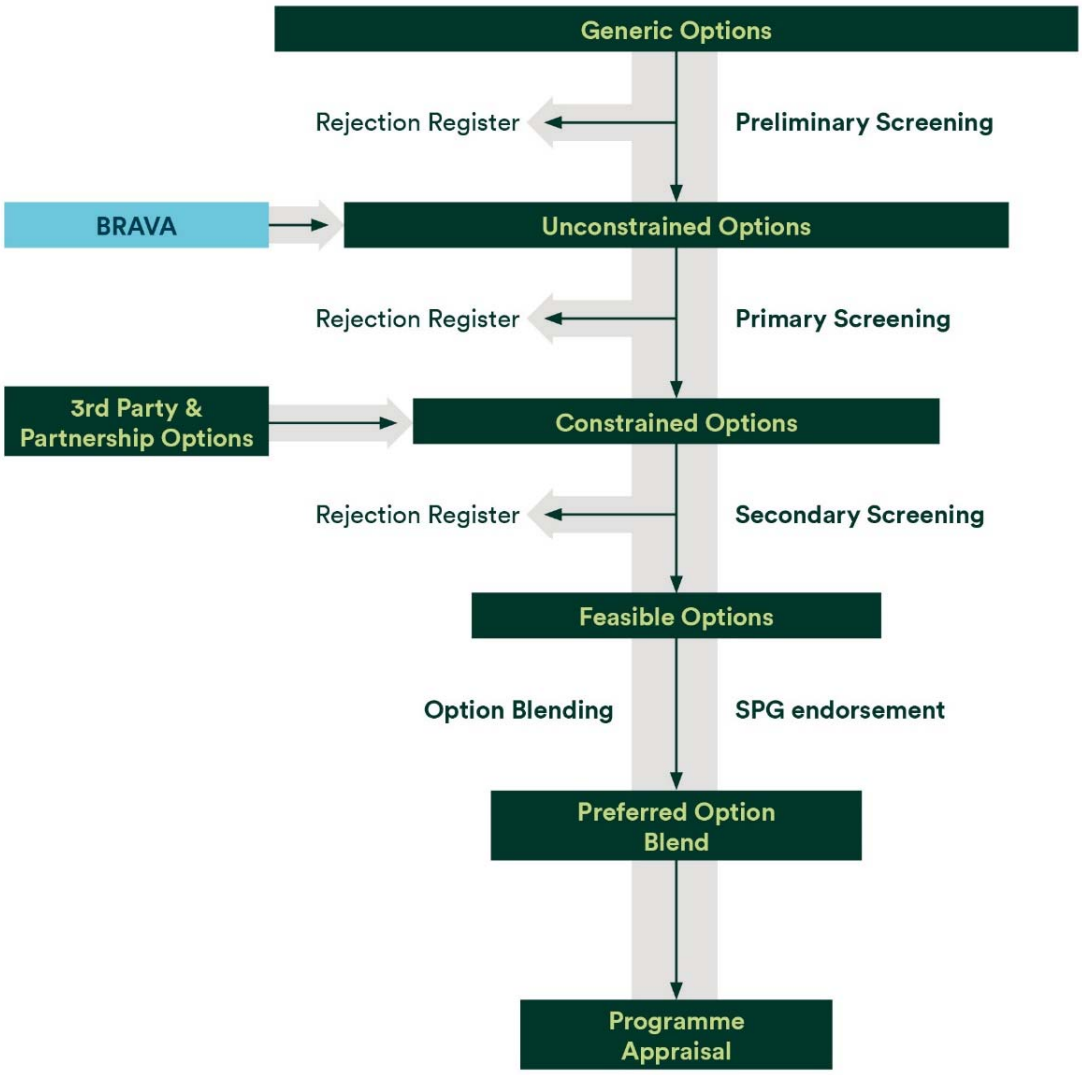
Figure 32 Example of the potential options and interventions considered within the options development stage



8.3 Options development and screening

8.3.1 The options development process followed an iterative approach (Figure 33) to determine a feasible list of options. An appraisal process was then undertaken to identify the preferred set of options to be incorporated within the plan. This process is described in detail within Technical Appendix 7 – Options Development and Appraisal (TA7).

Figure 33 Options development iterative screening process



8.3.2 When developing options we recognise many options contribute benefit to more than one planning objective, actions in one area can impact on other parts of the system. For example, removing rainwater from the sewer system benefits flooding, reduces reliance on overflows and reduces the amount of wastewater being transferred for treatment at wastewater treatment works. We have reflected this synergy through analysing the benefits options bring for each planning objective, rather than only a primary planning objective, driving more holistic decision making about the appropriate approach for the TPU.

8.3.3 The output of this process gave a prioritised combination of options, termed 'option blend', for each of the risks identified in each TPU. The selection of the preferred options took into consideration performance, cost and wider six capital benefits delivered, outlining how options would meet outcomes defined through the planning objectives.

8.3.4 Using option blends allows for incremental improvements to achieve targets and encourages low regrets solutions to be prioritised, it forms a key building block of our adaptive planning approach for DWMP. It allows for an ongoing review of performance to be undertaken, aligned to the DWMP

planning cycles, to monitor benefit realised through interventions and progression of external risks. This allows us to plan in an adaptive way, implementing 'low regrets' solutions now and adding to solutions as risks become more certain in the future. The option blend approach is one we feel is important in making a step change in our approach to planning for long-term risk and thus is embedded in all catchments.

8.3.5 In order to refine the list of possible options, geospatial analysis and catchment characteristic data were used to build an understanding of the likely feasibility of particular options. Additionally, 'opportunity workshops' were held which were a pivotal point to agree option strategies relevant to each TPU.

8.3.6 By following these steps in reviewing, refining and discounting possible options and interventions, over 65,000 options remained which needed to be refined further. This was done through detailed assessment on elements such as calculating monetary and carbon costs for each option.

8.3.7 Additionally, an assessment on the six capitals (economic, social, financial, manufactured, human and natural capital) was conducted to be included alongside the assessment of cost and carbon in the decision making stage.

8.3.8 Our approach to delivering best value using the six capitals

8.3.8.1 The scale and complexity of the challenges faced by the water sector is more significant than ever before. Demands placed on us from climate change, changes in customer and stakeholder expectations, against a back drop of customer affordability in the middle of a cost of living crisis. To navigate through these challenges, we need to understand more about our choices and the consequences of our activities. We need what out plans will cost, but also what they will deliver in terms of value.

8.3.8.2 Value-based decision making can help us to consider the full picture when making decisions. It can help us put customers, society and the environment at the heart of our planning. It can help account for differing stakeholder views, and give us a more complete picture of risk and opportunity, by bringing in a broader set of information into decision making.

8.3.8.3 We have chosen to structure our value-based decision making by using the six capitals framework, taken from the internationally adopted Integrated Reporting Framework. Six capitals helps us structure our decision making framework in a consistent and robust way which accounts for:

- Our dependencies – The resources that we rely on to deliver value, including less tangible things like trust and effective relationships as well as more tangible resources like water, chemicals and construction materials; and
- Our impacts – Both positive and negative impacts that we have on the North West.

8.3.8.4 The six capitals framework helps give structure to our complex operating environment, helps us select which metrics are most appropriate for our decisions, and helps us to consider environmental and social value in everything we do.

8.3.8.5 When developing the DWMP, we are adopting a value-based decision making process, using a six capitals methodology (Figure 34) as we acknowledge that there are numerous measures that reflect value to customers. A qualitative six capitals measure has been used to support our selection and screening of options. This has ensured that options, which may otherwise be discounted based on traditional cost benefit assessments, are considered further in the process. By taking this approach, it has allowed a more holistic view of value, in a way that will allow us to monetise and compare options/solutions. Additionally, we have been able to make informed decisions build a best value plan, as the outputs from the options development and appraisal stage of the DWMP process has evidenced that 'best value' and 'lowest whole life cost' are not often aligned.

Figure 34 The six capitals used within the DWMP

8.3.8.6 We are continuing to mature our approach to value-based decision making to give us an ever richer and broader view that helps further enhance how we serve all of our customers and stakeholders. This helps us serve their differing needs, and is increasingly important and valuable at a time where the sector is facing many significant drivers for change, at the same time as ensuring bills remain affordable. Our shift towards value-based decision making is also supported by our customers (Figure 35) as demonstrated from our bespoke customer research.

Figure 35 Six capitals customer research feedback

"It gives me a bit or reassurance to keep trusting them with the work that they do. And it shows how much they think about things showing it like this, so it gives me that trust. They are working behind the scenes to make things good for us."

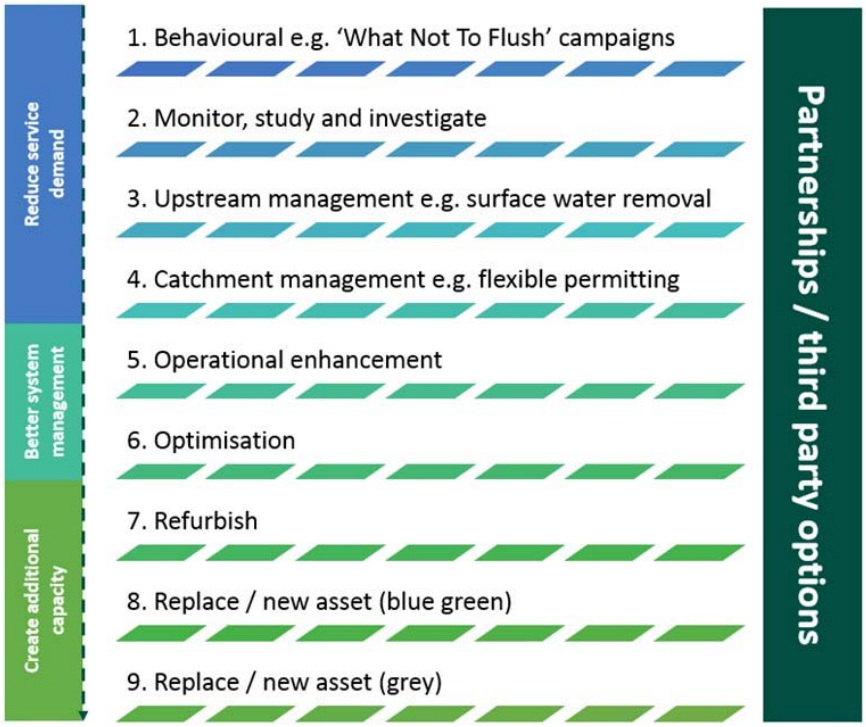
"I think it is very positive way of looking, it is very systematic in its process, it is also reproducible, so it allows you as a company to be open and transparent about how you do your business which is a plus for the customer as you can have faith in that company then."

8.3.8.7 Moving forwards towards the next investment cycle (2025–2030), our approach to assessing value is robust and mature, and we will continue to improve and further embed our approach to drive value-based decisions throughout everything we do. We are aligned with other strategic programmes of work such as the Water Resources Management Plan (WRMP) and the WINEP to ensure consistency in our understanding of the value a scheme delivers.

8.4 Preferred options

8.4.1 Following the iterative screening process outlined above, it is important that any potential options and interventions are supported and endorsed by customers and stakeholders. In order to do this, we conducted bespoke customer research and held stakeholder workshops to understand their views and priorities and to reflect their feedback within the plan. The result of this was the creation of the options hierarchy (Figure 36) and allowed us to co-create and co-develop a prioritised list of options.

Figure 36 DWMP options hierarchy



8.4.2 Following the creation of the options hierarchy, it was important to present customers and stakeholders with a choice of preferred options, so two different approaches were shared:

(1) Prioritisation of options based on the options hierarchy, prioritising those options which reduce demand and better manage the system over those which increase capacity; and

(2) Prioritisation of options based solely on the lowest whole life cost – this is a more traditional way of considering cost and benefit of options by weighing up the cost benefit ratio.

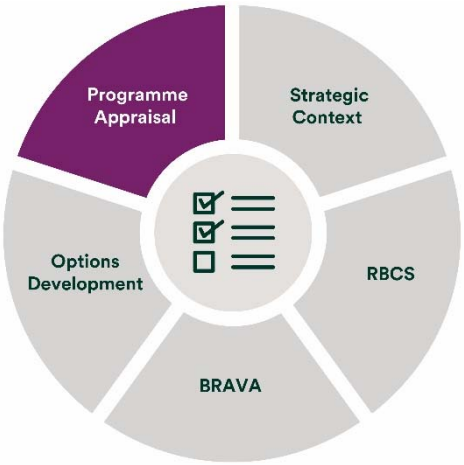
8.4.3 Whereby the lowest whole life cost approach takes into account cost and performance of an option over the duration of the plan (25 years), this considers benefit against our long-term targets (e.g. delivering drainage and wastewater services) and considers whether the benefit of an option outweighs the cost of implementing the solution. This approach drives a lowest cost plan but may not deliver as many wider benefits.

8.4.4 To understand the potential benefits fully, a cost-benefit analysis was conducted whereby options with a lower cost benefit score are brought forward where the natural capital score is net positive. This approach has ensured that the full benefits of each options is understand to the best of our knowledge.

8.4.5 The process outlined in this section has evidenced that 'best value' and 'lowest whole life cost' are not often aligned. Consequently, further customer engagement was undertaken to understand how customers value the wider benefits delivered by options. This will inform the further evolution of the approach used for future iterations of the DWMP and to support the development of the business plan for investment cycle 2025–2030.

8.4.6 More detail can be found in Technical Appendix 7 – Options Development and Appraisal (TA7).

9. Programme appraisal



More detailed information can be found in Technical Appendix 8 – Programme Optimisation (TA8).

9.1 Introduction

9.1.1 To enable a full assessment of the plan regionally, a programme appraisal step was undertaken. This is the final stage of the DWMP process and it utilises the options identified during options development (section 8).

9.1.2 Key themes

9.1.2.1 This sections aims to summarise the approach taken to determine the preferred plan. The main themes in this section are:

- Scenario testing;
- The preferred plan;
- Our approach to improving storm overflow performance;
- Environmental Assessments; and
- Adaptive planning.

9.2 Scenario testing to determine the preferred plan

9.2.1 Due to the statutory nature and thus legal requirements relating to both wastewater treatment and storm overflows, these planning objectives were not included within the scenario testing undertaken to determine our preferred plan. These elements are discussed separately within section 10.

9.2.2 The remaining planning objectives of flooding, pollution and sewer collapse were however included within iterative scenario testing in order to derive the best value combined solution based on the cost beneficial interventions derived as detailed in section 8.

9.2.3 During this stage, many possible combinations of solution blends were tested to understand how different intervention types should be prioritised across the three levels of the plan given different constraints.

9.2.4 This informed the selection of options within our final plan for the North West and considered, more broadly, issues of affordability and acceptable levels of risk and performance. The range of factors considered included cost, customer acceptability, wider six capitals benefits, and carbon before a scenario was chosen for the final plan.

9.2.5 In order to determine the preferred plan an innovative decision support tool was used to optimise the cost beneficial options. The cost, benefit and six capital assessment data from options development (section 8) was fed into the optimiser and a range of scenarios and constraints applied.

9.2.6 Using the applicable rules the optimiser determined what the optimal combination of interventions is for the region for each scenario. The resulting costs and benefits of each programme vary according to the outputs of the decision support tool.

9.2.7 The key scenarios that were tested were:

- Scenario 1: Best value approach where only feasible options are considered; and
- Scenario 2: Lowest whole life cost where only feasible options are considered.

9.2.8 Using the applicable rules, the optimiser determined what the optimal combination of interventions is for the region for each scenario. The resulting costs and benefits of each programme vary according to the outputs of the decision support tool.

9.2.9 Lowest whole life cost vs best value

9.2.9.1 Scenario 1, the best value approach, follows the options hierarchy (outlined in Figure 36 in section 8.4). The options hierarchy was developed with customers, alongside review and challenge from the Independent Challenge Group (ICG), YourVoice Environmental and Social Capital Sub Group (ESCG). Within scenario 1, options for the plan were selected and prioritised using this hierarchy.

9.2.9.2 In the lowest whole life cost approach (scenario 2), the optimiser selects the lowest whole life cost option from the available option list. The six capital benefits of options were considered in the creation of this option list with a lower screening threshold for secondary screening for options with additional benefits.

9.2.9.3 High level comparison of these two approaches (Table 20) shows differences in overall expenditure and the types of investment selected. A wide scale monitoring programme would be required for all scenarios to enable the delivery of an adaptive approach.

Table 20 Best value vs. lowest whole life cost (WLC) projected investment (totex)

Options hierarchy	Scenario 1: Best value		Scenario 2: Lowest whole life cost	
	Cost (£m)	Six capital score	Cost (£m)	Six capital score
Behavioural	80.9	45,971	14.8	7,389
Upstream management	290.1	5,618	103.3	4,065
Operational interventions	395.2	9,585	394.6	9,434
Refurbishment	0.1	-45	0.1	-45
Replace/ new asset (blue green)	16.5	72	14.3	56
Replace/ new asset (conventional)	946.6	-10,118	1,172	-10,189
Total	**1,729.3**	**51,083**	**1,699.4**	**10,710**

9.2.9.4 Table 21 demonstrates that both scenarios project a significant improvement in performance against UUW planning objectives. All figures demonstrate the projected percentage reduction in incidents following completion of proposed investment, taking into account performance improvements within the current investment period of 2020-2025.

Table 21 Best value vs. lowest whole life cost projected benefits

DWMP Planning objective	Scenario 1: Best value (% reduction)	Scenario 2: Lowest whole life cost (% reduction)
Pollution	57	56
Internal flooding	62	63
External flooding	28	27
Open space flooding	27	26
Sewer collapses	36	36

9.2.9.5 Further details on the scenarios assessed for the DWMP can be found within Technical Appendix 8 – Programme Optimisation (TA8).

10. The preferred plan

10.1 Introduction

10.1.1 This section sets out the key components which make up our preferred plan, which is divided into two key areas: activities which are mandated, and activities which have been selected as part of the optimised plan.

10.1.2 The processes and approaches outlined in the preceding sections of this document describe the data and evidence that has been developed and collated throughout the DWMP. The data and evidence developed during BRAVA and Options Development alongside assumptions outlined in supporting technical appendices have informed our decision support processes in order to determine the preferred plan.

10.1.3 The preferred plan selects a range of interventions to mitigate the long-term risks identified through BRAVA. It sets out a pathway and direction of travel to meet our long-term planning objectives. It must, however, be continually reviewed as part of an adaptive approach given the levels of uncertainty regarding factors outside of management control such as climate change and policy changes.

10.1.4 To provide a more complete picture of the potential long-term investment requirements we considered a range of components. We are setting out our plan through three core components (Table 22):

(1) Wastewater treatment – activities that are mandated by legislation or are required to maintain compliance with discharge permits;

(2) Performance improvements – optimised outputs of the non-mandated aspects of the plan e.g. to meet internal flooding planning objective; and

(3) Storm overflows – investment associated with meeting the targets within the Storm Overflows Discharge Reduction Plan.

10.1.5 A central view of the investment associated with each of the core components listed above are summarised in Table 22 and detailed in Sections 10.2 to 10.4. Our current core plan is focused on the areas where we have greatest certainty, with a risk-based approach being taken for those areas of greater uncertainty, which are inherently higher risk.

Table 22 Preferred Plan (totex) for 2025–2050 summary

Component	Area	Price base assumption (Financial Year, FY)	Cost £m (2025–2050)
Legal obligations	Wastewater Treatment (inc. WINEP)	FY21	6,107
Legal obligations	Storm Overflows (inc. WINEP)	FY21	18,119
Performance improvements	Optimised activity	FY21	1,729
	Total: Legal obligations + Performance improvements + Future requirements		**25,955**

10.1.6 Due to the high degree of uncertainty associated with key elements of the plan, it is key that we use an adaptive approach to manage this risk as it emerges. Therefore, there is greater certainty in proposed investment in the short term than the long term.

10.1.7 Phasing for this investment can be seen in Table 23.

Table 23 Phasing of investment

	Totex (£m) per investment cycle					
Investment Category	**2025 – 2030**	**2030 - 2035**	**2035-2040**	**2040 - 2045**	**2045 - 2050**	**Total**
Wastewater Treatment	2,473	1,340	732	767	796	6,107
Storm Overflows	2,253	3,771	3,879	4,044	4,171	18,119
Performance Improvements	206	389	369	382	383	1,729
Total	**4,932**	**5,500**	**4,980**	**5,193**	**5,350**	**25,955**

10.1.8 In the development of the phasing of investment for permit compliance, UUW has assumed an even distribution of investment, with the exception of where a site has also been identified as requiring investment associated with WINEP. In these cases, it has been assumed that permit compliance activities required will be aligned with WINEP investment, which is predominantly between 2025 and 2035 (as WINEP development by regulators can only reasonably look 10 years, or two cycles, ahead).

10.2 Optimised activities to deliver performance improvements

10.2.1 Introduction

10.2.1.1 In many areas of our plan, such as flooding, we have a good level of certainty around ambitions and flexibility in how these targets could be achieved. To develop a view of our core activities we have used an innovative decision support tool, Copperleaf Portfolio, as detailed in Technical Appendix 8 – Programme Optimisation (TA8). Copperleaf Portfolio is an industry leading asset management tool used across a number of sectors around the world.

10.2.1.2 We tested a range of approaches and scenarios and this has allowed us to understand the best set of activities at a regional level for meeting the planning objectives set out in this document.

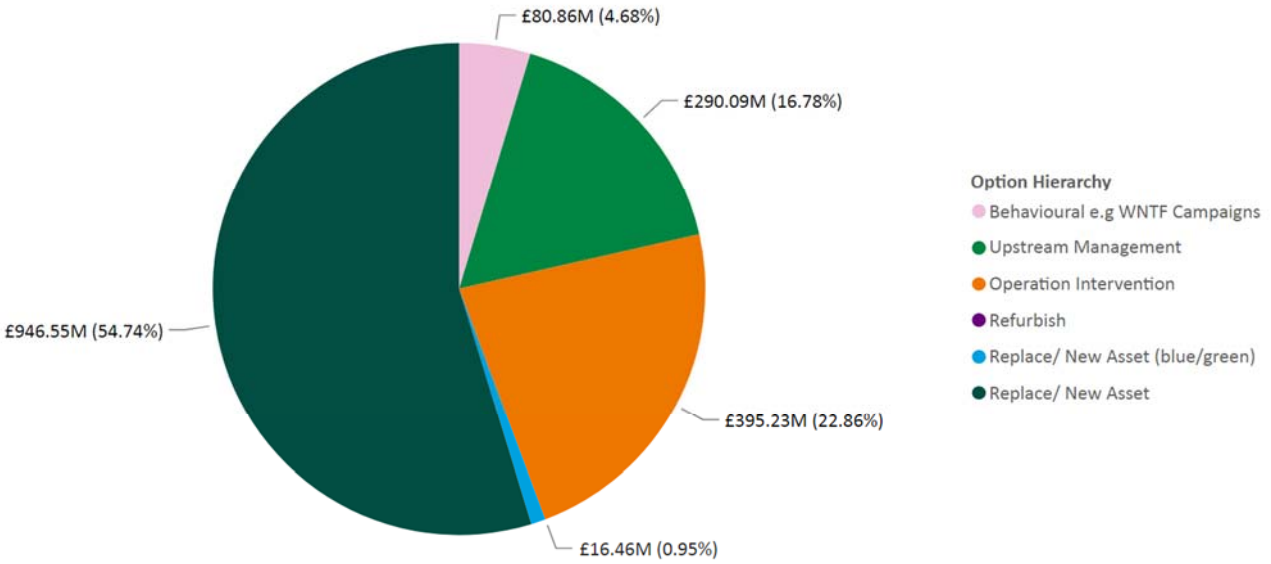
10.2.1.3 Two approaches were tested with stakeholders and ultimately the best value approach based on the option hierarchy set out in Section 8.4 was selected. This approach has, therefore, been used to identify the best set of options to meet planning objectives.

10.2.1.4 Following this optimisation, £1,729 million of interventions (over 25 years) have been identified across 512 TPUs. This includes a wide variety of different option types (Figure 37) including significant amount of surface water management activities.

10.2.2 Overview of optimised activities to deliver performance improvements

10.2.2.1 Following the best value approach, the optimiser was used to select the best combination of options to meet the long-term planning objectives across the region. A wide variety of different option types were selected.

Figure 37 Regional view of optimised activities investment (totex) by option hierarchy



10.2.2.2 At a regional level, new assets and upstream management (e.g. SuDS) and Operations Interventions (which comprises primarily of dynamic network management) make up the largest proportion of investment (Figure 37). This is generally in the form of both conventional and blue/green storage options, which are implemented to manage remaining capacity gaps in the sewer system caused by climate change; and sustainable drainage options to manage rainwater entering the sewer system.

10.2.2.3 SuDS options gained significant support from customers, owing to perceived additional benefits and getting to the 'root cause' of a problem. As such, UUW is looking to accelerate no regrets interventions such as SuDS through multiple streams of investment such as our rainwater management enhancement case for the investment period 2025-2030.

10.2.2.4 Additional significant investment is found in operational interventions. This investment includes activities to utilise innovative dynamic network management technologies and manage the wastewater and drainage systems using remote monitoring and artificial intelligence.

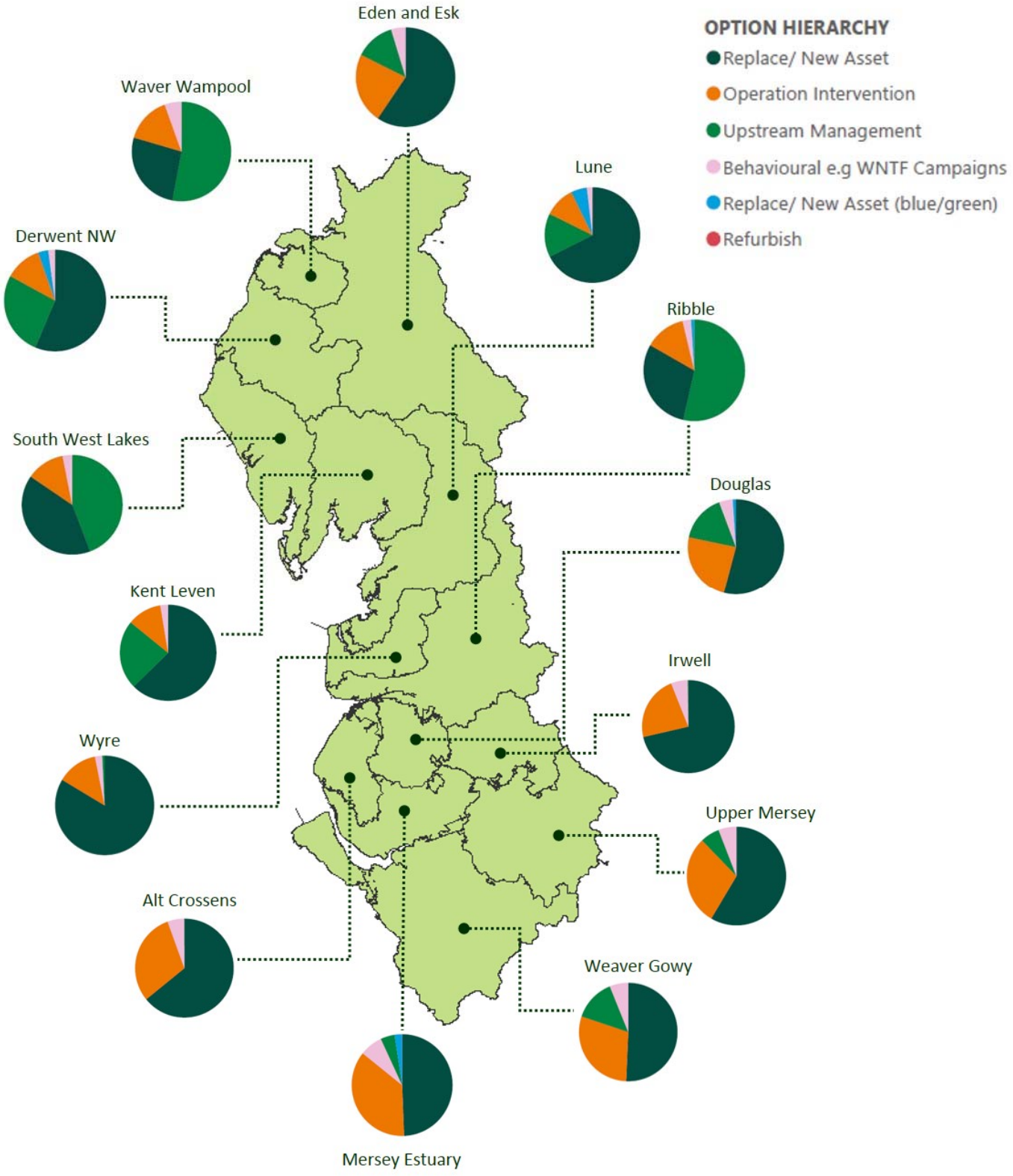
10.2.2.5 The blend of optimised activities varies between different SPAs depending on their needs and priorities (Figure 38).

10.2.2.6 The optimised set of interventions would provide multiple benefits as set out in Table 24. This includes significant improvement to flood performance, which is one of the key planning objectives for this plan.

Table 24 Potential risk reduction associated with the delivery of the optimised plan

Planning objective	Regional % reduction in risk targeted through optimised activities
Internal flooding	62%
External flooding	28%
Pollution	57%
Open space flooding	27%
Sewer collapses	36%

Figure 38 Optimised activity expenditure by SPA broken down by option hierarchy



The breakdown of optimised activities varies significantly between different SPA. This is because different needs and priorities were identified in different areas. For example, upstream management options are more prevalent in urban areas with a high proportion of combined sewers.

10.3 Storm Overflows

10.3.1 Introduction

10.3.1.1 With 54 percent of the existing sewer system of the North West being combined compared to an industry average of 33 percent, and high levels of rainfall in key urban areas such as Greater Manchester and East Lancashire, the scale of work we must deliver to meet the standards set out in the Storm Overflow Discharge Reduction Plan is significant. It is also significantly larger investment than other water companies, and the 25 year plan discussed in this section is likely to represent the largest such plan in the sector.

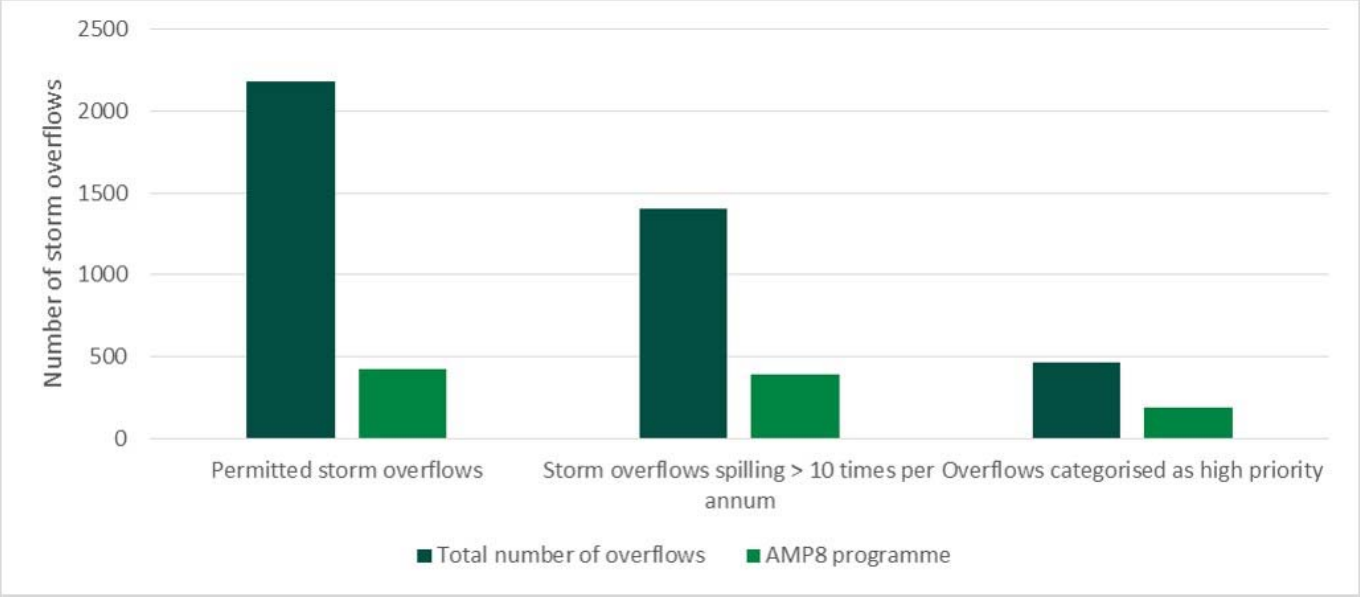
10.3.1.2 Over £18 billion (totex) of investment (over 25 years) has been identified across the North West to address the regions storm overflows in line with SODRP. This includes conventional storage solutions plus a significant amount of surface water management activities.

10.3.2 Background

10.3.2.1 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 activations 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.

10.3.2.2 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 39 shows a summary of the categorisation of all our storm overflows when compared to the number we plan to address in AMP8.

Figure 39 **UUW proposed AMP8 storm overflow programme compared with total number of overflows by SODRP category**



10.3.3 AMP8 WINEP Submission

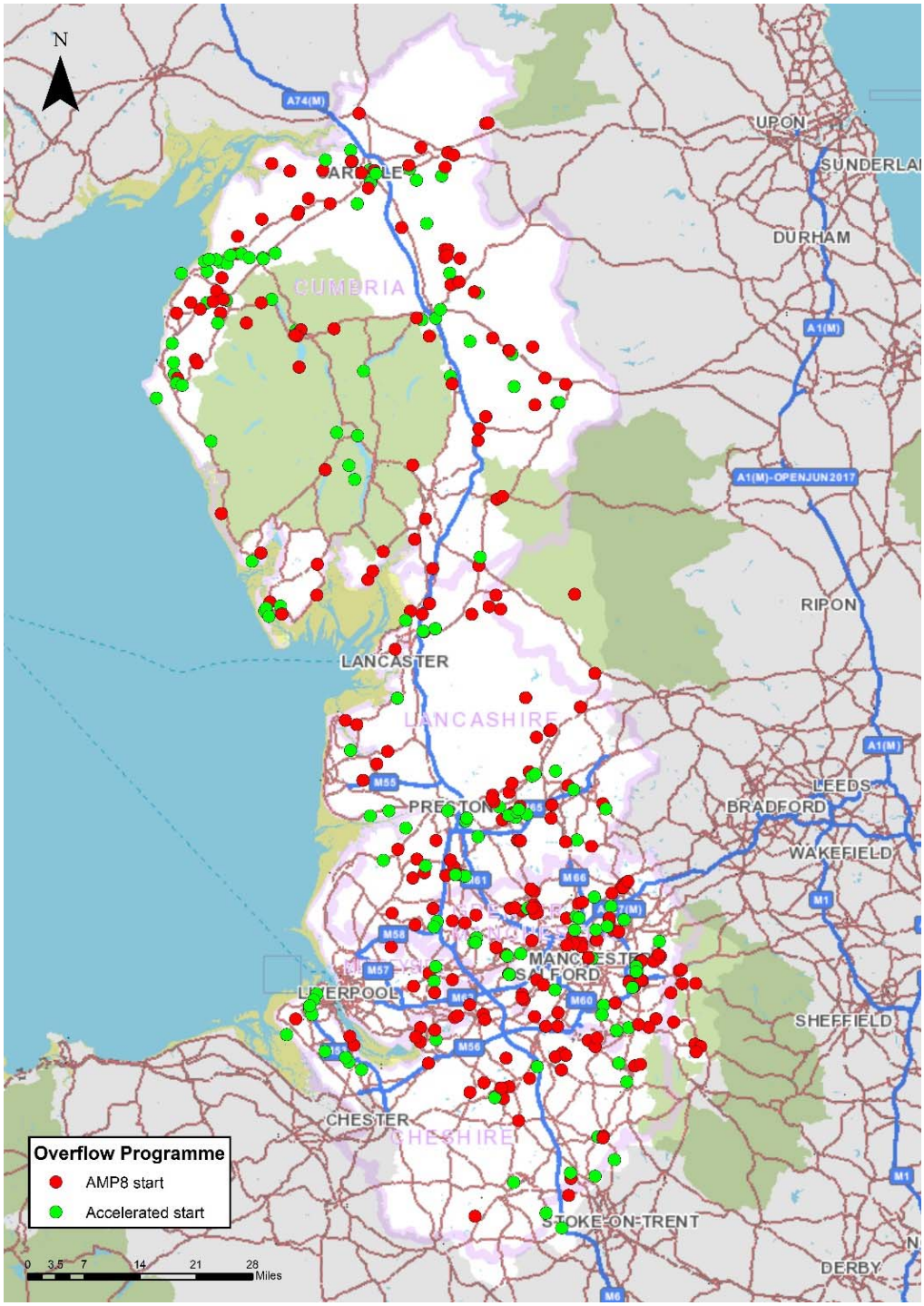
10.3.3.1 In our AMP8 WINEP submission of January 2023, we have developed a plan that:

- Delivers the trajectory set out in the SODRP by improving more than 38 per cent of high priority overflows;

- Improves 28 per cent of all storm overflows to achieve a reduction in activation frequency across UUW to an average of 20 activations 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.

10.3.3.2 Figure 40 demonstrates the spread of investment in addressing storm overflows across the North West as part of the AMP8 WINEP submission in January 2023. This includes investment across 419 storm overflows, with 154 of those receiving accelerated investment allowing work to commence sooner.

Figure 40 Geographic spread of the 419 storm overflows submitted within the AMP8 WINEP



10.3.3.3 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 activating more than 40 times a year, and thus a new requirement to get to 10 activations per annum on average at each overflow represents a very substantial additional change in performance standard.

10.3.3.4 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 25. 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 activation 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 activation frequency to around 20 activations per annum in the most cost effective way possible.

10.3.3.5 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 activation reduction is going to increase as we tackle these overflows. Future AMPs will therefore contain less overflows but still require similar levels, if not greater, of expenditure to AMP8. We will be using AMP8 to plan for some of this major investment.

***Table 25* 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	463	176	189	38%
EnvAct_IMP4 other	1403	196	392	14%

10.3.3.6 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 activation frequency significantly in line with the expectations.

10.3.4 AMPs 9 - 12

10.3.4.1 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[5]) and meeting the 10 activations per annum target (EnvAct_IMP4), prioritising addressing known harm.

10.3.4.2 Table 26 details the targets to be met within each investment period.

Table 26 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

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

AMP9	AMP10	AMP11	AMP12
Ensure 28% of all overflows requiring improvement are addressed – (AMP8 achieves 28%)			

10.3.4.3 This ambitious plan targets 10 activations or less per annum at all overflows by 2050 (Figure 41) and a reduction of over 56,000 storm overflow activations per year (Figure 42) by 2050.

Figure 41 Reduction in annual average activations of all storm overflows

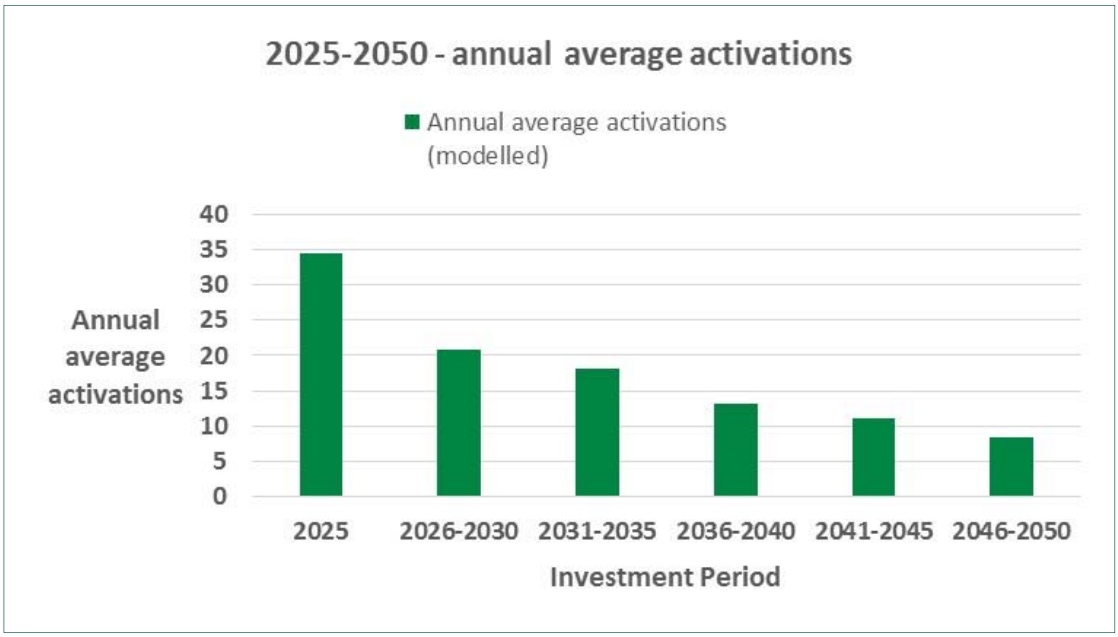
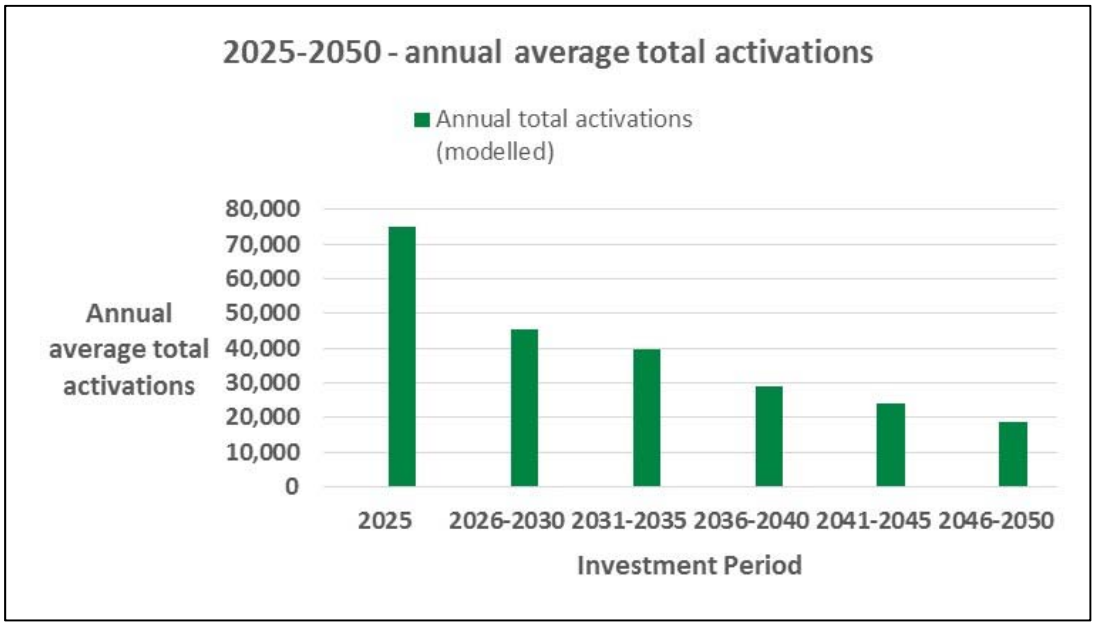


Figure 42 Reduction in total activations across all storm overflows



10.3.5 Ensuring our storm overflow programme is addressing hydraulic constraints

10.3.5.1 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 practise 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. This means that additional operating or maintenance expenditure to meet existing obligations are not 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 performance standard required rather than "double counting" existing obligations that should be met through base cost allowances.

10.3.5.2 We ensure this approach is embedded into our ways of working through our company model guidance and the industry code of practise, where there is a requirement for historic verification of actual performance versus the model prediction. This now includes a check of the activation performance measured through Event Duration Monitoring (EDM) and that 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 activation 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.

10.3.5.3 To provide additional reassurance, 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 activations per year). In our regulatory return for 2021 we were a sector leader in complying with this request and our analysis showed that 67 high-activating 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 activations occurring or to at least minimise the number or duration of activations that result from the issues – this prevents them from becoming high-frequency activating overflows.

10.3.5.4 This provides further supporting evidence that the majority of reasons for high-activating overflows in the North West is not due to maintenance or operational issues. High-frequency activating 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.

10.4 Wastewater Treatment

10.4.1 Introduction

10.4.1.1 Although certain areas of this plan are discretionary and we have been able to optimise proposed investment as described in Section 9.2, it is not appropriate to do so for all investment drivers. Maintaining permit compliance, while accommodating growth or complying with new environmental drivers set out in the WINEP are legal requirements. Therefore, a cost benefit screened approach is not appropriate. This means that these activities must be considered independently from the decision support tool optimisations, as using a cost benefit screen may not fully capture the activities required to meet legal obligations.

10.4.1.2 This section sets out two areas of investment which fall into this category:

(1) Permit Compliance; and

(2) WINEP.

10.4.1.3 In total, £6,107 million (totex) of investment has been identified to meet these mandatory activities for the period 2025–2050. This is associated with the known regulatory requirements for WINEP and the permit compliance as impacted by modelled growth and climate change out to 2050. Further detail of the short and long-term uncertainty around WINEP is set out in Section 10.6. As such, the detail set out in this section is likely to change in future iterations of the plan as new requirements are identified.

10.4.1.4 Legal obligations have been included for 334 TPUs, along with several WINEP derived schemes which are intended for investment across multiple catchments rather than site specific options. A significant potential expenditure has been identified through this process across the North West as a whole.

10.4.1.5 The requirement for these have been identified through the BRAVA process or by following the WINEP driver guidance issued by the Environment Agency.

10.4.2 Permit compliance

10.4.2.1 To understand the potential scale of programme that would be required to maintain permit compliance, a risk-based approach was used. The outputs of the BRAVA modelling were used to identify sites with the greatest vulnerability and a prioritised programme developed based upon this. This has involved assessing sites with investment need for:

- end of pipe compliance risk, which identifies long-term investment need in 79 TPUs; and
- DWF compliance risk, which identifies long-term investment need in 94 TPUs.

10.4.2.2 A number of significant TPUs have been identified through this approach including some of our largest TPUs. Sites such as these have a number of drivers and alignment of delivery will be key in ensuring an efficient and holistic solution.

10.4.2.3 For example, Carlisle TPU has significant increase in household population of 34% due to the creation of a garden village to the south of the city, it has also been identified as having a potential phosphorous permit change under the Habitats Directive and a number of overflows, which are likely to require investment following SOAF investigations. In order to create the best solution, the timing and solutions to address each of these issues must be considered in the round rather than developing a solution solely to accommodate the growth. In addition, careful consideration must also be given to ensuring resilience in final design as a number of assets have been identified as vulnerable to flooding and the wastewater treatment works has flooded on a number of occasions over the last 20 years. Further detail on Carlisle can be found in the Eden and Esk SPA plan (SPA_04).

10.4.2.4 All the sites identified as part of this programme will need careful monitoring to understand the growth rate and point where capacity would be exceeded in light of what is likely to be a significant programme of surface water management upstream. This programme of work is likely to be under regular review as part of an adaptive plan. Decisions on this type of investment are subject to decision and prioritisation through the periodic review processes and managed flexibly to incorporate changes in growth location and size as part of the overall DWMP.

10.4.3 Water Industry National Environment Programme

10.4.3.1 The WINEP is the programme of work water companies in England are required to do to meet their obligations from environmental legislation and UK government policy.

10.4.3.2 The development of the WINEP with the Environment Agency to inform investment cycle 2025 - 2030 and beyond is currently underway. This involves a thorough review of the evidence driving the investment. While this is currently under development there are some areas which have been identified as likely candidates for investment predominantly in investment cycles 2025 - 2030 and 2030 - 2035.

10.4.3.3 The drivers included in this plan are currently classified as 'core'. The schemes included are likely to change leading up to the submission of UUW's business plan for the investment period 2025-2030 later in 2023.

10.4.3.4 The locations of the schemes identified are not evenly distributed across the region. For example, significant investment to meet Water Framework Directive (WFD) requirements is identified in the Upper Mersey, while the majority of the investment to meet Habitats Directive improvements is in the Eden and Esk.

10.4.3.5 Further details on the wastewater treatment 25 year plan are contained within Technical Appendix 8 – Programme Optimisation (TA8).

10.5 Adaptive planning

10.5.1 UUW is supportive of the ambition to more explicitly embed long-term planning into business planning cycles. The key principles of adaptive planning have been considered within the first DWMP. We have further developed our capabilities in adaptive planning since draft publication and this is an area we will continue to build on through our Long Term Delivery Strategy for PR24.

10.5.2 Within the DWMP, we have:

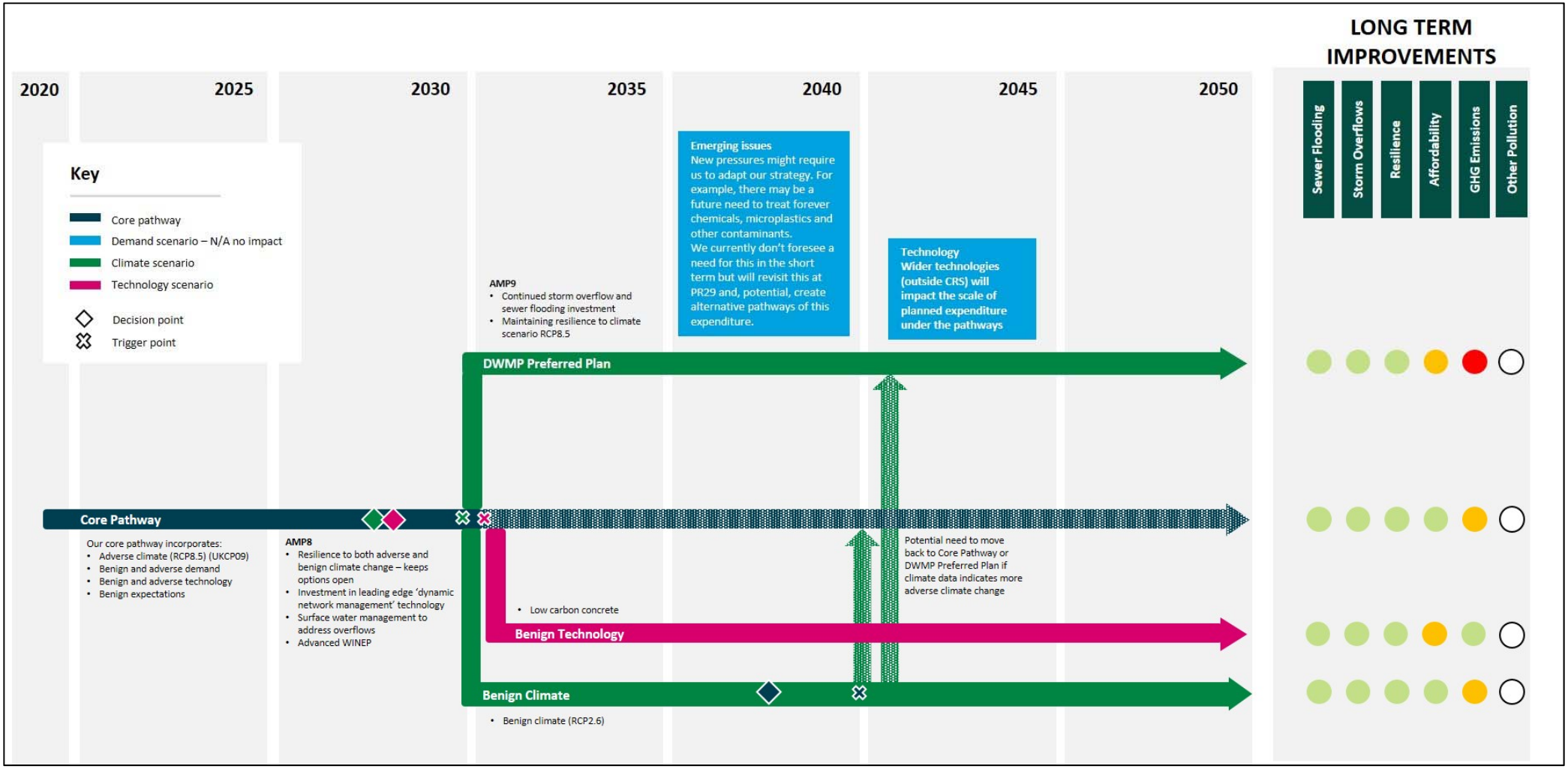
- outlined stretching ambitions to be achieved over the next 25 years, irrespective of uncertainty;
- considered the impact of uncertainty and applied these within risk forecasts;
- built an options development process which enables a flexible strategy to be developed, which can adapt to changes over time and optimises the timing of key interventions; and
- considered triggers which would require additional options to be implemented to manage risk, particularly in our strategic sites.

10.5.3 In order to deliver resilient and improved services over the long term we need to optimise the delivery of interventions in a timely and affordable way. Over time, our understanding of the scale and impact of external risk factors will become more certain as data and modelling develops. Additionally, the understanding of the costs, benefits and timescales of delivered interventions will improve.

10.5.4 To support the development of our DWMP we've used adaptive planning techniques. Adaptive planning is an approach which allows us to understand and plan for risks through scenario testing. Our DWMP preferred plan represents our current core pathway for wastewater, this is our initial long-term strategy and will be reviewed over time as the picture of risk changes or interventions are realised.

10.5.5 Our DWMP preferred plan is resilient to many of the future uncertainties we are likely to face and its component solutions are low regrets. To deliver on our planning objectives under less certain, more extreme future scenarios however, we may need to invest in different solutions. Figure 43 summarises our wastewater core pathway and alternative pathways branching from the core pathway, which may be needed in the future.

Figure 43 UUW's adaptive plan for wastewater



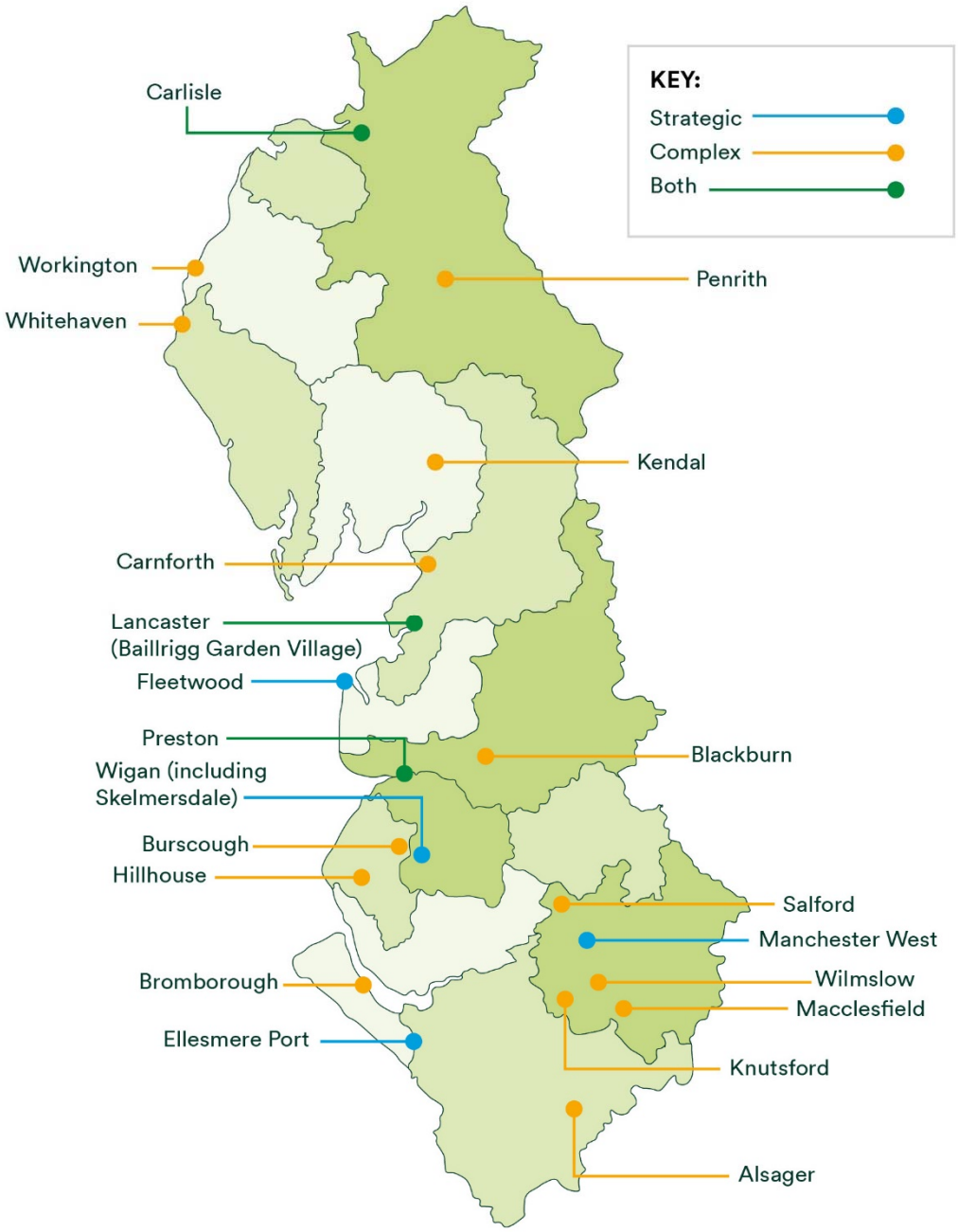
Understanding the impact of uncertainty on risk identification

10.5.6 During the Baseline Risk and Vulnerability Assessment (BRAVA) phase of the DWMP (section 7), for each drainage area the nature and the likely complexity of the interventions required were identified. A number of factors were considered including the range and scale of the problem identified through BRAVA and the level of uncertainty in the issues identified. This was then used to determine the appropriate level of options development and appraisal required (standard, extended or complex).

10.5.7 The output from this stage identified which drainage areas may require strategic decision points, such as large scale development in an area which is currently un-sewered. The areas identified are shown in Figure 44.

10.5.8 As part of the development of options in these areas, local place-based adaptive plans have been developed. The adaptive plans for these areas are described in each of the SPA documents (SPA_01 to SPA_14).

Figure 44 Drainage areas identified as strategic or complex catchments



Prioritising low regrets pathways through option blends

10.5.9 As discussed in section 8.3, for each drainage area we have created a suite of options, through options development, which could address issues identified in an area. These are referred to as option blends. Using this approach of option blends along with careful monitoring enables us to manage and deliver a suite of complimentary actions over time.

10.5.10 As risks materialise or understanding improves, option blends provide a range of solutions from which additional options can be deployed to ensure targets are met. In the short term, the options hierarchy ensures lowest regrets options are prioritised first. This allows risk to be reviewed and benefit to be understood ahead of more expensive solutions. Figure 45 demonstrates the general considerations and areas of uncertainty to be considered for an example TPU (Wigan, within the Douglas SPA).

10.5.11 Figure 46 sets out an example of how a long term target could be achieved in an area by deploying a number of strategies with appropriate review points. There are a number of factors which could affect long-term performance that have not been directly included in option blends. These factors could deliver further improvements to service and include both actions within reasonable management control, such as innovation and future efficiency, as well as external actions that we can only influence such as partnerships, regulatory reform and behaviours that impact performance.

10.5.12 We have optimised our proposal to plan ‘no regrets’ interventions first as a core pathway. These are options that are at the top of the option hierarchy. By monitoring changing risk, the plan can be adapted and additional options from the suite should be deployed, with the least desirable, single benefit or ‘higher risk in future scenarios’ interventions being the last resort. This results in the ability to phase delivery, monitor changes and adapt the approach accordingly.

10.5.13 For the interventions contained within this plan, a central view of risk has been taken to generate options and form a core pathway. To ensure best value investment is delivered, and before committing to investment, validation of the latest risk position will be undertaken.

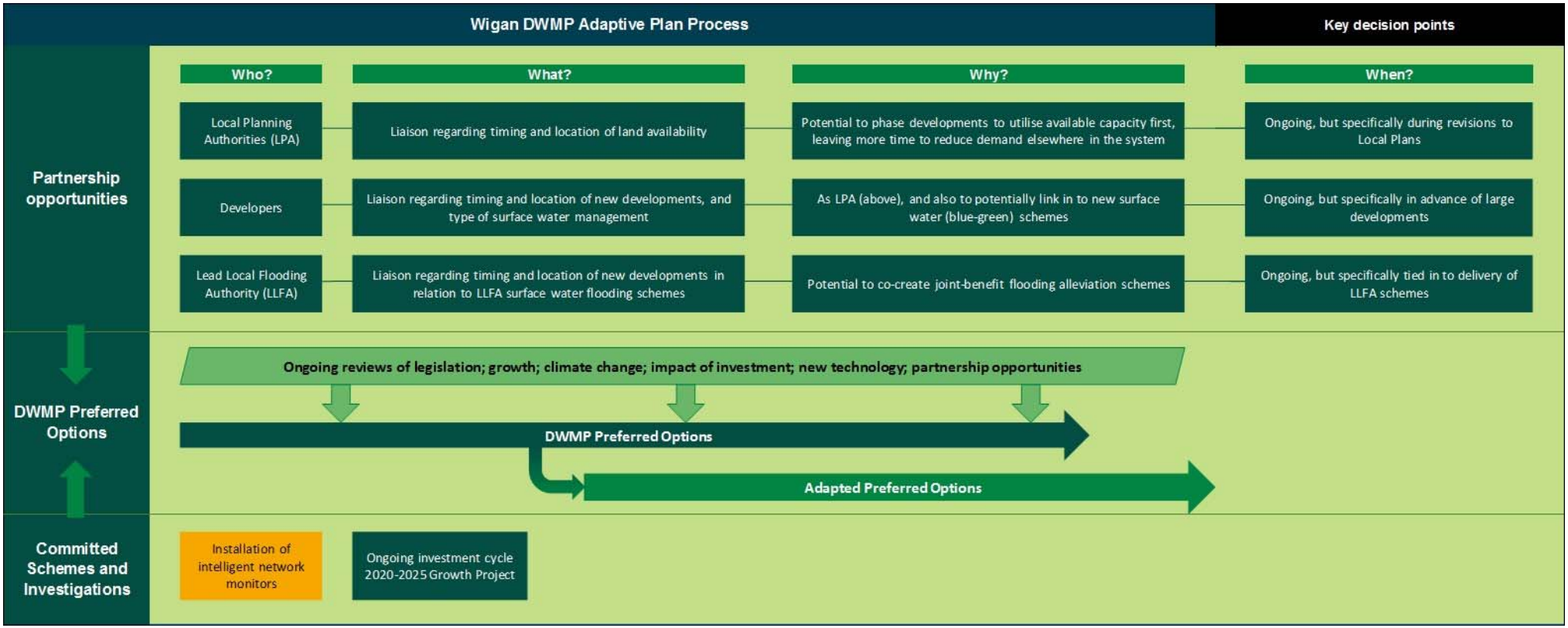
10.5.14 Adaptive planning allows for an ongoing review of performance to be undertaken, aligned to the DWMP planning cycles, to monitor the benefits realised through interventions and progression of external risks. This allows us to plan in an adaptive way, implementing ‘low regrets’ solutions now and adding to solutions as risks become more certain in the future. The option blend approach is one we feel is important in making a step change in our approach to planning for long-term risk and thus is embedded in all drainage catchments.

Further developing our adaptive planning capabilities

10.5.15 We are further developing our scenario testing and adaptive planning capabilities for wastewater through the PR24 long term delivery strategy. The iterative nature of the DWMP process allows us to continuously review risks and evolve solutions appropriately through later planning cycles. The DWMP has been a key tool in developing our 2025–2030 business plan and will be key in future business plan submissions.

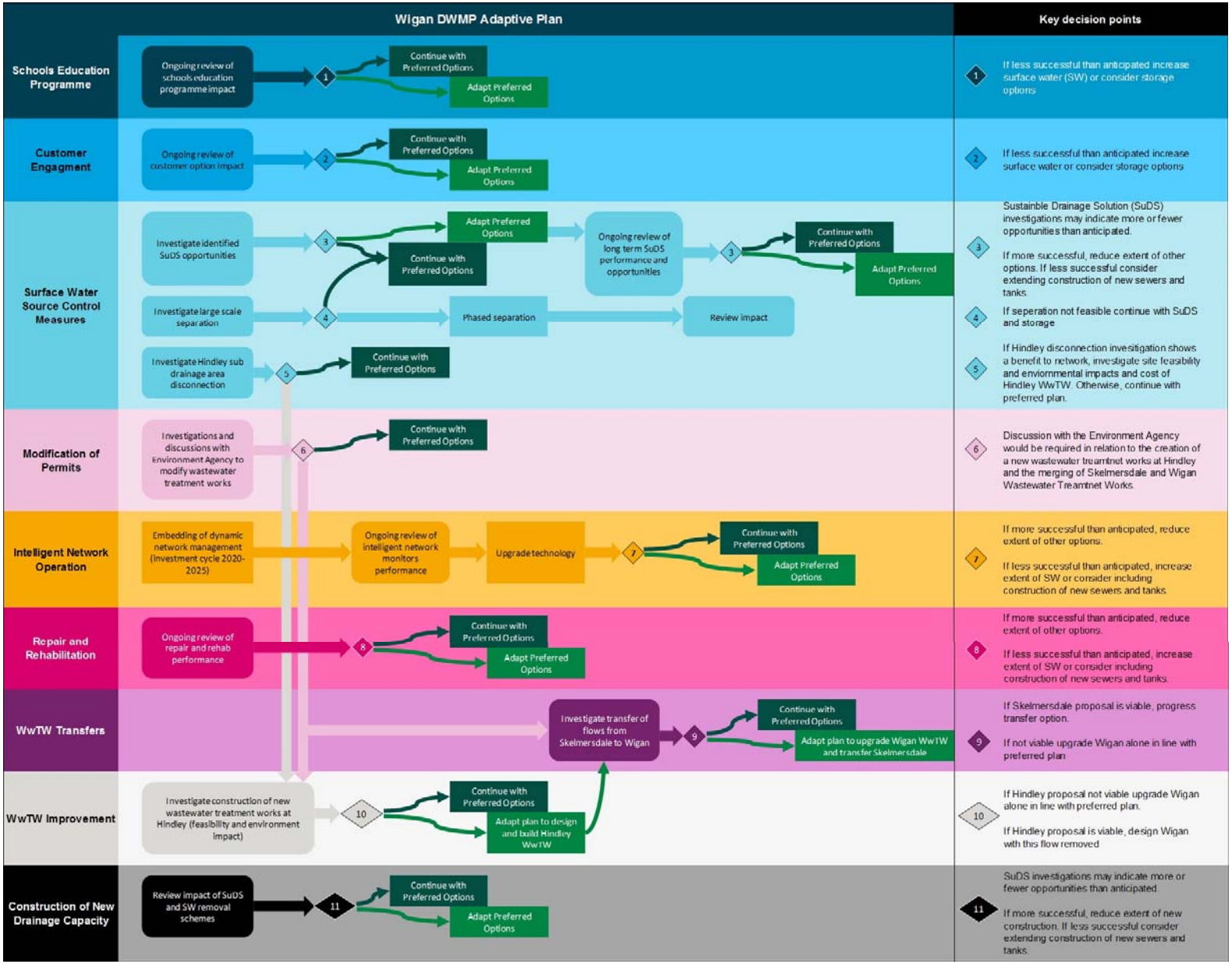
10.5.16 As part of business as usual activities within future cycles of the DWMP, regular reviews will be undertaken to understand both performance and benefits realised within the previous planning period. This allows us to assess the impact of interventions once they are implemented and also allows us to monitor the changing picture of risk within the region as updated data and modelling for growth and climate change are available (Figure 43).

Figure 45 General considerations for developing an adaptive plan for Wigan TPU



At a high level, a number of general uncertainties have been considered including partnership opportunities and the impact of committed schemes and investigations.

Figure 46 An adaptive plan for Wigan TPU



10.6 Alignment with the development of the next business plan for investment cycle 2025–2030

10.6.1 Introduction

10.6.1.1 UUW are currently developing the next business plan for investment cycle 2025–2030 (also referred to as AMP8).

10.6.1.2 During the finalisation of the DWMP, we have aligned to key aspects of the business plan development such as planning objective targets and key regulatory expectations such as WINEP and the SODRP, as they are at the time DWMP submission.

10.6.1.3 More information about our ambitions for the next investment cycle will be available in autumn 2023.

10.6.2 Bioresources Price Control

10.6.2.1 Delivery of our AMP8 Bioresources Business Plan will ensure that we continue to maximise the value created through recovery and re-use of sewage sludge. Through our WINEP actions we will increase the resilience of our sludge to land operations, prioritising no and/or low regrets investment to meet immediate resilience needs and focus on maintaining our ability to recycle sludge to agriculture.

10.6.2.2 We anticipate that biosolids recycling to agriculture will reduce over time to match the growing environmental ambitions of our customers and regulators. While we know that the future will not be 'business as usual', there is significant uncertainty of the scale and timing of this change. We are following an adaptive planning approach to avoid over investing in alternative outlets for sludge disposal.

10.6.2.3 Our AMP8 bioresources plan includes:

- Taking a leadership role in the development of the bioresources market and seeking a market solution to deliver increased sludge treatment capacity to meet rising demand;
- Meeting increasing regulatory expectations including compliance with Appropriate Measures for the Biological Treatment of Waste, Industrial Emissions Directive;
- WINEP actions that will deliver a significant reduction of over 12 per cent in our overall land bank requirement. Generate almost 120,000 tonnes of enhanced (microbial quality) biosolids cake a year at a higher percentage of dry solids, enabling access to greater and more diverse areas of land bank, increasing the flexibility and resilience of our operations. Provide 60 days covered, strategic storage to provide resilience against closed periods in the agricultural calendar, fine screening and increased analysis of our product qualities, and biosolids to agriculture permit compliance. Resilience items that are considered outside the sludge driver will be submitted as separate enhancement cases as appropriate; and
- A mechanism to unlock further investment activities if uncertainties over the future market demand for biosolids crystallise. Additional activities could provide greater resilience in our sludge recycling to agriculture operations, or allow a move to new sludge disposal outlets.

10.6.3 Components of this bioresources plan are contained within our WINEP submission of January 2023. At the time of this DWMP submission the WINEP is still evolving ahead of being finalised by regulators. In the event that some or all of the bioresource components are not included in the final WINEP we may include relevant enhancement cases within our PR24 submission instead.

11. Considering affordability

- Affordability is a key issue for customers in the North West.
- We have conducted ongoing research with customers to understand their views as well as bespoke research associated with DWMP.
- The majority of customers are likely to be supportive of relatively small bill increases.
- More detailed information can be found in Technical Appendix 9 – Customer Engagement (TA9).

11.1 Introduction

11.1.1 Affordability is a key issue for customers cross the North West. As highlighted in section 4.3, we regularly engage with customers to ensure that their views, priorities and options are taken into account when co-creating the DWMP. As part of this, we have undertaken overall bill affordability testing to gain early indications of how customers may view costs and benefits of this plan.

11.1.2 Key themes

11.1.2.1 This section sets out our approach to testing customers' views on the bill impacts of DWMP driven investment. Key themes in this section are:

- Customer acceptability testing; and
- Future bill impacts of the DWMP proposed investment.

11.2 Understanding customers' views

11.2.1 Our customer research, both as part of DWMP planning and wider on going UUW customer engagement, has demonstrated that bill affordability is a critical priority for customers. Customers' focus on affordability has increased in recent months as wider cost of living factors, such as rising energy and fuel costs, have become more prominent.

11.2.2 When UUW service priorities have been tested with customers, affordability is highlighted as a key priority (Table 27). For example, regular water service priorities research undertaken in 2016 found that affordability was ranked as the sixth most important priority out of 11. In 2021, the same research found affordability had increased to the third most important out of 11 priorities. Furthermore, between the two pieces of research a higher proportion of customers agreed that affordability should be a priority for UUW, rising from 64% of customers agreeing in 2016 to 77% in 2021.

Table 27 Customer feedback on the priority 'working hard to keep the cost of water as affordable as possible'

'Working hard to keep the cost of water as affordable as possible'	2016 survey results	2021 survey results
Rank of priority (out of 11 priorities tested)	6	3
% of customers agreeing this issue is a priority	64%	77%

11.2.3 The bespoke customer acceptability testing on the DWMP (section 4.3.5) to understand their views on overall bill changes indicated that whilst acceptability testing was conducted on an early version of the final DWMP, which differed from our final proposed plans in terms of bill impact and service levels, we can nevertheless draw a number of important conclusions as to customers views of the final DWMP.

11.2.4 The results of this acceptability testing have been considered alongside other DWMP customer research projects, including customer acceptability testing of the draft DWMP, six capitals customer research,

research supporting options appraisal and customer preference research. Taken together we believe we can safely conclude there is clear support from customers for the service improvements within the final DWMP, with an acceptance of bill increases of the general magnitude required to deliver these improvements.

11.2.5 Additionally, we have regularly sought to understand customers' views on overall bill changes, including as part of our research into customers' priorities. This package of research has consistently indicated that the majority of customers are likely to be supportive of relatively small bill increases (c.1%–2% on current bills) in exchange for service improvement in areas of customer priority. However, there are early indications that bill increases larger than this are more likely to be challenged by many customers. This suggests that, at minimum, gaining support for larger bill increase will require clear demonstration of the benefits of investment.

11.2.6 It is notable that customers from households categorised as low income are generally more likely to be sensitive to bill increases, consistently preferring lower bill options, even if this results in forgoing opportunities for service improvements. Given proposed investment profiles and associated bill impacts we anticipate that it will be necessary to consider how best to handle bill impacts for lower income households. This will likely form part of future Price Review and operational planning, and may require engagement with government and regulators.

11.2.7 Due to future uncertainty in increased risk from the impacts of climate change and growth, an adaptive approach is necessary to minimise impact on customer bills. An adaptive approach to implementing solutions will allow us to balance affordability with ambition for improvement. One major area of concern is the disproportionate impact on customers in the North of England, where there is higher rainfall and propensity for storms, and a consequently higher proportion of combined sewers and storm overflows activations.

11.3 Overall bill impact

11.3.1 Introduction

11.3.1.1 UUW has carried out bill impact assessments on the costs of each of the components contained within the preferred plan. The overall bill impact for the investment cycle 2025 - 2030 will be determined through PR24.

11.3.1.2 The bill impacts have been calculated using FY21 price base and excludes inflation.

11.3.1.3 As discussed in section 10.3.1, the bill impact includes an allowance for the £2.5 billion future operational running costs related to the proposed investment in storm overflows across the North West.

11.3.2 Summary of bill impact

11.3.2.1 The overall bill impact for each of the components is summarised in Table 28. The total enhancement expenditure is the total amount over a 25-year period. The 2030 and 2050 bill impacts are the estimated annual increase to customer bills.

11.3.2.2 We have approached calculating bill impacts in line with PR24 and beyond: Final guidance on long-term delivery strategies.

Table 28 Summary of potential bill impacts

Component	Total enhancement expenditure (£bn)	2030 bill impact (£ annual)	Anticipated 2050 bill impact (£ annual)
Legal obligations – Wastewater treatment (inc. WINEP)	6.1	37.10	59.53
Legal obligations – Storm overflows (inc. WINEP)	18.1	20.67	164.76
Performance improvements – Optimised activity	1.7	4.11	15.17
Total	**26**	**61.87**	**239.46**

12. Environmental assessments

- UUW commissioned a Strategic Environmental Assessment, Habitats Regulation Assessment and Water Framework Directive Assessment on the DWMP.
- This is to ensure that the environmental effects of the plan are understood.
- The findings of these assessments are found in standalone reports (C004, C005 and C006).

12.1 Introduction

12.1.1 This section sets out the work undertaken to understand the potential environmental effects of the plan. This incorporates the Strategic Environmental Assessment (SEA), Habitats Regulation Assessment (HRA) and a Water Framework Directive (WFD) Assessment. Catchments identified as either 'strategic' or 'complex' during BRAVA (section 10.5) were assessed. Further environmental assessments will be undertaken as and when individual projects, schemes and interventions become certain to ensure that there is no detrimental impact to the environment.

12.1.2 For this cycle of the DWMP, the assessments were conducted based on the draft DWMP. Any changes made since publication in June 2022 are within reasonable variable and tolerance of the environmental assessment methodologies.

12.1.3 The environmental assessments will be re-run once per DWMP five-year cycle.

12.2 Strategic Environmental Assessment (SEA)

12.2.1 A SEA is a systematic decision support process, aiming to ensure that the likely significant environmental effects of plans and programmes are identified, measures developed to avoid, manage or mitigate any significant adverse effects, and to enhance any beneficial effects. The purpose of a SEA is to encourage relevant plan authors to integrate environmental considerations into the development of any plan or programme.

12.2.2 UUW is considered a planning authority for the purposes of the SEA Regulations. As the first iteration of the DWMP is not a statutory plan, there is, therefore, no regulatory requirement for UUW to undertake an SEA, however we acknowledge the opportunity it has to strengthen the DWMP plan development process.

12.2.3 A review has been undertaken to identify the key economic, social and environmental issues, which are relevant to the SEA of the DWMP. The issues have been identified from a variety of sources including the SEA Regulations and other relevant plans and programmes.

12.2.4 A framework of assessment criteria relating to the key issues relevant to DWMP has been developed and for each option type, the assessments are scored based on the nature of the effect of the option (both adverse and beneficial), the timing and geographic scale. Scores determine whether the option has a significant effect, a minor effect or a neutral effect for each assessment criteria.

12.2.5 The outputs from the SEA can be found in the DWMP Strategic Environmental Assessment (SEA): Environmental Report Post Adoption Statement (C004).

12.3 Habitats Regulation Assessment (HRA)

12.3.1 The Habitats Regulations require every Competent Authority, in the exercise of any of its functions, to have regard to the requirements of the Habitats Directive.

12.3.2 The non-statutory nature of the DWMP, means at present, carrying out a HRA on the plan is potentially premature. However, if proposals in the DWMP could affect European sites, undertaking an HRA

enables the effects to be identified, avoided or minimised and demonstrates that the plan delivers the best, sustainable outcomes for customers, stakeholders and the environment.

12.3.3 The HRA aims to determine whether there will be any 'likely significant effects' on any European site as a result of a plan and programmes implementation (either on its own or 'in combination' with other plans or projects) and, if so, whether there will be any 'adverse effects on site integrity'.

12.3.4 A separate HRA of the DWMP is undertaken and its findings used, as appropriate, in the preparation of the SEA, notably when considering the effects on biodiversity.

12.3.5 The potential effects on European sites must be considered at every design and planning stage for each option (and their component schemes), to ensure that potential adverse effects are identified and avoided during the design process.

12.3.6 The outputs from the HRA can be found in the DWMP Habitats Regulation Assessment (HRA) Report (C005).

12.4 Water Framework Directive (WFD) Assessment

12.4.1 The WFD sets a default objective for all rivers, lakes, estuaries, groundwater and coastal water bodies to achieve 'good' status or potential by 2027 at the latest. The current (baseline) status (e.g. 2015 classification), and the measures required to achieve the 2027 status objective, are set out for each water body in the relevant River Basin Management Plans (RBMPs), prepared by the Environment Agency and Natural Resources Wales (NRW) every six years. The current RBMPs (known as the 'Cycle 2 plans') were published in October 2022.

12.4.2 Through undertaking a WFD assessment, we demonstrate that DWMP will not cause a deterioration in respect of these baseline conditions particularly in relation to the river flows or water quality. Furthermore, for those water bodies that are not currently attaining good status, the actions set out in DWMP will not preclude the delivery of measures to facilitate the improvements needed to attain good status and will contribute to improving WFD status.

12.4.3 As a result, we have completed a separate WFD Assessment of the DWMP to provide the evidence base for to respond to the WFD requirements. The assessments' findings will be used as appropriate in the completion of the SEA, notably when considering the effects on the SEA topic of water.

12.4.4 The outputs from the WFD Assessment can be found in the DWMP Water Framework Directive (WFD) Assessment Report (C006).

13. Concluding summary

Key Points

- **UUW has taken a robust approach to the development of the DWMP.**
- **The plan set out in this document would enable significant performance improvements to achieve the DWMP planning objectives.**
- **An adaptive approach is, therefore, critical to delivering long-term resilience to drainage and wastewater services in the North West.**

In summary the DWMP, and AMP8 WINEP, seek to deliver the following key benefits, despite the significant adverse pressure from climate change:

AMP8 WINEP 2025-2030

- **29,000 spills/annum reduction through AMP8 overflow programme to achieve 2030 SODRP trajectory;**
- **7,987 hectares of SSSIs improved;**
- **412 kilometres of rivers improved; and**
- **Reduced impacts on 27 shellfish waters and 30 bathing waters.**

DWMP 2025-2050

- **Full achievement of SODRP targets and trajectory;**
- **62% improvement reduction in internal flooding;**
- **28% reduction in external flooding;**
- **57% reduction in pollution incidents; and**
- **36% reduction in sewer collapses.**

13.1 Process

13.1.1 We believe our DWMP is of high quality and meets the requirements of the DWMP planning process. As a consequence of the rigor that has been applied to our DWMP programme, we are confident that:

- We have taken all reasonable steps to deliver against the requirements most recently defined by Defra, Ofwat and the Environment Agency (February 2022);
- We have demonstrated throughout the development of the DWMP, that effective programme management is in place and that we are working to develop a robust planning process to satisfy expectations for strategic planning frameworks at Price Review 2024;
- The DWMP is informed by customer research and underpinned by robust optioneering and estimation to ensure it represents a best value plan for customers and the environment.

13.1.2 The company has reviewed risks and issues that it considers material to the DWMP programme and its delivery through the strategic planning frameworks. In this regard, UUW draws attention to the following uncertainties and issues, which in our view will be particularly material:

- WINEP alignment;
- Delivery of the needs set out in the DWMP is dependent on separate future Price Reviews processes, requires partnership working into the future and future drainage regulation reform is needed;

- We have developed a partnership opportunity pipeline though the DWMP, but the opportunity, nature, availability and funding for partnership solutions remain a considerable uncertainty in terms of the long-term part of drainage and wastewater planning; and
- Similarly, the nature, timing and impact of drainage regulation reforms will be critical to sewerage infrastructure performance and the cost and deliverability of improvements.

13.2 Planning objectives

13.2.1 The proposed investment aims to meet our short-term (2030) planning objectives for flooding and sewer collapse, and goes a significant way towards our short-term pollution objectives and long-term internal flooding objective. Our long-term pollution planning objective is more challenging from optimised cost beneficial interventions alone, with further progress anticipated through the synergy and residual benefits of our significant storm overflows investment of £18.1bn (totex) over 25 years. The same is also true for our long-term external flooding and sewer collapse planning objectives, with the expectation that this synergy of benefits across investment programmes will, through rainwater management and reduced surface water volume landing in our asset base result in further improvements in performance. The quantification of this potential synergy benefit will be assessed through AMP8 and beyond and will inform future Price Reviews and DWMP's.

13.2.2 The planning objectives are impacted by both hydraulic risk and by 'other causes' of capacity constraints, including sewer misuse, blockages and collapses. We consider that there are good reasons to expect that innovation, legislative changes and future improvements in forecasting could also help progress towards planning objectives by 2050.

13.2.3 For wastewater treatment compliance into the future, the plan has identified significant potential expenditure for a small number of wastewater treatment works likely to be impacted by growth and therefore future permit changes. The expenditure profiled is based on best assessments of likely regulatory requirements and growth.

13.3 The future

13.3.1 Future changes will be required to fully deliver some planning objectives and wider benefits all parties are seeking. These changes are a mix of actions within reasonable management control, such as innovation and future efficiency, and more external actions that we can only influence, such as partnerships, regulatory reform and behaviours that impact performance. These additional actions will be required for some of planning objectives and outcomes, depending on how modelled risks and pressures materialise. Additionally, currently unknown obligations could arise in future and some local instances of technical infeasibility could arise later in the 25-year planning period when generic requirements can't be implemented in some specific local circumstances.

13.3.2 The plan outlined within the DWMP enables activities that protect the environment, support economic growth through providing infrastructure for local development and address the pressures posed by climate change, population growth and development in the North West.

13.3.3 The DWMP is not a static programme, so as part of the DWMP planning process moving forwards, we will use the foundation that we have built during cycle 1 of the DWMP to identify areas for enhancement and further development in conjunction with any new frameworks and guidance. Reviews will be conducted to understand any material changes and how factors may have changed over time such as:

- New planning applications, growth forecasts, progress towards delivery of interventions and planned outcomes;
- Whether the future risks identified are occurring earlier than previously assessed, and any changes to programmes of work which could affect stakeholders; and

- Further work to improve / facilitate partnership working, such as greater standardisation of data to allow more integrated planning.

13.3.4 The DWMP is embedded into our planning processes to ensure consistency and alignment with planning for both the short term and long term, and to adapt to changes in customer priorities and needs. This approach will allow us to continually review identified risks, when they may materialise (at a faster or slower rate than expected) and the proposed mitigation and interventions. Continued stakeholder engagement will be crucial to inform of any changes to on-going programmes of work and the identification of any new risks or opportunities relevant to specific areas of the North West.

13.3.5 In conclusion, UUW believes our DWMP is of high quality and has met all the guidance requirements – we have tested this through internal, external and Board assurance. The combination of new environmental ambitions and the first iteration of DWMP is a unique opportunity to deliver catchment level drainage performance that enhances the nature and communities of the North West – now and for the long term. The collective DWMP investments will help build a stronger, greener and healthier North West.

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Water for the North West