United Utilities Water

DRAFT Drainage and Wastewater Management Plan 2023

Main Document

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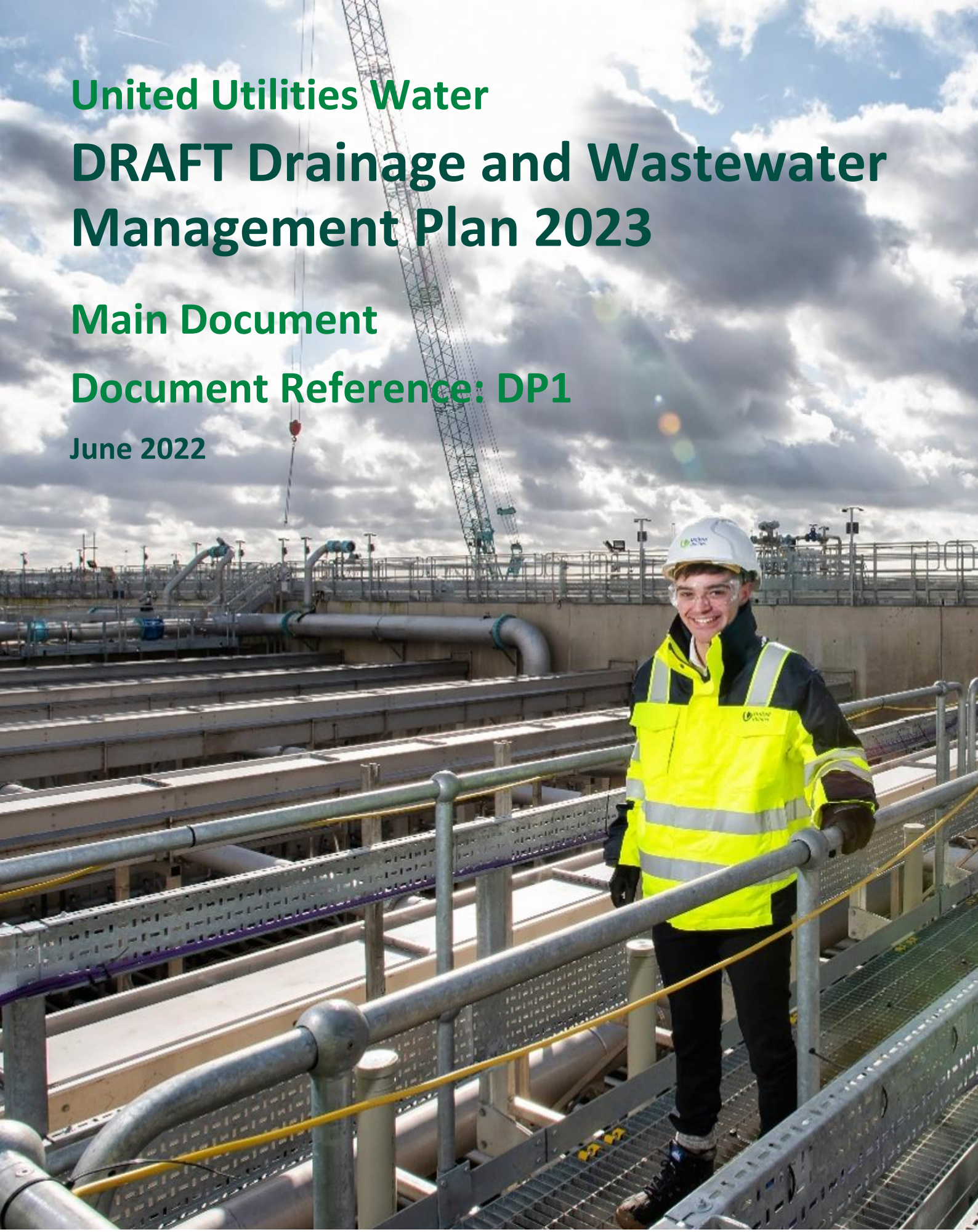


United Utilities

Water for the North West

Executive Summary

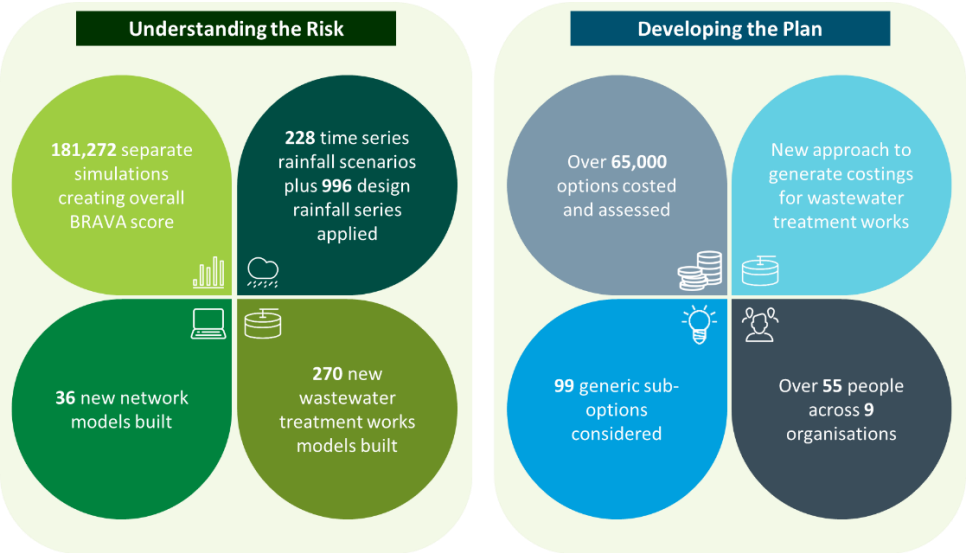
- **The Drainage and Wastewater Management Plan (DWMP) is a long-term plan, which sets out how United Utilities Water (UUW) proposes to ensure robust and resilient drainage and wastewater services for the North West.**
- **UUW has engaged with stakeholders and customers to develop a best value plan, which delivers a step change in performance against the backdrop of climate change.**
- **This draft proposes just over £3.5 billion of investment from 2025–2050 to meet three key planning objectives and likely statutory requirements, with a provisional view that a potential further £18 billion may be needed to meet the Government's Storm Overflow Discharge Reduction Plan requirements, based on our understanding of them as they are currently set out in the consultation.**
- **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. A key example of this will be on publication of the final Government Storm Overflow Discharge Reduction Plan following consultation.**

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 draft 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 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 to 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 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



[1] A framework for the production of Drainage and Wastewater Management Plans (Atkins, 2018). Accessed at:

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 just over £3.5 billion of investment is required to ensure we can achieve the planning objectives set out in this plan from 2025–2050, with a provisional view that a potential further £18 billion may be needed to meet the Government's Storm Overflow Discharge Reduction Plan requirements, based on our understanding of them as they are currently set out in the consultation. The overarching planning objectives are outlined in Figure 2.

Figure 2 The overarching planning objectives of the DWMP for 2025–2050

This plan reflects our commitment to innovation by considering the benefits that new approaches and technologies could deliver. For example, we are proposing over £300 million of investment in green infrastructure and other nature-based solutions. 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 the 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 Government requirements and other areas of considerable uncertainty. The most substantial of these is the Government's Storm Overflow Discharge Reduction Plan. This requires a significant step change in ambition and performance for storm overflows. We have considered some of these proposals in our plan, but further work will be required to optimise these improvements and balance customer affordability with environmental ambition and ensure best value for money.

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. This statement can be found in Board Assurance Statement (C0002).

The key points from our draft 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 ongoing 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 bets value and affordability. An adaptive approach is key to achieving long-term successes, be best placed to prepare for alternative futures, identify resilient phased improvements that are beneficial under all scenarios and where further innovation is needed around policy, regulation, behaviours, partnerships and technology.**
- **The preferred plan sets out just over £3.5 billion of investment over 25 years to ensure we can protect, restore and improve 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 planning objectives and meets certain regulatory requirements, which are not subject to cost benefit.**
- **Our provisional view is that a potential further £18 billion may be needed to meet the Government's Storm Overflow Discharge Reduction Plan requirements, based on our understanding of the requirements as they are currently set out in the consultation. These costs are set out separately for the draft DWMP.**
- **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 solution types.**
- **Customers have told us that the environment is important to them. Whilst 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.**
- **Whilst this draft plan was being developed there were delays to some key guidance – such as for overflows and elements of the Water Industry National Environment Programme (WINEP). In the development of the draft DWMP, and recognising some of the uncertainties, UUW considered a number of potential scenarios. However, the delays have inevitably led to a material degree of uncertainty about the inputs and requirements for the plan and, therefore, its conclusions. These uncertainties will be addressed between draft and final plans, where clarity is provided. There may need to be a considerable shift in the plan to meet performance expectations in some areas when regulatory requirements are confirmed, and indeed there may be more local environmental investigation required in order to establish needs when more details are clear.**

Consultation

We have published the draft DWMP for consultation and would like to understand your views. Given the uncertainties around some key drivers, there will be significant changes between draft and final plans, however, we believe there is still valuable feedback to be gained on direction and key points.

As well as inviting general feedback, we have a number of specific questions for consultation that we would welcome your feedback on to allow us to further develop our final DWMP which will be published in March 2023.

Consultation will be open from **Thursday 30th June – Thursday 22nd September 2022.** You can submit your feedback via our online form on the DWMP website.

Personal details

1. Are you responding as a:

(a) Regulator,

(b) Customer,

(c) Stakeholder,

(d) Other?

2. **Confidentiality question:** Would you like your response to be confidential?

2a. If yes, please state your reason

3. If a regulator or stakeholder: Name, organisation, email

Introduction

4. Do you feel that the planning objectives are the key drainage and wastewater priorities for the North West?

5. Which planning objective is your highest priority:

(a) We will collect, treat and recycle wastewater in compliance with our permit, now and in the future, to protect the environment,

(b) We will protect, restore and improve the natural environment of the North West through our actions,

(c) We will sustainably reduce the risk of sewer flooding in the North West?

6. What is your key long term priority that you think we should be addressing as part of the DWMP?

7. Any additional comments?

Overview of the DWMP

8. Which level of information is most relevant to you:

(a) Level 1 – Company,

(b) Level 2 - Strategic Planning Area (SPA),

(c) Level 3 - Tactical Planning Unit (TPU)?

9. What do you think needs to change in order to allow for greater partnership working?

10. Any additional comments?

Co-developing the DWMP

11. Do you agree that we should be consulting with stakeholders to develop the DWMP?

12. Do you agree that we should be consulting with customers to develop the DWMP?

13. If you have been engaged with during the DWMP, do you feel like your views and priorities have been heard?

14. Do you think that key priorities from other management plans are reflected?

14a. If no, why?

15. Do you think there are any gaps in the development of the DWMP?

16. Any additional comments?

Developing the plan

17. Do you think that we have adequately evaluated the impacts of climate change on drainage and wastewater services?

18. Do you think that we have considered the correct drivers for change?

19. Are there any other drivers for change/ scenarios which it would have been beneficial to consider?

20. Do you think that planning for 25 years (2025 to 2050) is sufficient?

21. Any additional comments?

Baseline position and future risk

22. The use of 0/1/2 scoring definitions applied to BRAVA is useful?

23. Are there any assessments other metrics which you think we should have assessed?

24. Any additional comments?

Deciding the future

25. Do you agree with the options hierarchy?

26. Do you feel that enough has been done to prioritise nature based solutions?

27. Do you have any suggestions for options to reduce demand and manage rainwater entering the sewer system?

28. Are there any other factors you think we should consider when assessing option benefits?

29. Do you think that using a six capitals approach was suitable for the best value assessment?

30. Which approach do you prefer:

(a) Best value,

(b) Lowest whole life cost?

31. Any additional comments?

Affordability

32. Do you agree there is a need to further engage with customers around their views on planned service improvements, implications for future bills, and impacts on water bill affordability?

32a. Please explain your answer?

Managing uncertainty

33. Do you think these are the key short and medium term uncertainties?

34. Do you think that adaptive planning is a way to manage the uncertainties?

35. Any additional comments?

Determining the preferred plan

36. Do you agree with the approach to the preferred plan based on the three components (legal obligations, performance improvements and future requirements)?

36a. If no, why?

37. Do you think that overflow improvements should be included in the preferred plan?

37a. If no, why?

38. Is there anything else you think we should have included within the preferred plan?

39. Any additional comments?

Summary of the preferred plan

40. Do you think that the preferred plan adequately address risk across the North West?

41. Do you agree that the success of the plan depends on partnership working, innovation and legislative change?

42. Do you agree with the preferred plan intervention types?

42a. If no, why?

43. Do you agree with the risk-based approach to permit compliance?

44. The preferred plan demonstrates the need for a step change in drainage capacity and capability through significant investment in surface water management. Do you agree that this is a reasonable intervention to focus investment?

45. Any additional comments?

Concluding summary

46. Overall, I believe that the draft DWMP is of high quality and meets the requirements of the DWMP planning process?

47. What did you like about the draft DWMP?

48. Having reviewed the draft DWMP are there any other specific areas that you consider should be a priority for improvement?

49. Are there any specific ways in which you prefer to be engaged or contacted as we develop the plan, including any ideas for collaboration that we could consider?

50. Any additional comments?

Environmental assessments

51. Do you think that the Environmental Report has correctly identified the likely significant effects of the draft DWMP?

51a. If not, what other significant effects do you think we have missed, and why?

52. Do you agree with the conclusions of the Environmental Report and the recommendations concerning the mitigation and enhancement of significant effects?

53. Do you agree with the proposed arrangements for monitoring the significant effects of the implementation of the DWMP?

53a. If not, what measures do you propose?

54. Any additional comments?

Acronyms

For a list of acronyms, refer to document C0003.

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1. 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 draft DWMP that it meets the expectations set out by Defra, the Environment Agency and Ofwat in February 2022.**

1.1 Background

1.1.1 UUW is one of the largest water and wastewater providers in the UK. Our purpose is to provide great water and more for the North West of England. From Crewe to Carlisle, we provide essential water and wastewater services to over seven million people every day. 'Providing great water' means delivering our core water, wastewater and customer services, reliably and to the highest quality. 'Providing more' means creating value for our stakeholders by understanding what matters to them through strong and constructive relationships. 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, whilst at the same time meeting regulatory requirements and wider environmental objectives.

1.1.2 This report, along with a number of additional, more detailed reports outlined in Appendix A, form our draft DWMP, which is being published in June 2022 for consultation. Consultation will take place over a 12 week period from 30 June 2022 to 22 September 2022. Following this period, we will update our plan taking into account the consultation responses received and new or clarified regulatory targets/guidance. We plan to publish our final DWMP in March 2023. As we consult on this draft we are already aware of potential changes to storm overflow policy and further guidance on the Water Industry National Environment Programme (WINEP), which will need to be incorporated, this is further discussed in Section 8.

1.1.3 The DWMP will be a key iterative tool in:

- building the long-term plan;
- working with others to deliver where partnership working is needed;
- 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.

1.2 Requirement for the Drainage and Wastewater Management Plan

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

1.2.2 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, to drive more partnership solutions, consistency and transparency.

1.2.3 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.

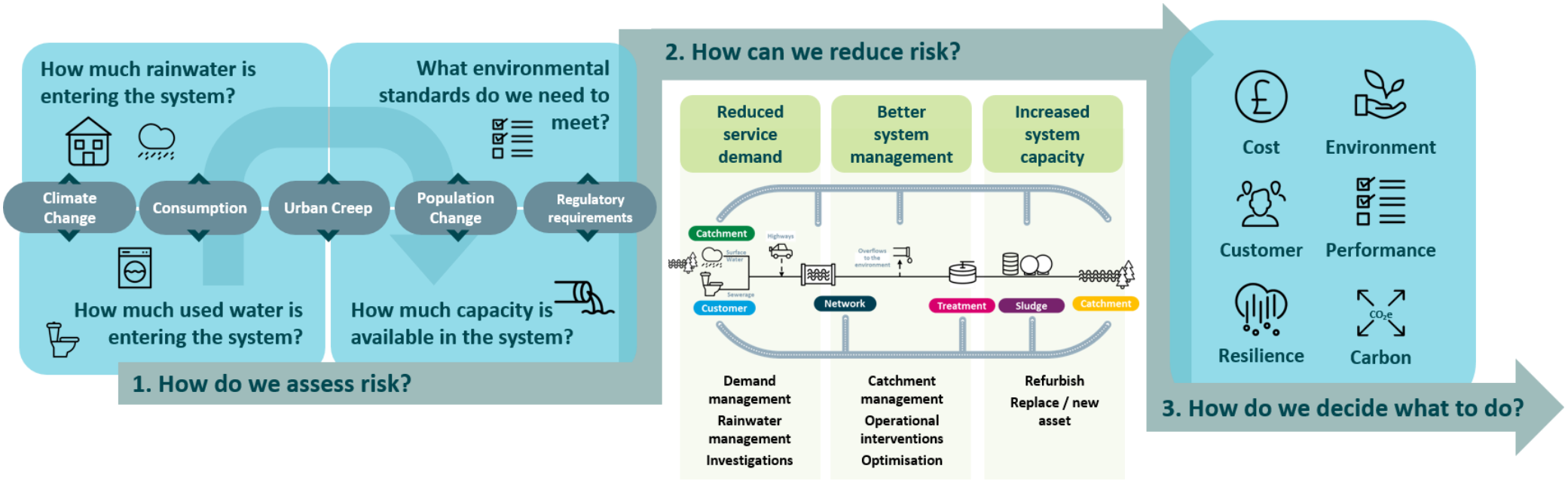
Within this first iteration of DWMP we have followed, throughout development, the guidance set out in the Water UK document *'A framework for the production of Drainage and Wastewater Management Plans'* published in September 2018. We look forward to continuing to build on this collaborative work across 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.

1.2.4 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".

1.3 Developing the plan

1.3.1 In order to develop our plan, we have produced forecasts of demand and capacity across the wastewater system, taking into account a range of factors 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, then UUW has assessed a range of options against a series of criteria and select 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 3.

Figure 3 Developing the DWMP



1.3.2 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 being prepared for the Price Review 2024 (PR24), for the investment cycle 2025–2030. The DWMP is a long-term view of risk and investment need, it is 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 final DWMP, will set out our detailed investment plan for the next five-year period. This will be considered in the context of the long-term risks, needs and uncertainties identified through the DWMP.

1.4 Long-term objectives

1.4.1 In developing the DWMP, we are testing future performance against a number of planning objectives. The planning objectives have been developed in consultation with customers and stakeholders as set out in Technical Appendix 2 – Stakeholder Engagement (TA2) and Technical Appendix 9 – Customer Engagement (TA9). 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. Beneath each of these sit a number of more specific metrics, which were used to quantify the planning objective (Figure 4).

1.4.2 The planning objectives underpin the DWMP process, outlining the services we assess risk against in the process and driving the selection of options to mitigate risk. In developing the planning objectives we strive to be ambitious and stretching.

Figure 4 DWMP Planning Objectives

1.5 Board assurance

1.5.1 To manage the development of the first iteration of the draft 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. The business governance and audit processes feed into and support final endorsement by the board.

1.5.2 Further details of our approach to governance, board assurance and audit processes can be found in Technical Appendix 1 – Assurance and Governance (TA1) and within the Board Assurance Statement (C0002).

Consultation questions

4. Do you feel that the planning objectives are the key drainage and wastewater priorities for the North West?

5. Which planning objective is your highest priority:

(a) We will collect, treat and recycle wastewater in compliance with our permit, now and in the future, to protect the environment,

(b) We will protect, restore and improve the natural environment of the North West through our actions,

(c) We will sustainably reduce the risk of sewer flooding in the North West?

6. What is your key long term priority that you think we should be addressing as part of the DWMP?

7. Any additional comments?

2. An overview of the Drainage and Wastewater Management Plan

- **The Drainage and Wastewater Management Plan (DWMP) is a plan for the end-to-end wastewater system across the UUW 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.**

2.1 Background

2.1.1 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. Over 50% of the sewers in the North West are combined (and a much higher percentage in some specific locations), a legacy of their Victorian construction, which creates significant challenges for managing rainwater in the North West.

2.1.2 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:

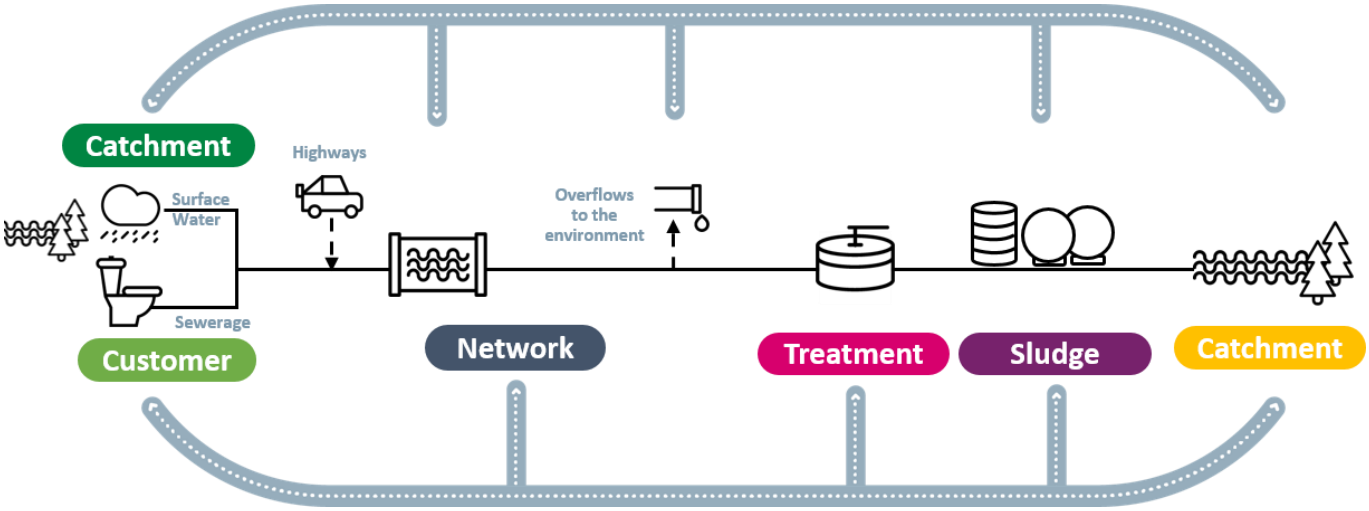
- set out our assessment of long-term challenges to drainage and wastewater, the key drivers underpinning this and the risks and uncertainties;
- provide a clear, transparent and consistent planning approach with sufficient adaptability to respond to future challenges;
- provide confidence to customers, 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.

2.1.3 The plan covers the end-to-end wastewater system (Figure 5):

- 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

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

Figure 5 An overview of the end-to end-wastewater system



2.2 Strategic Planning Areas (SPAs)

2.2.1 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 6).

Figure 6 Geographical scales applied for planning and collaboration within DWMP

Outlining the three geographical scales applied for planning and collaboration within DWMP.

2.2.2 **Level 1 North West**: at this level, the Customer Challenge Group (CCG) have 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.

2.2.3 **Level 2 Strategic Planning Area (SPA) (**Figure 7**):** UUW has set up 'Strategic Planning Groups' (SPGs) to facilitate collaboration on DWMP's with other risk management authorities (the Environment Agency, Lead Local Flood Authorities) and partners such as Natural England and the Catchment Based Approach (CaBA) catchment host. Our SPGs are described fully in TA2.

2.2.4 **Level 3 Tactical Planning Unit (TPU):** local level planning and data has underpinned engagement with SPGs. Engagement at this level has been supplemented by existing arrangements, such as CaBA Catchment Partnership Meetings, Local Planning Authority engagement and tactical and strategic flooding forums, led by the Lead Local Flood Authority (LLFA).

Figure 7 UUW SPAs

2.2.5 Accompanying documents are available for each SPA (SPA_01-SPA_14) which detail the background of the SPA, summarised in Table 1, the risk assessments undertaken and the preferred options.

Table 1 Summary of UUW SPAs

SPA Name	Number of TPUs	Population 2020/21	Approximate Area (Km^2)
Alt Crossens	12	377,887	382
Derwent NW	64	86,742	892
Douglas	15	608,304	472
Eden and Esk	95	174,668	2715
Irwell	14	1,069,969	616
Kent Leven	46	115,713	1120
Lune	33	168,095	1309
Mersey Estuary	20	1,886,744	783
Ribble	47	1,059,373	1478
South West Lakes	32	138,787	906
Upper Mersey	46	2,290,747	1182
Waver Wampool	13	13,410	375
Weaver Gowy	120	598,807	1753
Wyre	10	290,121	461

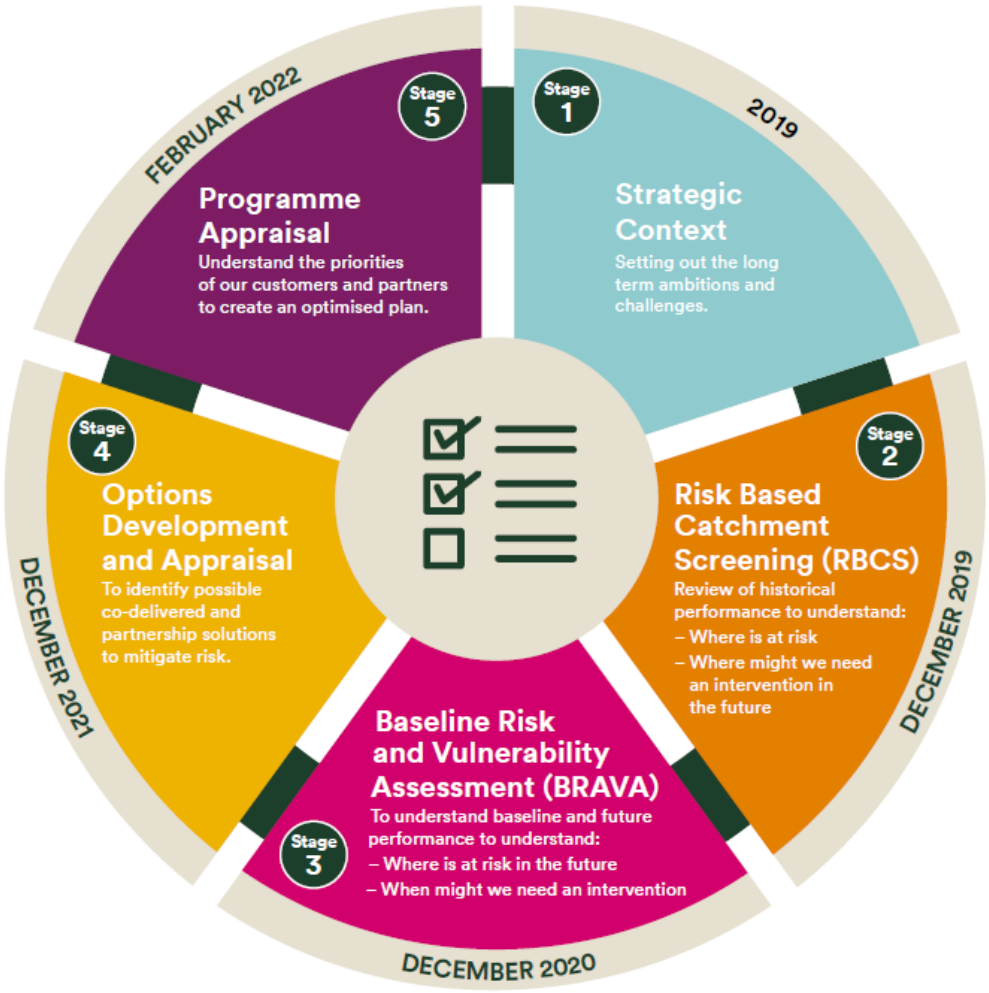
2.3 Approach to developing our DWMP

2.3.1 This section outlines the individual stages of the DWMP process, as outlined in Figure 8, and provides a brief descriptions of each stage. For each stage a detailed methodology is provided within the Technical Appendix documents.

2.3.2 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 described below and summarised in Figure 8. These phases of planning have allowed for a process of defining drivers and objectives followed by developing an understanding 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.

2.3.3 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.

Figure 8 Stages of the DWMP Process



Strategic Context: setting out the long-term ambitions and drivers for change to be considered in the development of the plan.

2.3.4 Strategic context is the first stage in the DWMP process.

2.3.5 The strategic context 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.

2.3.6 The planning objectives were developed through consultation with subject matter experts, considering key drivers for change and taking into account customer feedback from the business planning process for investment cycle 2020 - 2025. This ensured a clear line of sight between our DWMP planning objectives and wider business goals.

2.3.7 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. Details of how feedback influenced the final planning objectives is outlined in TA2.

2.3.8 Planning objectives have been reviewed in light of the Government's Storm Overflow Discharge Reduction plan consultation. We have developed options for a range of overflow scenarios, however, the significant consequences and timing of this new guidance will need to be incorporated fully between draft and final DWMP publication. An assessment of the potential impact of the proposed legislation has been set out in Section 9.4.

Risk Based Catchment Screening: screening used to determine which TPUs should progress to the next stage.

2.3.9 Risk Based Catchment Screening (RBCS) underpinned our approach to understanding risk and prioritising areas across the region. This stage of the process used historic data to prioritise TPUs, which required further investigation to understand how future pressures will impact on performance.

2.3.10 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.

2.3.11 Without undertaking a detailed risk assessment across our entire asset base, 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 Baseline Risk and Vulnerability Assessment (BRAVA) stage, focusing effort in areas where there is vulnerability in the system.

2.3.12 Our findings from this stage of the process show that the TPUs screened in equate to over 99% of the population served by UUW. Detailed methodologies for RBCS are described in Technical Appendix 4 – Risk Based Catchment Screening (TA4).

Baseline Risk and Vulnerability Assessment: assessments of current and future performance to identify where potential interventions may be needed.

2.3.13 The aim of the BRAVA was to understand how future changes might impact on our ability to achieve planning objectives and understand potential resilience risks.

2.3.14 Within BRAVA we ran a suite of assessments to establish current and future risk. These identified the level and locations of multiple different types of risk. Assessments were conducted on sewer flooding, combined sewer overflow spills, wastewater treatment performance and the impact on the receiving environment from these discharges. Further details can be found in Section 4.5 and in Technical Appendix 5 – Assessing Future Risk (TA5).

2.3.15 The results of these assessments were used to inform preliminary problem characterisation scores and identify locations where interventions may be required in order to ensure planning objectives can be achieved.

2.3.16 Additional horizon scanning assessments, looking at long-term strategic risks, were undertaken to supplement the understanding of each catchment, to enable a full assessment of potential risk to be undertaken.

Problem Characterisation: identifying a suitable approach to options development.

2.3.17 A final problem characterisation step identified the nature and likely complexity of the interventions required for each TPU. 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.

2.3.18 This was then used to determine the appropriate level of options development and appraisal required (standard, extended or complex).

Options development and appraisal: identification of possible options to address risks identified through BRAVA and selection of preferred options.

2.3.19 The options development process was designed to promote interventions to meet the needs identified through BRAVA. Options development and appraisal aimed to ensure that appropriate, plausible and innovative options were considered in the planning process to deliver robust and resilient drainage up to 2050 and beyond. Further details can be found in Technical Appendix 7 – Options Development and Appraisal (TA7).

2.3.20 The options development process followed an iterative approach, as outlined in Appendix D of the DWMP Framework, transitioning from an 'unconstrained' to a 'constrained' and finally a 'feasible' list of options. Following the definition of feasible options an appraisal process was undertaken to identify the preferred set of options to be incorporated within the plan.

2.3.21 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.

Programme Appraisal: considering affordability and performance to agree a regional plan.

2.3.22 To enable a full assessment of the plan regionally, a programme appraisal step was undertaken. During this stage, through eight strategic scenarios, millions of 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. 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.

2.3.23 Due to timing, programme appraisal was conducted prior to the consultation on overflows. With the continuing uncertainty around future legislation, an assumed outcome was used to optimise the plan. However, aware of the risk this would not be the final outcome a number of scenarios for overflows were considered when the issue was considered in isolation. Details of these scenarios can be found in Section 8.2.2. Following publication of the consultation on the Government's Storm Overflow Discharge Reduction Plan, an additional assessment has been conducted. Further details can be found in Sections 9.4 and 10.2.3.

2.3.24 Environmental assessments, including a Strategic Environmental Assessment (SEA), Habitats Regulations Assessment (HRA) and Water Framework Directive (WFD) Assessment were carried out on the preferred plan, to ensure no environmental harm. Environmental metrics were also incorporated into our screening processes. These assessments are detailed in Section 12.

Consultation questions

8. Which level of information is most relevant to you:

(a) Level 1 – Company,

(b) Level 2 - Strategic Planning Area (SPA),

(c) Level 3 - Tactical Planning Unit (TPU)?

9. What do you think needs to change in order to allow for greater partnership working?

10. Any additional comments?

3. Co-developing the DWMP

- **Engagement and collaboration with customers and stakeholders has helped UUW to develop and shape the draft DWMP.**
- **UUW cannot deliver significant change to drainage alone, engagement from other risk management authorities and legislative reform are both crucial to the achievement of long-term goals.**
- **Over 1,000 potential partnership opportunities have been identified through engagement with the SPGs.**
- **UUW has an excellent track record on developing partnerships, which it will continue to build on.**

3.1 Introduction

3.1.1 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.

3.2 Opportunities from collaborating in long-term planning

3.2.1 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.

3.2.2 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.

3.2.3 It is also the case that regulatory reform is required to enable planning objectives to be met. The key areas of regulation which, if reformed, would support the delivery of wider drainage objectives are outlined in Table 2.

Table 2 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.

3.2.4 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 TA7.

3.3 Customer engagement

3.3.1 Customers' priorities and needs are central to our decision making. Throughout the DWMP process we have been engaging with customers across the North West. This engagement has influenced how we identify and assess the priorities and risks; and how we prioritise opportunities that the plan will propose. Feedback on these key areas from customers allows us to ensure that wastewater services are able to adapt and be resilient to future risks, whilst meeting the performance expectations of customers, stakeholders and communities today.

3.3.2 We have gained endorsement from our customers through several different channels:

- through review of our approaches with YourVoice, our independent customer and stakeholder challenge group;

- through 'customer priorities' research to understand how customers prioritise the range of different services provided by UUW;
- through 'State of the Nation' research to understand customers' concerns, the impact of COVID-19 on customer behaviour and usage and more broadly understanding household finances, expectations of brands and the environment;
- through research on customers' engagement with DWMP outputs – testing the format customers would prefer to access the DWMP and the level of information they would find informative; and
- through joint research with the Water Resources Management Plan (WRMP) on option strategies, informing which option types should be prioritised and ultimately informing the DWMP hierarchy for selection options.

3.3.3 Our approach, as summarised in Table 3, has evidenced that we have collaborated with customers to understand customer priorities and needs. We have ensured this feedback is adequately reflected in the plan and informs our decision making. Further details on our approach to customer engagement can be found in Technical Appendix 9 – Customer Engagement (TA9).

Table 3 Customer Engagement Activities

Stage of DWMP Process	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.

Stage of DWMP Process	Customer Engagement Summary
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.
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 spills 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.

3.3.4 Use 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. This research was conducted against an ongoing background of uncertainty surrounding legislative and regulatory requirements for overflows, but provided us with a strong set of data points, which we have used to try and quantify the impact in view of the government's current consultation on reducing the impact of storm overflows.

3.4 Stakeholder engagement

3.4.1 Summary

3.4.1.1 The following section outlines the framework for stakeholder engagement undertaken by UUW throughout the process of developing the DWMP.

3.4.1.2 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.

3.4.1.3 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.

3.4.1.4 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.

3.4.1.5 The North West covers an extensive geography, which means there are a large and diverse group of stakeholders. A wide variety of stakeholders have been consulted with including Environment Agency, National Highways, local councils, the Rivers Trust, National Rail and Natural England. Feedback and endorsement has been provided on a variety of stages throughout the DWMP and is outlined fully within TA2. Figure 9 summarises the extent of the engagement UUW has undertaken.

Figure 9 Breadth of UUW stakeholder engagement

UUW has engaged with a wide variety of stakeholders in the development of this plan.

3.4.1.6 Assessing the future drainage and wastewater risks widens the opportunity to involve other more strategic partners in managing these risks. Through DWMP, UUW has engaged with Network Rail and National Highways and other large scale infrastructure providers in the North West to investigate funding mechanisms, risk management and partnership opportunities.

3.4.1.7 To help structure the delivery of engagement with stakeholders, a framework was established (Figure 10), aligned to the stages of developing the DWMP to focus on five key deliverables.

Figure 10 Five key phases of stakeholder engagement in the development of the draft DWMP

3.4.1.8 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.

3.4.2 Long-term ambitions

3.4.2.1 When developing our long-term planning objectives, stakeholders and partners were invited to workshops across three strategic areas; 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.

3.4.2.2 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.

3.4.2.3 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% and 70% of attendees, respectively. However, many considered that, as UUW already operate at, or near to, 100% 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[2]);
- 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 workshop.

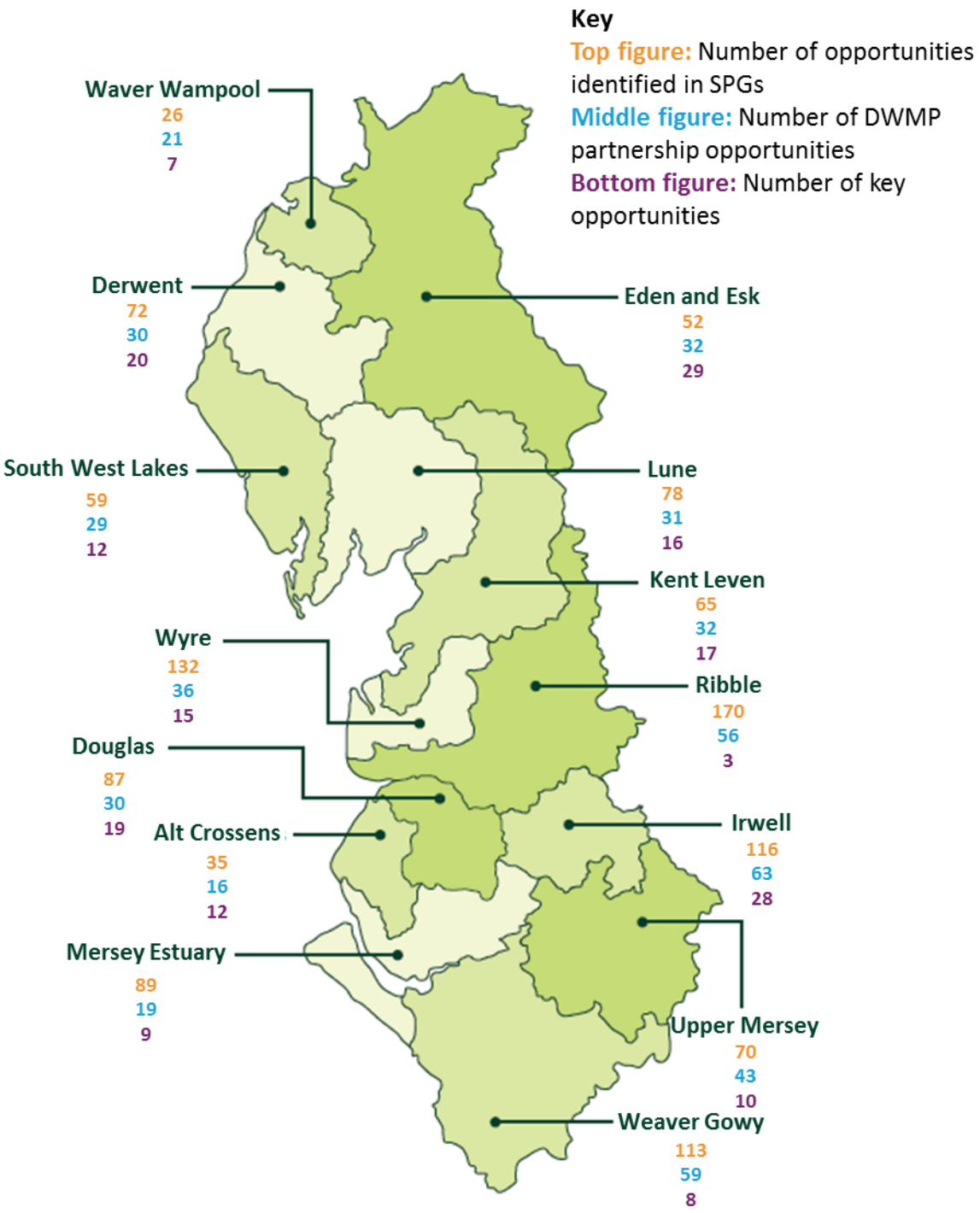
3.4.3 Identifying shared risk and opportunities

3.4.3.1 Along with potential options, the modelled BRAVA define the priority areas for DWMP options development. The ability to examine the changing risk from, 2020 to 2035 and to 2050 also provide partners with the ability to assess where their own risks are in comparison and identify where there may be the opportunity to work in partnership.

3.4.3.2 Between January and March 2021, workshops were held in each SPA to discuss the catchment, present the BRAVA results and document partner risks and shared opportunity to work collaboratively. The output from this engagement is termed the Partnership Opportunities Pipeline. A summary of the pipeline can be seen in Figure 11.

[2] This is currently as per the industry-wide Price Review 19 definition.

Figure 11 Partnership Opportunities Pipeline



Through engaging with the SPGs over 1,000 potential oportunities were identified. Following investigations this was narrowed down to approximately 500. Following final review, a number of these have been identified as key opportunities.

3.4.3.3 The SPG workshops in which BRAVA results were shared, allowed partners to identify a plethora of opportunities. UUW reviewed every opportunity to identify which were applicable to DWMP. Through these investigations the total number of opportunities was reduced from over 1,000 to approximately 500. This formed the initial partnership opportunities pipeline. A number of these needed further investigation and discussion.

3.4.4 Develop partnership opportunities for the plan

3.4.4.1 Following its creation, the partnership opportunity pipeline was reviewed in later workshops with the SPGs (September – December 2021) and refined following the discussions held. Additional benefits were sought, and where location data was available, the opportunities were mapped in GIS. This enabled the identification of key opportunities for further development.

3.5 Place based planning

3.5.1 As outlined in Section 3.3.4, strong and consistent partnership collaboration by all risk management authorities is critical for integrated drainage management. To drive this further, we are piloting place based planning in priority areas where there is significant potential to work more closely with stakeholders. Core stakeholders include the Environment Agency, local Councils, NGO's such as the Canal and River Trust, communities and other land owners, to deliver a more resilient future. Figure 12 summarises the key principles of place based planning.

Figure 12 Place based planning concept for integrated water and wastewater management

3.5.2 Climate change poses a risk to long-term resilience of public water and wastewater services. Customer research has been conducted, which found that the majority of customers see climate change as a high priority, and want to see us take a proactive approach to tackling it. We recognise that climate change and nature recovery can't be addressed in organisational silos, therefore, partnership working will support cost effective investment and planning within local areas. Place-based planning will help to diversify solutions to include a combination of traditional hard engineering approaches, nature-based solutions and behavioural change initiatives. Together, these will help to safeguard water bodies and build resilient catchments for future generations.

3.5.3 UUW is currently trialling place-based planning within the Eden and Esk, Wyre and Upper Mersey catchments. The Upper Mersey catchment is a large strategic catchment, which covers the sub-catchments of the Rivers Tame, Goyt, Etherow, Bollin, Mersey and their associated tributaries (Figure

13). The Upper Mersey has a significant population as it covers a large proportion of the Greater Manchester conurbation and surrounding areas of Cheshire and Derbyshire.

Figure 13 The Upper Mersey catchments with sub catchments Tame, Goyt, Etherow, Bollin and Mersey

3.5.4 The aim of the trial is to bring together all core stakeholders, which have an influence over planning, development and management of water within the catchment. This will provide an opportunity to listen and share the activities, initiatives, opportunities and challenges faced in managing the water environment. A shared vision for how the catchment should be managed can then be developed, which will inform future decision making.

3.5.5 The Upper Mersey catchment has been selected as a trial area based on resilience challenges identified through DWMP and WRMP assessments. We already have a history of partnership working in the Upper Mersey and have a strong track record of driving innovation with organisations including Natural Course, IGNITION, Moors for the Future and the Manchester Ship Canal partnership (more detail on these can be found in TA2. This will be strengthened by the recently established partnership with the Greater Manchester Combined Authority and the Environment Agency, focused on enhancing resilience and natural capital. Through enhancing natural capital, there will be further opportunity to implement schemes such as peatland restoration, which will help to improve raw water quality. This will help to

ensure raw water resources are treatable during dry weather conditions and improve flow attenuation in upland catchments.

3.5.6 Place-based planning will help to support the delivery of our Catchment Systems Thinking (CaST) approach to managing catchments in a holistic, integrated manner. By working with local authorities and planning agencies, we will be better equipped to manage water close to where it falls and tackle issues at source. Synergies will be explored between managing surface and rainfall better for wastewater systems and the potential for customer demand reduction.

3.6 Alignment with other strategic plans

3.6.1 Across our region, 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 14). 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.

3.6.2 We continue to assess national policies and statements published by regulators and changes, which drive performance across the sector. For our draft submission we have ensured that the main goals and objectives of Defra 25-Year Environment Plan and the Water Industry Strategic Environmental Requirements (WISER) are complimented 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 DMWP, where this is not the case, we will adapt our approach reflecting changing requirements in future iterations of the DWMP.

Figure 14 Strategic Management Plans that we have considered alignment across

Consultation questions

11. Do you agree that we should be consulting with stakeholders to develop the DWMP?

12. Do you agree that we should be consulting with customers to develop the DWMP?

13. If you have been engaged with during the DWMP, do you feel like your views and priorities have been heard?

14. Do you think that key priorities from other management plans are reflected?

14a. If no, why?

15. Do you think there are any gaps in the development of the DWMP?

16. Any additional comments?

4. Developing the plan

- **A number of drivers for change were identified through the development of strategic context. Key drivers for change include climate change and population change.**
- **In trying to understand future performance, assumptions need to be made about the extent of the changes.**
- **UUW have considered the impact of different scenarios through BRAVA where appropriate.**

4.1 Introduction

4.1.1 This section outlines the potential future changes and uncertainties, which have been considered within the DWMP risk assessments. It describes how the uncertainties were used to inform scenarios, which were in turn used to test a range of different futures within our BRAVA.

4.2 Drivers for change

4.2.1 Introduction

4.2.1.1 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. Trends take into account social, technological, environmental, economic and political/legal domains and consider change at global, national and local level.

4.2.1.2 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.

4.2.1.3 Understanding the drivers for change is a critical step in scenario development and testing uncertainties in long-term planning. Drivers for change are outlined under the categories of: environment and climate; customers, people and communities; infrastructure and technology; and markets and regulation.

4.2.2 Environment and climate

4.2.2.1 Under the category of environment and climate, a number of exogenous factors were identified, all of which have an impact on the future of wastewater. The key drivers in this category are:

- **Climate change –** changes in the climate have far-reaching impacts on the water industry, with longer drier summers and more intense rainfall events posing challenges for both water resources and drainage and wastewater management;
- **Rainwater management –** the combination of increased rainfall and additional impermeable surfaces, such as tarmacked roads and driveways, means more rainwater will end up in the combined sewer system. This consequently impacts on the capacity of those sewers. Action from multiple risk management authorities to reduce the amount of rainwater entering the sewer will be key to meeting flooding and overflow performance objectives;
- **Flood risk –** flood risk from rivers, the sea and surface water flooding is projected to increase due to climate change, this poses a risk to flooding of critical wastewater assets (in terms of inundation of sewers, hydraulic locking of outfalls and erosional damage to infrastructure);
- **Environmental legislation –** legislative change will continue to drive significant new investment needs in the water industry, but conversely drainage reform could drive significant benefits for drainage and flood risk management;

- **Integrated catchment management –** a continuing shift is anticipated towards more holistic management of water and wastewater catchments, this could deliver improved catchment resilience and consequently more resilient wastewater services. The resolution of long standing drainage problems, with multiple route causes and responsibilities, require catchment level system solutions and partnerships to resolve;
- **Land management** – the way in which we manage land in the UK is changing, and this impacts upon the catchments in which we operate. Better management of soils in upper catchments, for example, could provide flow attenuation in the uplands and improve downstream resilience during heavy rainfall events; and
- **Carbon emissions –** the UK's target to achieve net zero carbon emissions by 2050 and English Water companies target to achieve net zero emissions (scope 1 and 2) by 2030 bring to the forefront the importance of building in circular economy principles to minimise waste and promote resource efficiency.

4.2.3 Customers, People and Communities

4.2.3.1 Affordability and vulnerability are increasingly important issues for customers, this is particularly a challenge in the North West where there are four of the UK's ten most deprived neighbourhoods. The key drivers for change in this category are:

- **Economic climate –** affordability is influenced by the wider economic outlook at any point in time, driving further uncertainty in this area. Additionally, income inequality across the UK is increasing, widening the gap between the richest and the poorest;
- **Customer expectations –** expectations around the personalisation, convenience, speed and flexibility of the services we provide is increasing, this is a key area where UUW aim to keep ahead by utilising innovation and technology to deliver great customer experience;
- **Growing population –** the population served in the North West is expected to be over eight million by 2050, putting increased pressure on the capacity of the legacy sewer systems. There is opportunity to manage part of this growth sustainably through delivering sustainable drainage systems in housing developments and delivering low water footprint homes;
- **Collaboration –** resulting from the challenges outlined in environment and climate category, more partnerships and collaboration will be required to tackle these complex issues. Partnerships can deliver wider benefit and drive efficiencies, however, this comes with challenges around funding, planning cycles (timing alignment) and organisational priorities. Drainage reform is an opportunity to create the right incentives and rewards to better encourage partnership working; and
- **Community action –** positively, public awareness over the impact of climate change on drainage and wastewater services is increasing. This could support a change in behaviours in response, such as a reduction in blockages, reduced water use and an uptake in sustainable drainage systems in homes.

4.2.4 Infrastructure and technology

4.2.4.1 There are wide-ranging uncertainties and far reaching impacts associated with climate change, population growth and increasing service and environmental expectations. To manage all of these issues sustainably and affordably necessitates risk-based asset management incorporating technology and innovation to drive efficiencies and performance. The key drivers for change in this category are:

- **Ageing assets –** much of our legacy sewerage system dates back to the late nineteenth and early twentieth centuries and these assets are vulnerable to the increased load both from new development, but also from the increasingly frequent, high intensity storms seen in the North West of England;
- **Climate change –** the increasingly frequent, high intensity storms resulting from climate change put increasing stress on drainage and wastewater infrastructure. This puts significant strain on sewers in

the North West because a large proportion of the sewer systems are combined, where rainwater and foul water (from toilets etc.) are transported together in one shared sewer system; and

- **Innovation and technology –** the accelerated degradation of network asset performance cannot be outpaced purely by managing problems reactively, as they arise. UUW 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.

4.2.4.2 Whilst innovations and technological advances will improve efficiency and predict issues, we still anticipate that the step change in challenges will require a significant change in maintenance investment to continue the improving service trend and to build asset resilience in the longer term.

4.2.5 Market and regulation

4.2.5.1 Markets and regulation are key areas of uncertainty for the future of drainage and wastewater management. The key drivers for change in this category are:

- **Catchment system operation –** within integrated catchment management there is potential for a future role of a Catchment System Operator to deliver holistic catchment management, security of supply, losses and environmental impact operations;
- **Environmental markets –** the growth of environmental investment creates opportunities to invest in improvements in the natural environment and payment for the services provided by beneficiaries or blended finance. Such a market has been successfully implemented by UUW and partners in the Wyre catchment through a natural flood management investment readiness project (Figure 15); and
- **Six capitals –** UUW is transitioning towards valuations of six capitals: economic, social, financial, manufactured, human and natural capital. This is a focus area and we are working to embed the six capitals more comprehensively in decision making.

Figure 15 Wyre Investment Readiness project case study

Wyre Natural Capital Approach Delivering Partnership Investment

The Wyre Natural Flood Management (NFM) investment readiness project: **partnership working to deliver an ecosystem service-based market.**

It offers a very serious solution for investing in natural capital improvements in our landscape, at scale, with **multiple environmental benefits for nature, climate change mitigation and adaptation**, based on repayment for social impacts valued by wider society.

A simple transaction structure was developed where a **Special Purpose Vehicle will draw down external investment finance**, to fund the capital delivery. This will be repaid over a nine-year period through ecosystem service contracts with **buyers** (those who will benefit from the intervention) and **sellers** (farmers and landowners) who will host the NFM on the ground.

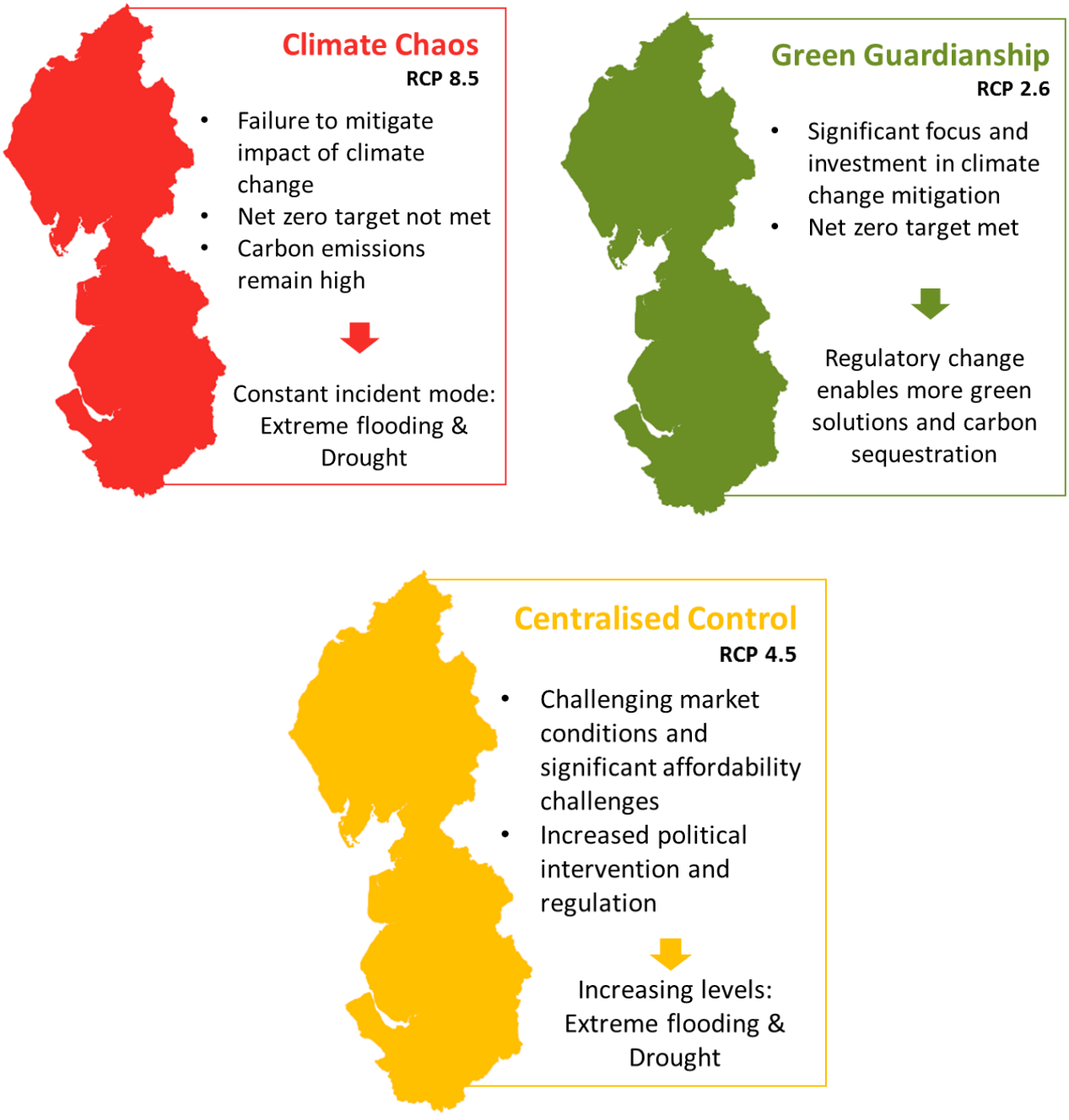
The project is one of the **first examples of an ecosystem service-based market**. The project was developed over 18 months from mid-2020 and is in its final, legal stages of development prior to drawing down **£1.5 million of external investment** in the environment**.**

4.3 Scenarios

4.3.1 Understanding the future drivers of change (outlined in Section 4.2) 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. 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 mean there are few detailed alternative projections with metrics that could be used for modelling.

4.3.2 The scenarios identified are Climate Chaos; Green Guardianship; and Centralised control, as outlined in Figure 16.

Figure 16 The three scenarios developed to support planning for uncertainty



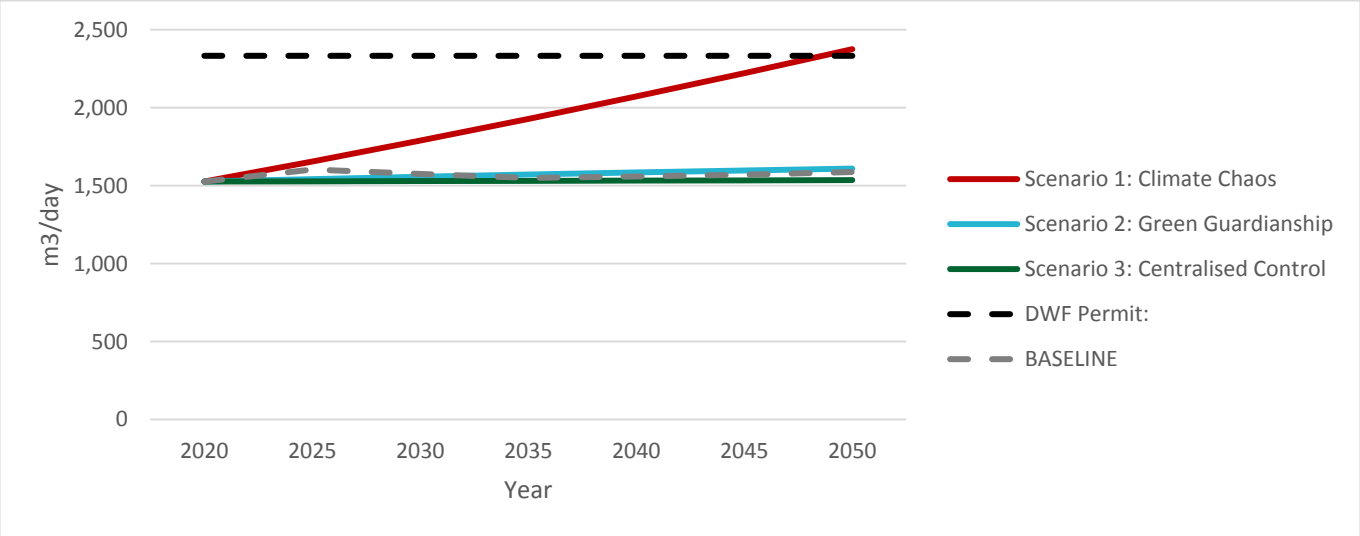
4.3.3 The scenarios worked within a 2050 design horizon and developed assumptions on population growth, consumption rates, infiltration and trade effluent applied to Dry Weather Flow (DWF), multiples of flow and no deterioration models. The assumptions are detailed in Table 4.

Table 4 Alternative assumptions used to forecast continuous flow in more complex drainage areas

Element of demand	Scenarios		
	Climate Chaos	**Green Guardianship**	**Centralised Control**
Per Capita Consumption	2020 rate + 35%	2020 rate - 15%	2020 rate - 4%
Population	Urban -3% Rural +7%	Urban +8% Rural +3%	Urban +10% Rural -1%
Trade Effluent	Average of 5 years	Maximum of 5 years	Minimum of 5 years
Surface water flows (current properties)	Baseline assumption +5%	Baseline assumption	Baseline assumption +5%
Surface water flows (new properties)	Central assumption +5%	Central assumption	Central assumption +5%

4.3.4 An example of how the three scenarios lead to variation in forecast flows is outlined in Figure 17.

Figure 17 Applying different assumptions to elements of demands to forecast future dry weather flow under three scenarios



4.4 Planning scenarios

4.4.1 Introduction

4.4.1.1 Forecasting future conditions is inherently uncertain, due to the many different possible combinations of the drivers for change outlined in Section 4.2. A central, most likely scenario has underpinned our BRAVA assessments 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. The criteria and associated assumptions included are described briefly in Table 5 and detailed in the remainder of Section 4.4.

Table 5 Criteria used within the central scenario for BRAVA

Criteria	Approach within 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% of the average value.
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.

4.4.2 Population growth

Residential population

4.4.2.1 In line with Environment Agency guidance and the WRMP guidance (published by Defra and the Environment Agency), a local housing plan trajectory forecast is used to represent residential population changes. This forecast was updated for the draft WRMP24, after the DWMP BRAVA had been published, consequently WRMP19 data has been used in DWMP. A review of the differences between WRMP19 forecast and WRMP24 forecast was completed and additional risk-based screening (based on population increase) applied to identify TPUs where changes in forecast indicated additional assessments were required.

4.4.2.2 Plan-based assumptions on housing growth (instead of ONS trend-based population) is expected to be more representative of growth as plan-based assumptions take into account known approved future developments in specific locations. In addition to this, more detailed assessments of local planning data and applications is completed for drainage areas to understand specific impacts. This approach is shared with all Local Planning Authorities.

4.4.2.3 Limitations of this methodology are that the assumptions on location, timing and extent of new properties can change over time.

Non-residential population

4.4.2.4 Trade effluent forecasts (by trade/industry type) are used to understand likely regional trends but are not reliable on a local scale due to individual trader characteristics. Historic trade discharge values are used, and this is verified internally 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.

4.4.2.5 Likewise, non-household consumption (business premises with a discharge that does not require a trade permit) are assumed to be stable and, therefore, the volumes and composition are within the baseline assumption.

4.4.3 Urban Creep, Infiltration, Per Capita Consumption Changes

4.4.3.1 More specific information on these elements and how they are used throughout the DWMP is included in Technical Appendix 3 – Demand Forecasting (TA3).

4.4.3.2 In 2019, UUW commissioned a piece of work to investigate best practice within the UK water industry of the calculation and application of urban creep to urban drainage models. The findings were that the methods detailed within the UKWIR Research document Impact of Urban Creep on Sewerage Systems, Allitt (2010), are the most widely used and are considered a sound evidence-based approach. This was in line with UUWs existing approach to the application of urban creep to its sewer models.

4.4.3.3 Infiltration is applied using standard assumptions for future developments (55 l/hd/day).

4.4.3.4 Per Capita Consumption (PCC) is applied in line with the most recent WRMP as 95% of the average value (2019 for BRAVA but updated with more recent figure for option development). This accounts for the PCC reductions anticipated in WRMP and the consequent impact on wastewater dry weather flow (DWF).

4.4.4 Climate change

4.4.4.1 Ten year time series rainfall simulation outputs are used to calculate annual overflow spill performance at the baseline 2020 scenario and then used to forecast future change in overflow spill 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.

4.4.4.2 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.

4.4.4.3 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 6. 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 6 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)

The increase in global mean surface temperature averaged over 2081–2100 compared to the preindustrial period (average between 1850–1900) for the representative concentration pathways (RCPs) (best estimate, 5–95% range) and the most similar SRES scenario in terms of global mean temperature.

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

4.4.5 Water quality

4.4.5.1 The planning scenarios and assumptions applied to our water quality assessments are outlined below. These have been divided into those assessments focused on continuous discharges (e.g. final effluent from wastewater treatment works) and those looking at intermittent discharges (e.g. discharges from storm overflows, which operate intermittently).

General assumptions

4.4.5.2 Where there are confirmed environmental drivers in the investment cycle 2020 – 2025 WINEP, it has been assumed these improvements will be delivered by 2025.

Continuous discharges

4.4.5.3 The no deterioration model identifies locations where the increase in wastewater treatment works discharge pollutant load could lead to tighter environmental permits. Locations identified as requiring environmental permit improvements that have not been included in the current planning cycle (2020 - 2025) have been identified through horizon scanning and highlighted for option development.

4.4.5.4 Existing water body status and discharges that impact on Sites of Special Scientific Interest (SSSIs) and Special Areas of Conservation (SACs) are highlighted through the horizon scanning process along with potential inland bathing waters. In the absence of completed bathing and shellfish water model data, spill frequencies have been assessed against current bathing and shellfish requirements.

Intermittent discharges

4.4.5.5 At the time of BRAVA, options development and programme optimisation expectations for storm overflows were not clear. Consequently, an assumption on spill frequency and volume thresholds that generate risk was applied for the planning scenarios.

4.4.6 Maintenance investment

4.4.6.1 Three different maintenance scenarios are simulated that each represent a different level of investment into the asset base over time. All three scenarios are assessed for the baseline year (2020) plus each of the 2030 and 2050 planning horizons within our asset deterioration model, named PIONEER. The investment strategies are;

(1) Fix On Fail – simulating a more reactive approach to maintenance than we would typically deploy in our normal business operation. This means that we would react to faults and failures across our system, rather than proactively intervene to ensure that assets are in a suitable condition to provide the expected service level.

(2) Stable Performance – For stable performance we look to simulate maintaining a broadly stable service, in line with our recent historical experience. This means that we select the most cost effective, proactive work to refurbish or replace those assets that present the largest predicted risk to service.

(3) Investment Cycle 2020 - 2025 Committed Spend – This scenario looks at the expected long-term impact of maintaining the current level of investment into the future. This scenario is often very similar to the stable performance scenario, but as it is financially constrained it will typically show some increase in service risk.

4.4.6.2 The 'Stable Performance' scenario helps us to identify; underlying trends in expected deterioration, future risk hotspots, overall investment needed, as well as relative levels of investment between different types of assets in order to provide a stable long-term service. Consequently, this scenario was selected to inform the BRAVA results and most closely aligns to the existing strategic ambition of UUW to manage and then stabilise asset health across our services by 2035; the end of investment cycle 2030 - 2035.

4.4.6.3 The two remaining scenarios are used for sensitivity analysis and to inform the optioneering and solution development stages of DWMP.

4.4.6.4 The 'Fix on Fail' scenario results in a gradual deterioration in predicted service levels as the asset base ages and becomes increasingly less reliable. This scenario provides a "worst case" planning approach to help us understand how quickly our assets, system and overall service levels could deteriorate without proactive investment.

4.4.6.5 The 'Investment Cycle 2020 - 2025 Committed Spend' scenario supports the identification of other work that could help to stabilise and even reduce the risk resulting from deteriorating asset health. This is often through changing operational processes and procedures or through more efficient use of new technology.

4.4.7 Common reference scenarios

4.4.7.1 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. 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. A summary of the common planning scenarios and how these have been incorporated into the DMWP is outlined in Figure 18.

Figure 18 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

Reference scenarios were published midway through the development of draft DWMP following completion of the BRAVA and options identification.

4.5 Using the planning scenarios within BRAVA

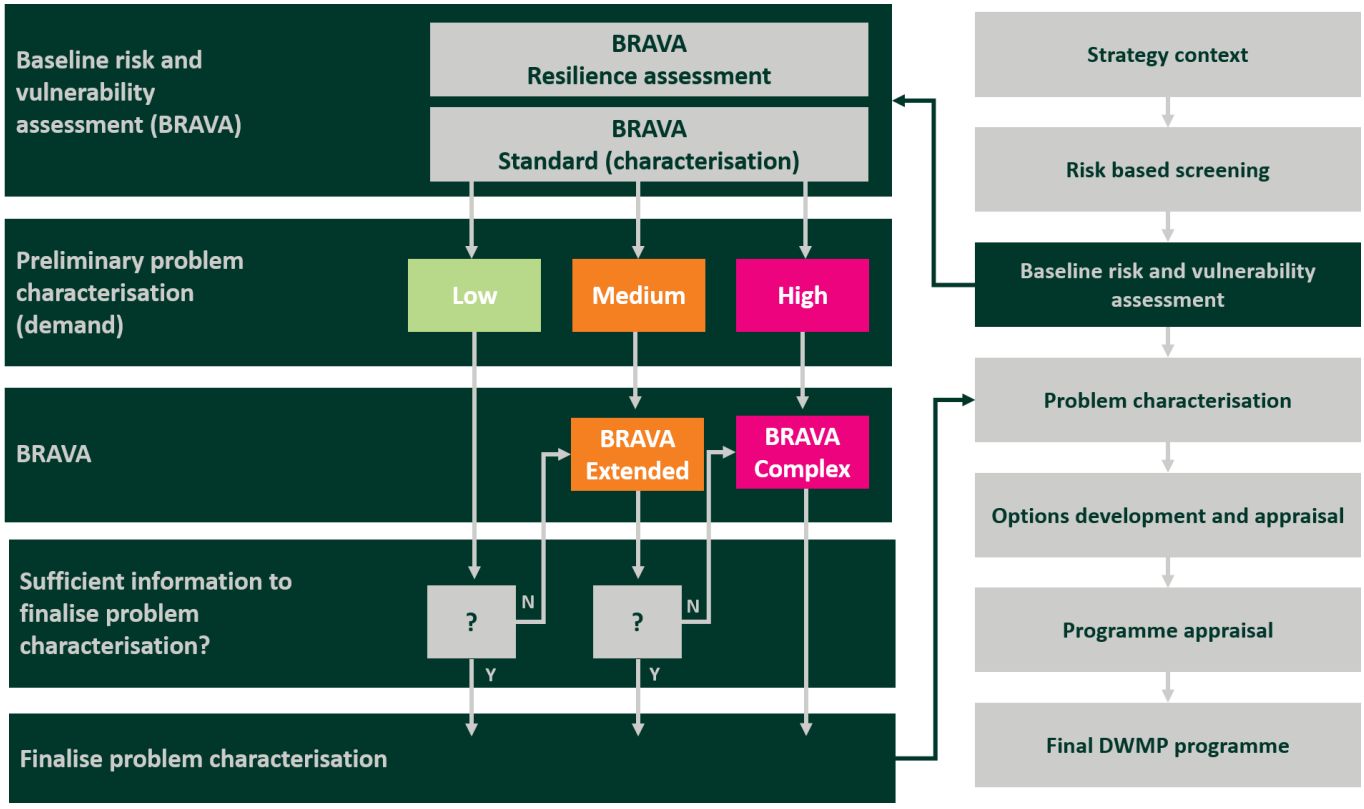
4.5.1 Introduction

4.5.1.1 This section describes how the planning scenarios outlined in Section 4.4 were used to test a number of future uncertainties in the BRAVA. The assessments are undertaken at a TPU level, representing a wastewater treatment works and the sewer network which drains to it. The assessments support our understanding of the primary reasons for failing to meet planning objectives in the future. The outputs from each assessment provide an indication of the likely severity of the forecast risk and when it is likely to occur (short, medium or long term).

4.5.1.2 Initially, a central, most likely scenario for demand is used within all of the BRAVA. This is termed a 'standard' BRAVA assessment. In addition to the standard assessment, if there is high uncertainty and high risk identified in a TPU, further BRAVA assessments using alternative scenarios can be undertaken. Where required, these are termed 'extended' and 'complex' BRAVA assessments and are detailed in Sections 4.5.4 and 4.5.5.

4.5.1.3 The process to determine whether further BRAVA assessments are required is termed 'preliminary problem characterisation'. This process is outlined in Figure 19.

Figure 19 Undertaking additional scenario testing within the BRAVA



Outlining the decision making approach to determine whether additional scneario testing is required within BRAVA.

4.5.2 Preliminary problem characterisation

4.5.2.1 Preliminary problem characterisation is a process used to understand whether a TPU requires additional BRAVA assessments to test alternative future scenarios. To determine the preliminary problem characterisation score the level of uncertainty relating to the growth forecasts for the area and the scale of the risks identified through 'standard' BRAVA are compared. The scale of risk is termed the 'strategic needs score'. This approach to determining additional assessment needs is summarised in Table 7.

Table 7 Preliminary problem characterisation guide (DWMP Framework, Appendix C Baseline risk and vulnerability assessment; and problem characterisation)

		Strategic needs score ("How big is the problem")			
		Negligible	Small	Medium	Large
		1-2	3-4	5-6	7-8
Growth (demand) forecast uncertainty	High				
	Medium				
	Low				

4.5.2.2 Growth forecast uncertainty is determined based on confidence in the growth forecasts, for example whether the local plan has been adopted or not.

4.5.2.3 The strategic needs score is calculated by combining two scores calculated during BRAVA:

(1) the supply assessment; and

(2) the demand assessment.

4.5.2.4 The detail of how the supply and demand assessments were carried out can be found in Technical Appendix 5 – Assessing Future Risk (TA5).

4.5.2.5 In summary:

- For all combinations of growth uncertainty and strategic needs a 'standard' assessment is undertaken (green in Table 7);
- Where the strategic needs score indicates a small medium or large problem and for all growth uncertainty scores, an additional 'extended' assessment is undertaken (amber in Table 7); and
- Where the strategic needs score indicates a medium or large scale risk, and growth uncertainty is high, an additional 'complex' assessment is undertaken (red in Table 7).

4.5.2.6 The detail of the scenarios used within each of the standard, extended and complex BRAVA are described in Sections 4.5.3, 4.5.4 and 4.5.5 below.

4.5.3 Standard BRAVA

4.5.3.1 The standard BRAVA assessment 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.

4.5.4 Extended BRAVA

4.5.4.1 For the extended BRAVA scenarios, 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.

4.5.5 Complex BRAVA

4.5.5.1 For the complex BRAVA scenarios, 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.

4.5.5.2 The application of standard, extended and complex scenarios in each of the models used during BRAVA is outlined below in Table 8.

Table 8 Scenarios tested for standard, extended and complex

BRAVA Scenario Complexity	Model type		
	Hydraulic model	Asset deterioration model (PIONEER)	Wastewater treatment model
Standard	Growth added as average uplift across the TPU.	Alternative scenarios to assess risk were completed as part of the standard BRAVAs (see Section 4.4.6 for details), the results compared for both extended and complex BRAVA locations are used to understand the potential variation in risk. The outcomes are described in Table 9.	Central growth estimate used.
Extended	Data from developer impact assessment studies was utilised and the specific planned significant development added to the model.		Applied +/- 30% population increase converted to flow for DWF, pass forward flow (PFF) and no deterioration assessments.
Complex	Results were generated by applying 2050 high emissions and 2080 design rainfall to the 2050 model.		Models used the assumptions from our 'climate chaos' scenario to reflect a more extreme future demand and where a local assessment of development had been provided, the associated population from that was applied.

Table 9 Complex and extend BRAVA results using non-hydraulic flooding model (PIONEER)

Assessment	Results
Collapse Results	Two Extended locations showed increased risk of collapse between the different scenarios, the increase in risk occurred earlier in the fix on fail scenario. No change in the collapse risk was identified for any complex locations.
Pollution Results	There was no change in risk categorisation for pollution for either extended or complex locations, this is due to all having being areas of focus in 2050 using standard BRAVA results.
Blockage Results	No difference in blockage risk categorisation for any extended TPU between the stable and investment cycle 2020 - 2025 scenarios, with the exception of one location. Three complex locations showed an increase level of blockage risk with the increase in risk earlier in the 'fix on fail' maintenance scenario.

4.5.5.3 Locations identified as requiring complex or extended bathing or shellfish water BRAVAs were not re-assessed as there is an ongoing investment cycle 2020 - 2025 Bathing Water investigation programme. The results of these investigations provide a more detailed view of the potential risk and inform investment needs for investment cycle 2025 - 2030.

Consultation questions

17. Do you think that we have adequately evaluated the impacts of climate change on drainage and wastewater services?

18. Do you think that we have considered the correct drivers for change?

19. Are there any other drivers for change/ scenarios which it would have been beneficial to consider?

20. Do you think that planning for 25 years (2025 to 2050) is sufficient?

21. Any additional comments?

5. Our baseline position and future risk

- **UUW has used models to understand the baseline (2020) risk for a range of key performance metrics aligned to the planning objectives. By taking into account of key drivers for change such as climate change and population growth in the modelling UUW has also been able to understand the potential future risks.**
- **The models outputs were used to identify where there was a risk of not achieving a planning objective to inform optioneering.**
- **Significant increases in risk for key metrics, such as internal flooding, are seen with the application of climate change.**

5.1 Introduction

5.1.1 This section outlines our forecasts of wastewater and drainage performance against the planning objective targets for the 25-year period to 2050. The baseline performance is assessed for the year 2020, forecast performance is assessed for the years 2030 and 2050.

5.1.2 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%. 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).

5.1.3 Climate change is not a risk we can delay action on. Between 2020 and 2030, if no mitigation action is taken, we anticipate an additional flood volume of 1.4million m^3 in a 1 in 20-year storm. This is approximately a 38% increase in wastewater flood volume. This figure reflects the amount of additional inputs to the sewer system as a result of the combined effects of climate change, population growth and urban creep.

5.1.4 A significant proportion of the additional forecast volume consists of rainwater; the sheer volume of rainwater draining into the sewer network puts stress on assets and is the primary cause of the increases in sewer flooding risk and increase in overflow operation. This additional forecast rainwater will not be effectively drained given the current capacity of our drainage networks and wastewater treatment works.

5.1.5 Through BRAVA, we have assessed future risk in 396 TPUs, which were identified during RBCS. These TPUs account for more than 99% of the total population served by UUW. We carried out an additional verification stage to verify risks with operational colleagues to determine which BRAVA assessments were appropriate.

5.2 Overview of BRAVA

5.2.1 Introduction

5.2.1.1. BRAVA allow us to model baseline and future performance, 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. By assessing the impact of current and future risk, we can understand the challenges that arise from uncertainties such as population growth and climate change. 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.

5.2.2 Assessments have been undertaken across key metrics aligned to the planning objectives (Figure 20) to inform where there is a forecast risk preventing us from achieving planning objective targets.

Figure 20 DWMP Planning Objective Targets

5.2.3 Interpreting BRAVA results

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

5.2.3.2. 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.
- N/A: No assessment required.

5.2.3.3. The BRAVA results are presented in sections aligned to the planning objectives (5.3, 5.4 and 5.5).

5.2.4 Uncertainty

5.2.4.1. There are a range of factors affecting the future demand for water and the changing patterns of demand. Over the last two 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. Whilst 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 sewer, and whilst 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.

5.3 Outputs: we will collect, treat and recycle wastewater in compliance with our permits, now and in the future, to protect the natural environment

5.3.1 Introduction

5.3.1.1 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.

5.3.1.2 A range of different models were used to quantify the risks for the different assessments (Table 10).

Table 10 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

5.3.2 Wastewater Quality Compliance

5.3.2.1 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.

5.3.2.2 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).

5.3.2.3 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 11 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

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

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

5.3.2.6 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 spilling 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.

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

5.3.2.8 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.

5.3.2.9 Results, summarised in Table 12, 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 12 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% 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% population increase) BRAVA results identified one additional TPU locations 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 six more TPUs at risk with a +30% population increase. 'Complex' BRAVA results showed greater risk for almost all TPU's 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.

5.3.3 Pollution

5.3.3.1 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.

5.3.3.2 Results for this assessment are shown in Table 13. Despite having good historic performance around pollution, by 2050 an ambition to eliminate pollution results in a significant shift of all TPUs having a risk score of two due to the ambitious planning objective.

Table 13 Pollution BRAVA results (number of TPUs)

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

5.4 Outputs: we will protect, restore and improve the natural environment of the North West through our actions

5.4.1 Introduction

5.4.1.1 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 14.

Table 14 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

[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.

5.4.1.2 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.

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

5.4.2 Storm overflow performance

5.4.2.1 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 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.

5.4.2.2 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 15.

5.4.2.3 Since this assessment was conducted in December 2020, there have been significant shifts in expectations around overflow performance. These changes are still uncertain, the changes are detailed and impact assessed in 9.4.

Table 15 Overflow BRAVA results (number of TPUs)

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

5.5 Outputs: we will sustainably reduce the risk of sewer flooding

5.5.1 Introduction

5.5.1.1 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 TA5.

5.5.1.2 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 16.

Table 16 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
Asset health model (PIONEER)	Yes	Yes	Yes	Not applicable	Yes

5.5.1.3 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.

5.5.1.4 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.

5.5.1.5 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. Whilst this change has focused attention towards more sustainable drainage, a step change is required across risk management authorities (RMA's), highways, planning and development to come together to mitigate the impacts of climate change. These recommendations are further expanded on in Section 6.

5.5.1.6 In financial year 2022, approximately 80% of internal sewer flooding incidents could be attributed to 'flooding other causes', this is a trend we see continuing, particularly when forecasting external flood risk. 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 and blockages in the sewer quickly. The implementation of these options is discussed further in Section 6.

5.5.2 Internal flooding

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

5.5.2.2 A summary of the results for this assessment can be seen in Table 17. 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 17 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

5.5.3 External (curtilage) flooding

5.5.3.1 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.

5.5.3.2 A summary of the results for this assessment can be seen in Table 18. 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 18 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

5.5.4 External (open space) flooding

5.5.4.1 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).

5.5.4.2 A summary of the results for this assessment can be seen in Table 19. 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 19 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

5.5.5 One in 50-year flooding risk

5.5.5.1 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 20. 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.

5.5.5.2 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 20 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

5.5.6 Risk of sewer collapse

5.5.6.1 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 21.

Table 21 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

Consultation questions

22. The use of 0/1/2 scoring definitions applied to BRAVA is useful?

23. Are there any assessments other metrics which you think we should have assessed?

24. Any additional comments?

6. Deciding on future options

- **UUW has developed an iterative screening process to develop options for this plan.**
- **A broad catalogue of generic options has been created from a range of sources.**
- **All generic options were considered for issues identified through BRAVA.**
- **In total over 65,000 were costed and had benefits assessed.**
- **A range of different approaches were considered prior to the selection of preferred options.**

6.1 Introduction

6.1.1 This section outlines the structured approach taken to identifying, developing and screening options in order to deliver a robust plan. The options development phase of the process looks to take the exceedances identified through BRAVA and develop appropriate options, which could be implemented to mitigate those risks over time. The options development covers the period 2025–2050 and ensures that shorter-term decisions are made within the context of long-term challenges and needs.

6.1.2 The DWMP Framework provides the following key principles relating to the assessment and development of options:

- the unconstrained options should cover a broad spectrum of options;
- constrained options should be derived by assessing the unconstrained options using screening criteria created through engagement with the SPGs;
- feasible options should be assessed against a range of more detailed screening criteria and based on more detailed information;
- a preferred option from the list of feasible options should be selected, based on cost and benefit assessments, for endorsement through engagement with SPGs;
- measures that can deliver multiple benefits (beyond the DWMP) purposes and address more than one driver or deliver more than one outcome should be considered; and
- the assessment of impacts and benefits should be aligned to the Strategic Environmental Assessments (SEA) process.

6.2 Identifying possible options

6.2.1 We have developed generic options, which comprise of a range of approaches to address exceedances through the management of demand on or capacity of the system. The approach to identify possible options is outlined in Figure 21 and further described below.

Figure 21 Identifying possible options for the DWMP

6.2.2 Our initial list of high level generic options was based on the cross-industry 'DWMP Options Task and Finish Group (TFG)' developed generic option list, derived from examples included in Appendix D of the DWMP Framework . The Options TFG generic options list was shared with the DWMP Industry Steering Group for endorsement.

6.2.3 In developing this list further we have considered our own options, such as Dynamic Network Management (DNM) (Figure 22), as well as those options from external providers (termed third-party options) through a process of market engagement. Additionally, a review was undertaken with the WRMP to identify shared opportunities and linked options.

6.2.4 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. An overview of how stakeholder engagement informed the development of partnership options is included in TA2 and TA7.

6.2.5 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.

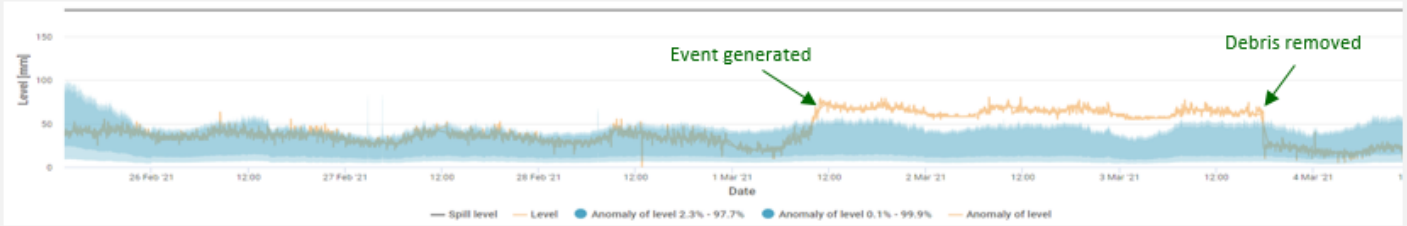
Figure 22 Case study of Dynamic Network Management (DNM), a keystone of our systems thinking approach. This will be a key option in our next business plan submission.

Dynamic Network Management

Dynamic Network Management (DNM) is an innovative monitoring approach which has been developed to make us 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 **10,000 sensors** have been installed across the drainage system.

Over **1600 operational issues** identified and addressed so far.

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

6.3 Options development and screening

6.3.1 Our approach to developing the feasible list of options is aligned with the DWMP framework (Figure 23). We have ensured the level of detail is proportionate to the level of risk identified through the BRAVA process and have confidence in the information used to define the inputs. The approach to options development and screening includes the steps outlined in Figure 23 and is described fully in TA7.

6.3.2 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 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.

6.3.3 Due to the interconnected nature of drainage and wastewater, options need to be considered holistically. Option blends have been created to resolve the planning objective exceedances identified in each TPU. An option blend comprises of a combination of different intervention types, which allow us to close the gap in performance identified through BRAVA. Drainage issues are by their nature interconnected but often there is not a fix all solution. Option blends have allowed us to utilise options which contribute to meeting multiple performance targets, even if the option cannot fully resolve the risk identified. The approach to using option blends supports systems thinking enabling the consideration of a holistic range of options as part of the solution – recognising a partial solution adds value when managing risk. This particularly supports the selection of nature-based solutions such as SuDS and operational improvements utilising innovative technology to drive performance benefits.

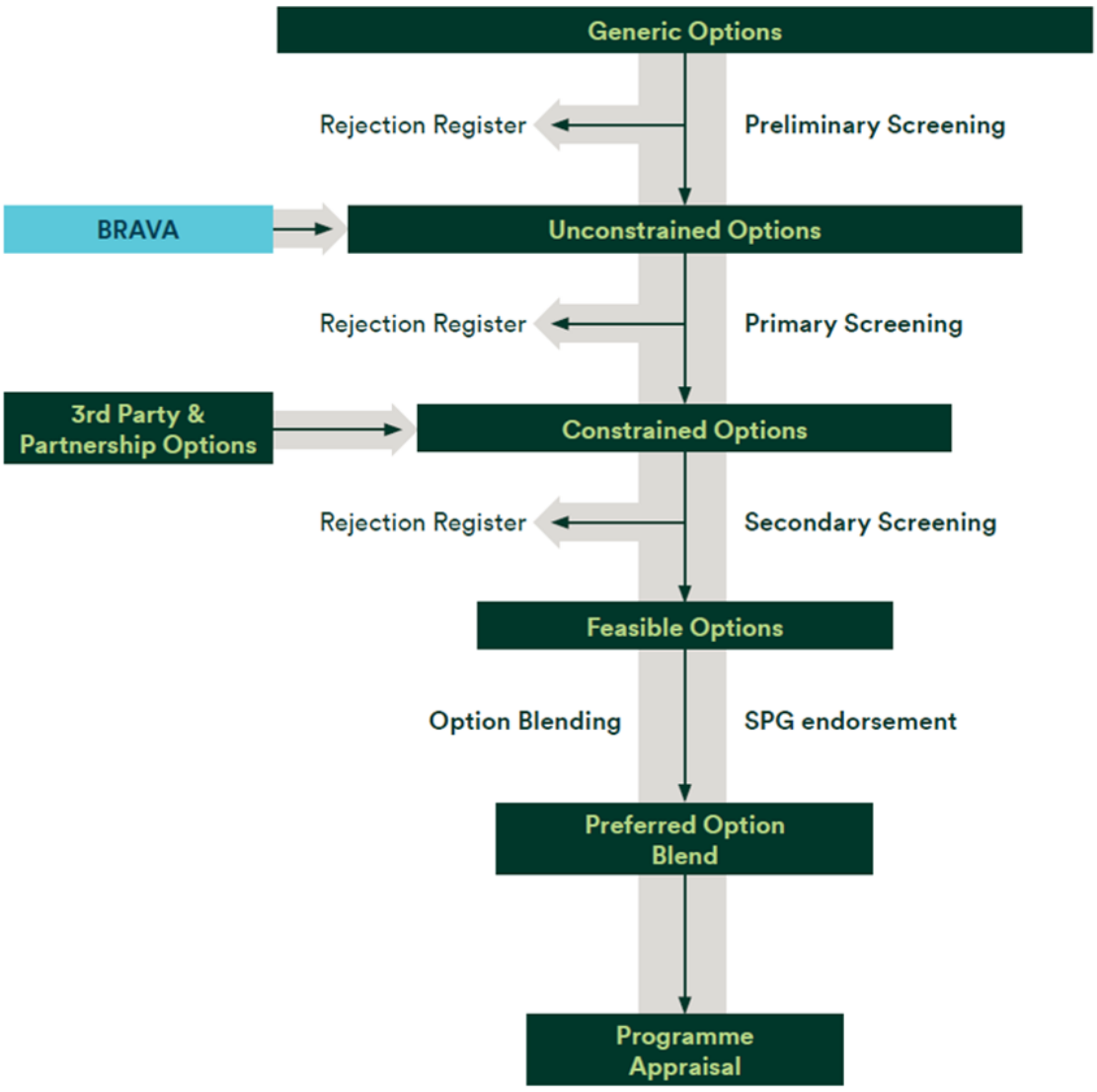
6.3.4 Using option blends allows for incremental improvements to achieve targets and encourages low regrets solutions to be prioritised, it forms a key building block of our adaptive planning approach for DWMP. It allows for an ongoing review of performance to be undertaken, aligned to the DWMP planning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

6.3.5 In order to quickly identify and eliminate solutions for specific tactical planning units (TPUs), geospatial analysis was used to identify potential appropriate solutions for individual areas. Through unconstrained options and primary screening, catchment characteristic data was used to build an understanding the catchment and high level data gathered to determine likely feasibility of options within a given TPU. For example, to identify opportunities for surface water disconnection areas of the network where surface water sewers connects directly into a foul or combined sewer were highlighted.

6.3.6 This information was reviewed during 'opportunity workshops' with operational colleagues to ground truth the desk study findings. The opportunity workshops were a pivotal point to agree option strategies relevant to each TPU. Consequently, constrained option development was focused on a smaller number of options and options which could contribute to meeting multiple planning objectives were identified.

6.3.7 Following primary screening, over 65,000 constrained options remained. In order to reduce this down to a set of feasible options a further screening stage (secondary screening) was required. During the secondary screening stage, we undertook further detailed assessment on the constrained options including the calculation of monetary and carbon costs for each option. In parallel, appraisal of a number of wider capitals metrics (described in Section 6.4.1) was carried out to develop a list of feasible options to take forward into our decision making analysis. This included an assessment of cost, carbon and six capitals for use in the decision making stage.

Figure 23 Options Development Process



6.3.8 In order to present stakeholders and customers with a choice of preferred options, two different approaches to developing option blends were developed:

(1) Prioritisation of options based on the options hierarchy, preferencing those which reduce demand and better manage the system over those which increase capacity (the options hierarchy is outlined in Figure 25).

(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.

6.3.9 All options (with the exception of must do activities) considered still need to meet an agreed cost benefit threshold (Figure 24). Options with a lower cost benefit score (between 0.5 and 0.75) are brought through to feasible options if their natural capital score is a net positive.

Figure 24 Cost benefit thresholds with a six capitals lens

6.3.10 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.

Figure 25 Options Hierarchy

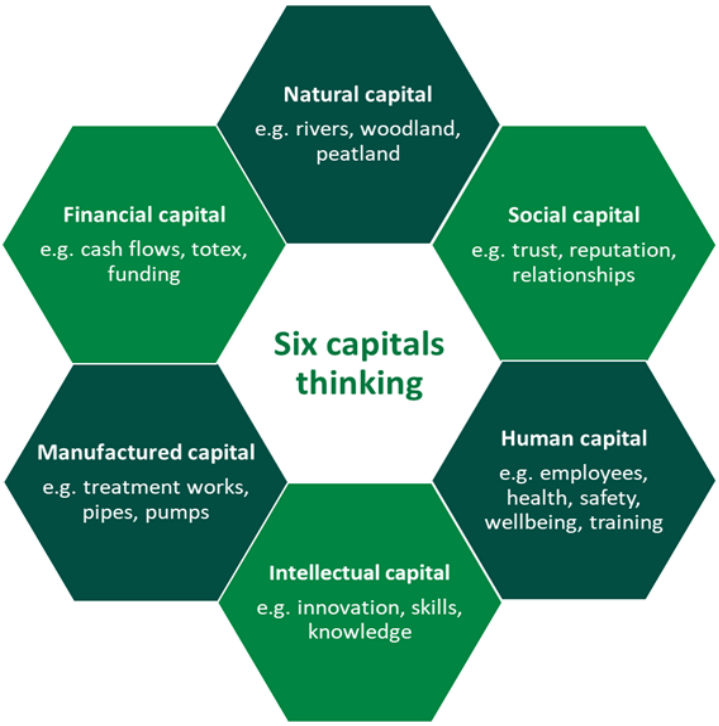
6.4 Decision making framework

6.4.1 Best Value Assessment

6.4.1.1 We are adopting a value-based decision making process, using a six capitals methodology. The six capitals methodology allows us to consider social, economic and environmental costs and benefits. We recognise that this isn't something that can be fully embedded quickly as the data and tools to support this will take time to mature, however, the development of the approach for our DWMP and the business plan for 2025–2030 is an important milestone on this journey. Six capitals is the approach that we feel will give us the most holistic view of value, in a way that will allow us to monetise and compare options/solutions (Figure 26).

6.4.1.2 Within DWMP 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. The outputs of options appraisal have evidenced that 'best value' and 'lowest whole life cost' are not often aligned. Consequently, further customer engagement is being undertaken to understand how customers value the wider benefits delivered by options. This will help to inform further evolution of the approach used for final DWMP23 and Price Review 2024.

Figure 26 The six capitals



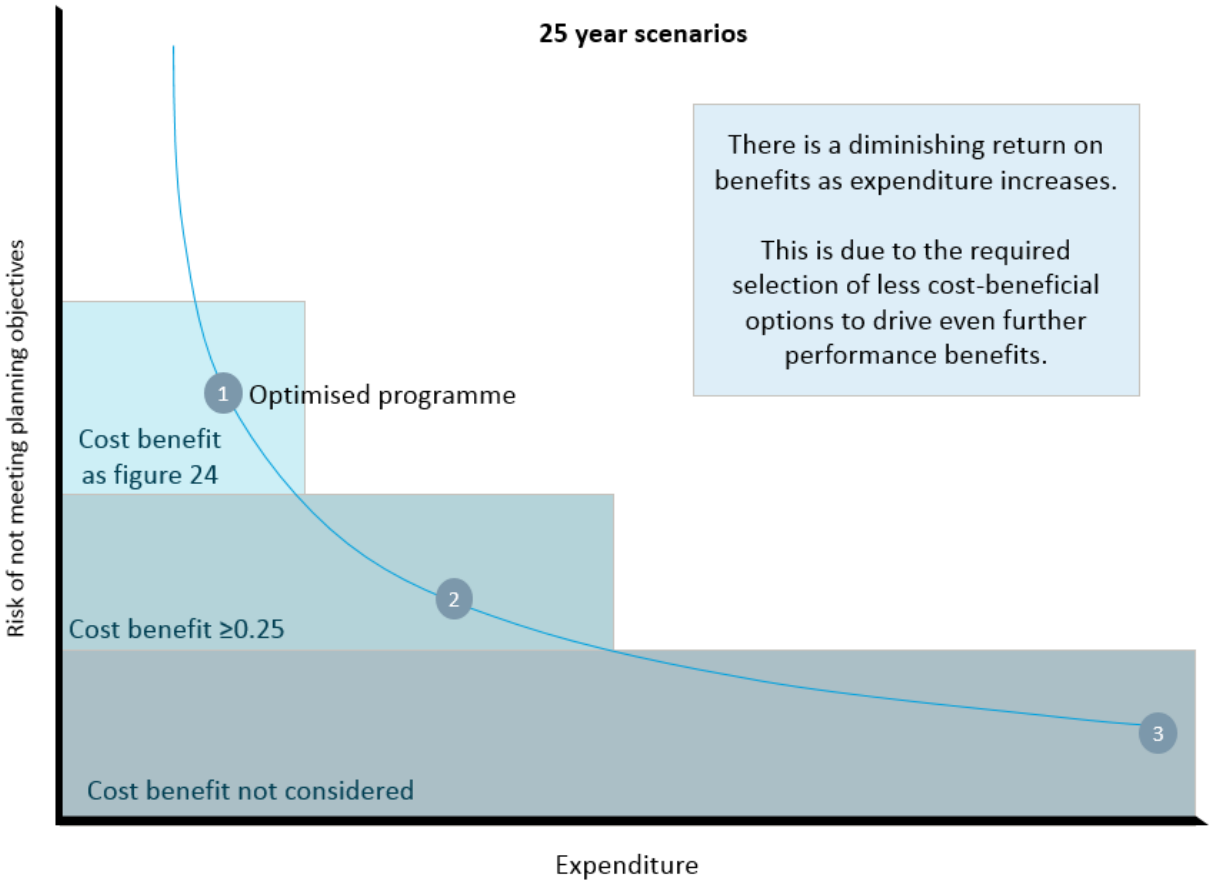
6.5 Scenario testing

6.5.1 In order to determine the base programme an innovative decision support tool was used to optimise the preferred options. The cost, benefit and six capital assessment data from options development was fed into the optimiser and a range of scenarios and constraints applied.

6.5.2 A range of scenarios were considered to reflect the current uncertainty around certain outcomes, particularly overflows and investment driven by WINEP, where it is unclear whether cost-benefit will apply. 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. Generally, there was an asymptotic trend with expenditure vs. risk reduction as shown in Figure 27.

Figure 27 Example of potential benefits relating to expenditure and risk of not meeting planning objectives



6.5.2.1 Key scenarios run that are discussed further in this document are:

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

6.5.2.2 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. However, there are some clear activities that appear in all scenarios and these are the 'low regrets' activities that will be the base of the investment for investment cycle 2025 – 2030 as summarised in Section 9.

6.5.3 Lowest whole life cost vs best value (for no regrets activities)

6.5.3.1 Scenario 1, the best value approach, follows the options hierarchy outlined in Figure 25. The options hierarchy was developed with customers and endorsed as a best value approach by the Your Voice Environmental and Social Capital Sub Group (ESCG). Within Scenario 1, options for the plan were selected and prioritised using this hierarchy.

6.5.3.2 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.

6.5.3.3 High level comparison of these two approaches (Table 22) 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 22 Best value vs. lowest whole life cost projected investment

Option hierarchy	Scenario 1: Best value		Scenario 2: Lowest WLC	
	Cost (£m)	Six Capital Score	Cost (£m)	Six Capital Score
Behavioural	81.2	16368	46.3	4719
Upstream Management	290.5	14158	277.9	13775
Catchment Management	15.6	174	15.8	168
Operational Interventions	151.0	2837	151.0	2937
Refurbishment	161.0	117	169.0	455
Replace/New asset (blue green)	17.4	1967	12.0	1940
Replace/New asset (conventional)	299.2	-7954	157.3	-3460
Total	**1016.0**	**27667**	**829.3**	**20434**

6.5.3.4 Table 23 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 programme investment.

Table 23 Best value vs. lowest whole life cost projected benefits

	Scenario 1: Best value (% reduction)	Scenario 2: Lowest WLC (% reduction)
Pollution	88	88
Internal flooding	68	68
External flooding	39	38
Open space flooding	56	32
Sewer collapses	72	76

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

6.6 Adaptive planning

6.6.1 Introduction

6.6.1.1 This section considers adaptive planning in ensuring a long-term affordable plan.

6.6.1.2 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 and this is an area we will build on between draft and final publication given the recent Ofwat guidance on Long-Term Delivery Strategies.

6.6.1.3 Within the DMWP, UUW has:

- considered ambitions over the next 25 years;
- developed potential future scenarios and applied these within risk forecasts; and
- built an options development process which enables a strategy to be developed, is flexible to cope with changes over time and optimises the timing of key interventions.

6.6.1.4 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, understanding of changes will be better understood and become more certain. With time, the understanding of the costs, benefits and timescales of delivered interventions will improve. It is, therefore, essential that the DWMP is iterative and continues to evolve through later planning plans. The DWMP is, therefore, a key tool in developing the 2025–30 and future business plan submissions.

6.6.1.5 UUW proposes a continuous review of performance and benefits realisation to allow for assessment of the impact of interventions as and when they are implemented but also the changing picture of risk within the region as growth and climate change occur.

6.6.1.6 Adaptive planning allows for an initial long-term plan or strategy to be amended over time as the picture of risk changes or interventions are realised.

6.6.2 Option blends

6.6.2.1 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. Figure 28 shows options blends combining in the best (least regrets order) to progress towards planning objectives, and the future enablers required to close any gaps. As risks materialise or understanding improves, additional options can be deployed to ensure targets are met. This figure sets out a principle of how to achieve a target in an area by deploying a number of strategies at appropriate review points. There are a number of areas which could affect long-term performance that have not been directly included in option blends, which could deliver further improvements to service. These future enablers 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.

6.6.2.2 This results in the ability to phase delivery, monitor changes and adapt the approach accordingly. The use of our option hierarchy also helps to identify core pathway activities like surface water management, which are least or no regrets in the most future scenarios.

6.6.2.3 We have optimised our plans to ensure that ‘no regrets’ interventions are delivered first as a core pathway. These are options that are at the top of the option hierarchy. By monitoring changing risk, it can then be identified whether 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.

6.6.2.4 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.

Figure 28 Option blend approach lends itself to adaptive planning

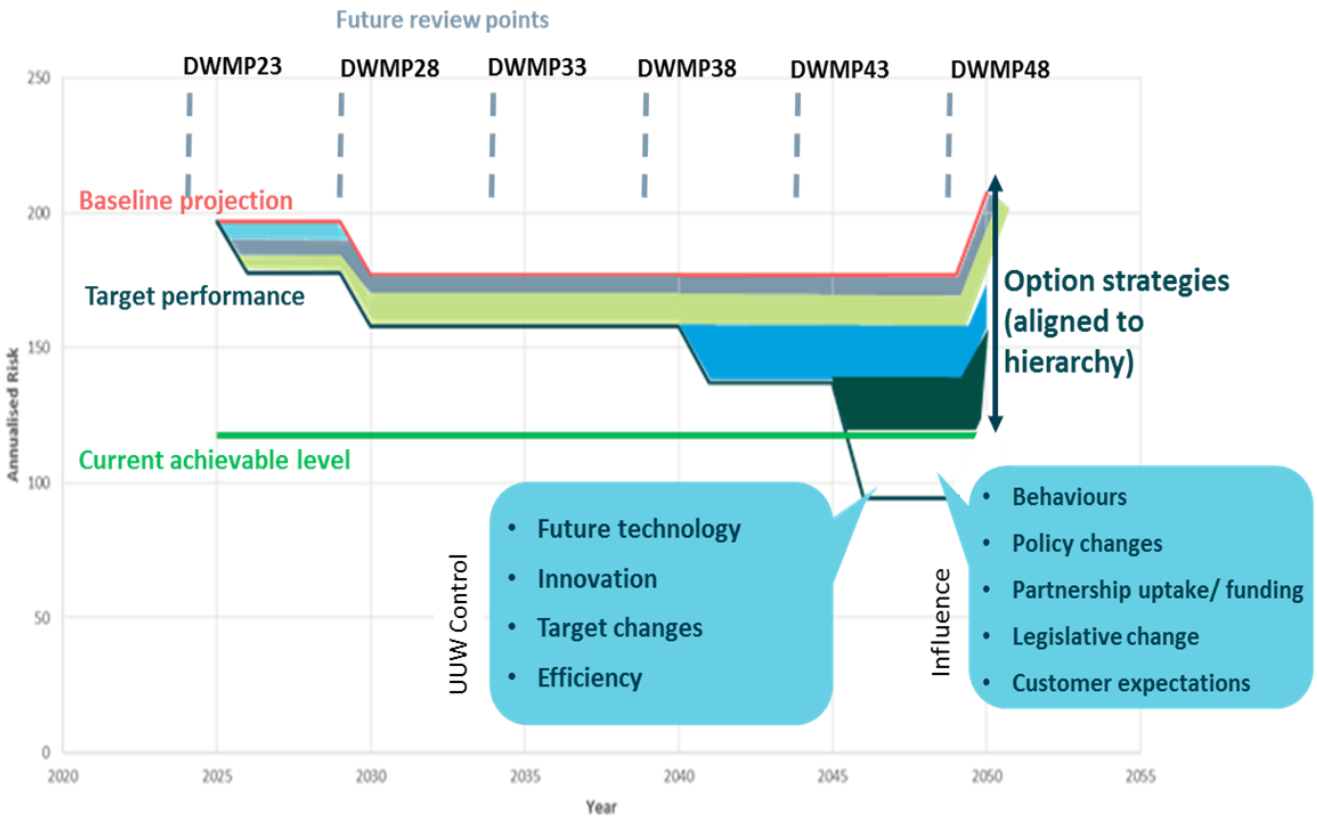


Figure 28 shows options blends combining in the best (least regrets order) to progress towards planning objectives, and the future enablers required to close any gaps.

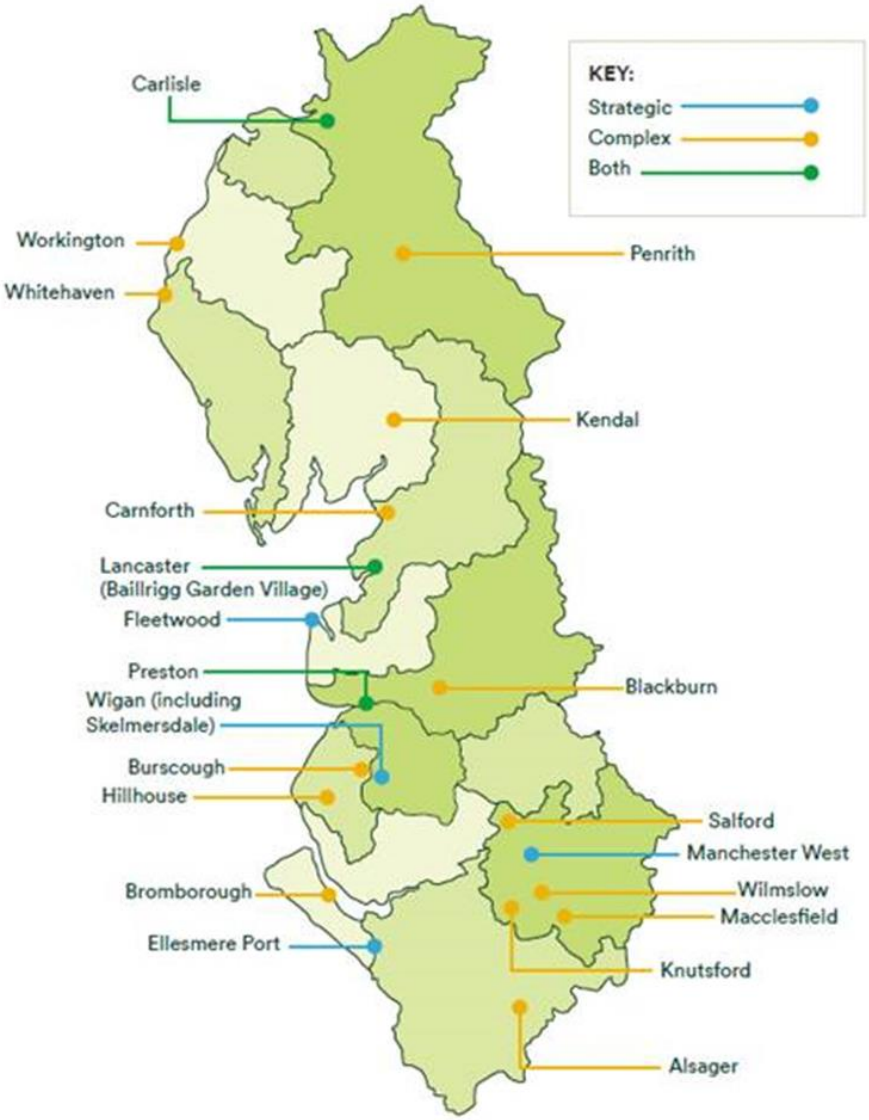
6.6.2.5 Adaptive planning allows for an ongoing review of performance to be undertaken, aligned to the DWMP planning cycles, to monitor the benefits realised through interventions and progression of external risks. This allows us to plan in an adaptive way, implementing 'low regrets' solutions now and 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 tactical planning units (TPUs).

6.6.3 Adapting to uncertainty within options

6.6.3.1 In order to consider the inherent uncertainty around performance delivered by identified options, an adaptive approach has been employed to identify potential pathways, transitioning from low regrets activities to gain clarity and certainty in need ahead of investing in any significant schemes. This approach has been embedded in TPUs identified for complex and strategic optioneering.

6.6.3.2 TPUs were identified as requiring complex optioneering through the problem characterisation process. TPUs were identified as requiring strategic optioneering through horizon scanning if a significant strategic decision point was identified (such as a large scale development in an area which is currently unsewered). TPUs identified for strategic and complex optionering are displayed in Figure 29.

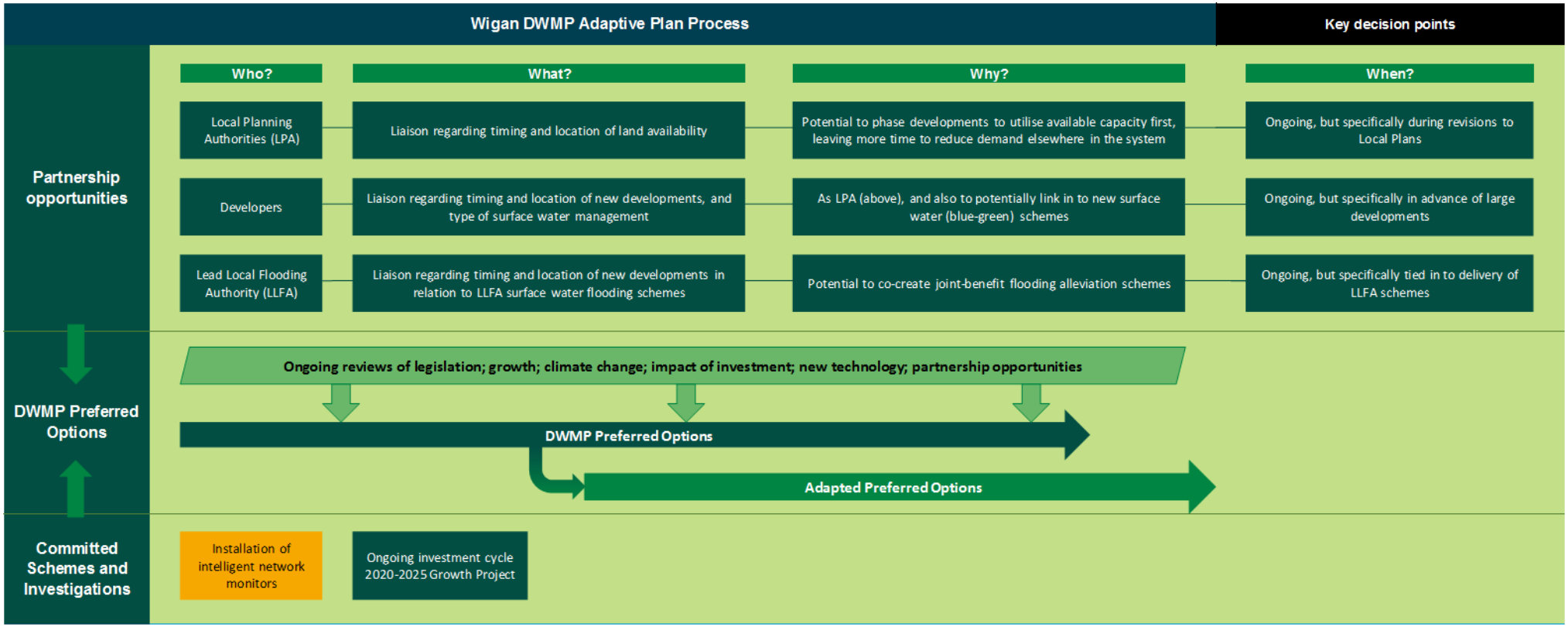
Figure 29 Areas identified through problem characterisation and horizon scanning as requiring complex or strategic optioneering



A number of areas were identified for further consideration during options development.

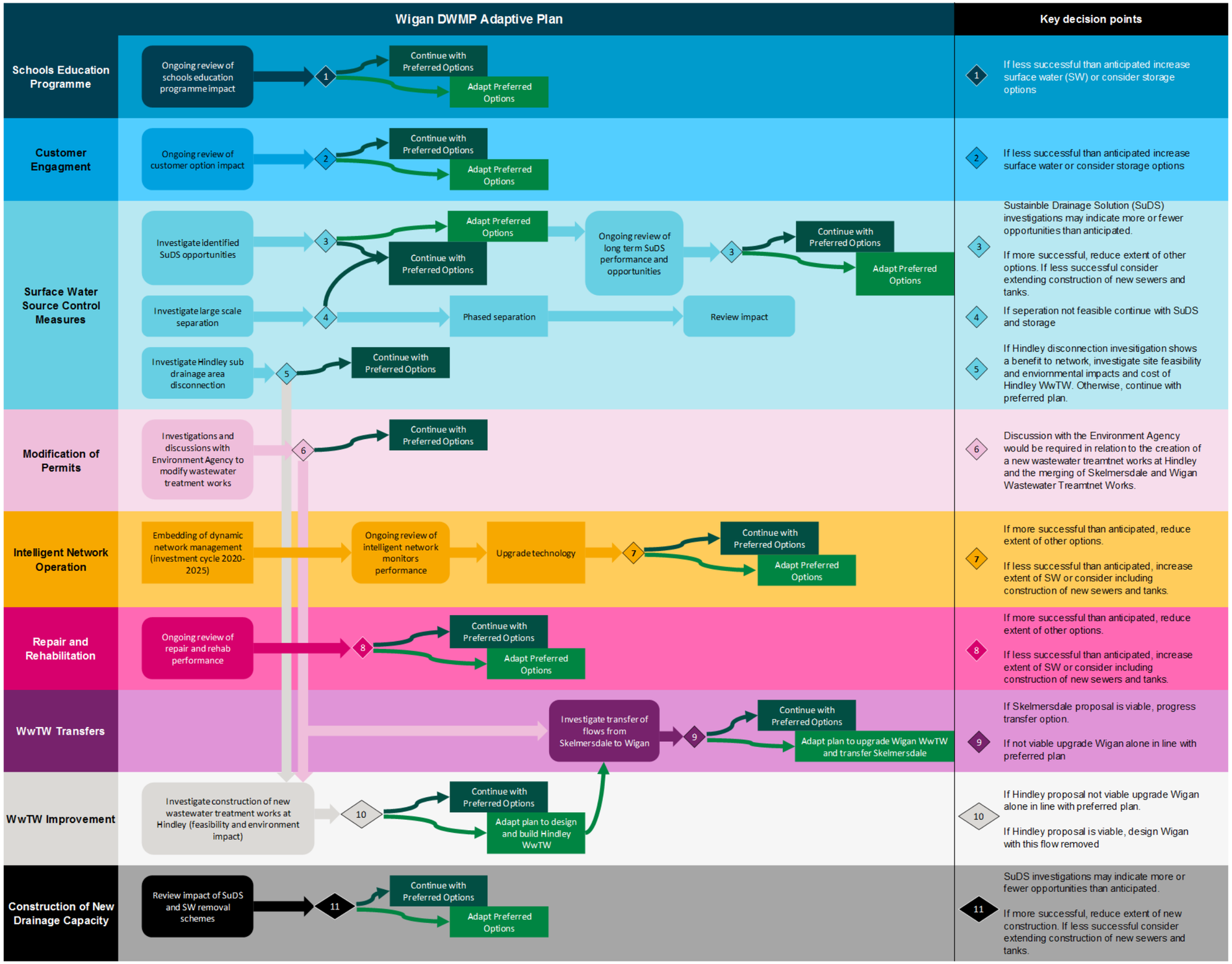
6.6.3.3 As part of the development of options in these areas, adaptive plans have been considered in more detail beyond the option blend approach. The adaptive plans for these areas are described in each of the SPA documents (SPA_01 – SPA_14). One of these areas is Wigan TPU, within the Douglas SPA. Adaptive plan charts have been developed for these areas, which explain the general considerations and areas of uncertainty (Figure 30) and TPU specific uncertainties and possible solution pathways (Figure 31).

Figure 30 General considerations for developing an adaptive plan for Wigan



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

Figure 31 Stakeholder version of an adaptive plan for Wigan TPU



There are multiple issues and factors at play in the Wigan TPU, which make it a complex catchment. There are a number of different trigger points for different drivers, many of which need to be considered in tandem.

Consultation questions

25. Do you agree with the options hierarchy?

26. Do you feel that enough has been done to prioritise nature based solutions?

27. Do you have any suggestions for options to reduce demand and manage rainwater entering the sewer system?

28. Are there any other factors you think we should consider when assessing option benefits?

29. Do you think that using a six capitals approach was suitable for the best value assessment?

30. Which approach do you prefer:

(a) Best value,

(b) Lowest whole life cost?

31. Any additional comments?

7. 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.**
- **Further research will be conducted as part of this consultation.**

7.1 Introduction

7.1.1 This section sets out our approach to testing customers' views on the bill impacts of DWMP driven investment. We regularly engage with customers to ensure we understand their views on overall bill affordability, and as part of the DWMP process we have gained early indications on how they may view costs and benefits of this plan (further details can be found in TA9); however, significant uncertainty in investment requirements means we do not yet have a clear understanding of customers' views on affordability implications of this plan. We intend to conduct further research to address this between draft and final DWMP.

7.2 Summary of findings

7.2.1 Through the planning and programme appraisal processes we have identified significant potential investment associated with regulatory requirements, which at this stage still have significant uncertainty (e.g. overflows and WINEP). Based on emerging guidance and conversations with regulators, we have conducted high level testing of costs and benefits with customers for a range of potential investment scenarios based on the emerging information at the time, including testing views on a variety of different overflow performance targets. The depth of this testing has been limited by the uncertainty associated with investment at the time of testing.

7.2.2 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. When UUW service priorities have been tested with customers, affordability is highlighted as a key priority (Table 24). 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 24 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%

7.2.3 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.

7.2.4 This draft plan is likely to drive relatively large bill impacts, however, uncertainty around investment requirements have, up until now prevented us from developing a clear articulation for customers of service improvements associated with the potential bill increases. As a result, we do not at this stage have a robust understanding of customers' informed views on affordability impacts of this plan. Therefore, as part of the draft DWMP consultation we will conduct further research with customers, engaging to better understand views on this draft plan, including planned service improvement, investment priorities and associated bill changes.

7.2.5 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.

7.2.6 As regulatory requirements are a major uncertainty in this process 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 in the legislative uncertainty around overflows is the disproportionate impact on customers in the North of England, who have a significant proportion of combined sewers, higher rainfall and propensity for storms, and, therefore, more storm overflows.

Consultation questions

32. Do you agree there is a need to further engage with customers around their views on planned service improvements, implications for future bills, and impacts on water bill affordability?

32a. Please explain your answer?

8. Managing uncertainty

- **There are a number of uncertainties, both short and long term, which could have a material impact on the DWMP.**
- **During the development of this draft DWMP, one of the major uncertainties has been expectations for overflows.**

8.1 Summary

8.1.1 This section outlines the approach taken to understand future uncertainties in both the short and medium to long term. It describes the key uncertainties in these design horizons and how these have been managed within the DWMP.

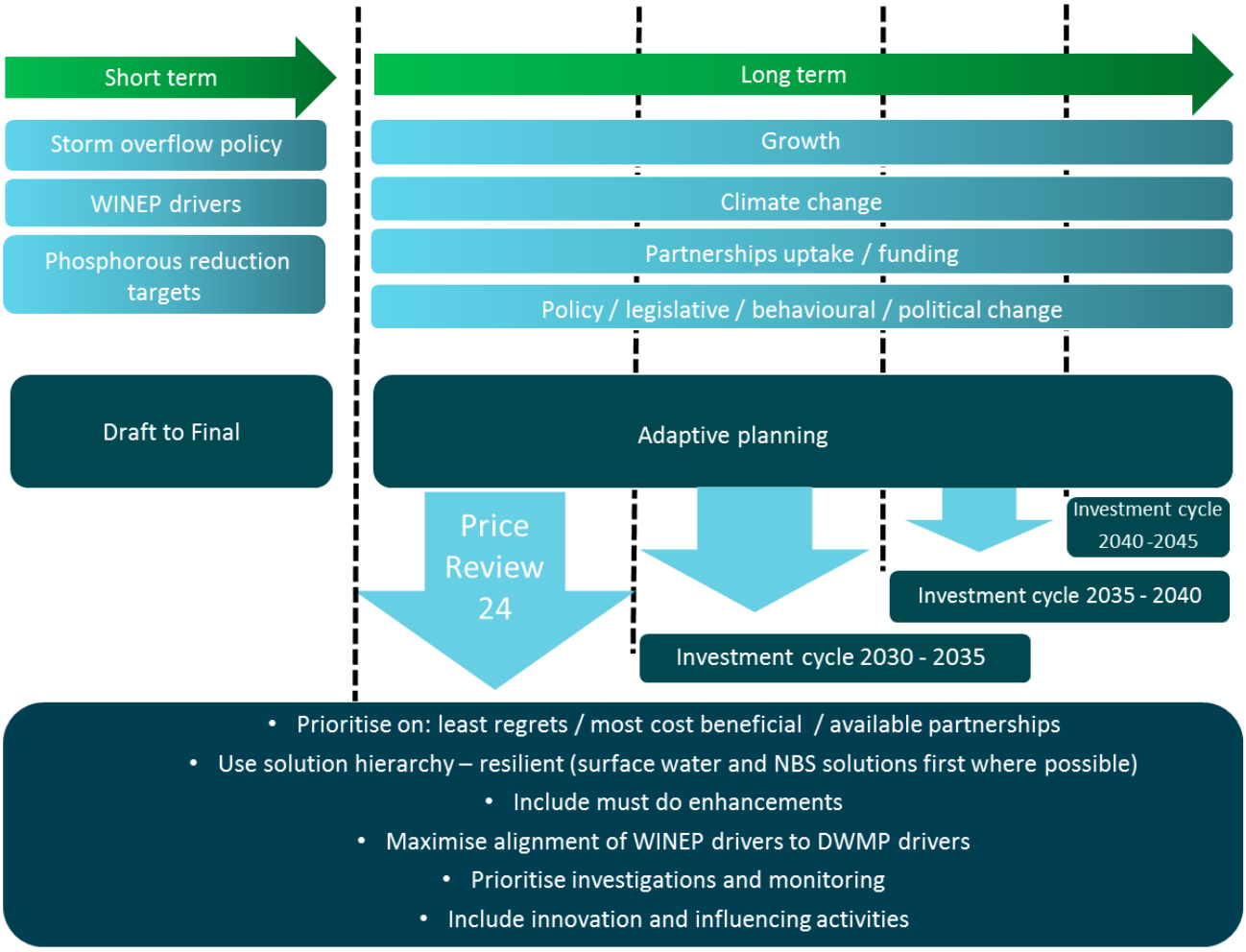
8.1.2 There are elements of our planning where we have reasonable clarity of planning objectives and future drivers for change. Where we have clarity, we have assessed best value options to achieve these objectives, along with likely permit driven requirements that we must do in response to growth.

8.1.3 There are, however, other areas where uncertainty remains. A key uncertainty relates to storm overflow improvements, as this is subject to the Government's Storm Overflows Discharge Reduction Plan consultation (March 2022). Targets and interventions for overflows are intrinsically linked to the performance of the system, and have a domino effect on other service levels such as flooding, flows to works and pollution. Consequently, full optimisation of the plan – particularly across flooding and pollution objectives, has been undertaken with a number of assumptions and, ahead of any investment, further work will be required. The anticipated storm overflow policy update will run in parallel to the DWMP progressing from draft to final submission. Additionally, not all guidance was available in time to inform options development, including the WINEP storm overflow guidance.

8.1.4 For the draft submission of the DWMP we have not considered the potential implications of future legislation changes for example dangerous substance requirements, or any wider non-environmental regulatory changes such as hazardous waste, planning or sludge to land restrictions. If such issues arise, they can be addressed through adaptive planning principles.

8.1.5 We have set out short and long-term uncertainties impacting on decision making in Figure 32.

Figure 32 There are a number of short and long-term uncertainties, which lead to the need for an adaptive approach for long-term planning. A range of scenarios, therefore, have needed to be considered.



8.2 Short-term uncertainty

8.2.1 Introduction

8.2.1.1 The key short-term uncertainties are around the storm overflow policy requirements, associated WINEP drivers and new Environment Act requirements for 80% reduction of phosphorus from 2020 baseline. Due to the concurrent evolution of the WINEP driver guidance alongside this draft DWMP, it has not always been possible to incorporate the emerging expectations. As such, our base preferred plan focuses on activities identified as cost beneficial and those must do activities we consider to be most like, we will provide additional detail below on alternative scenarios we have explored and the potential implications of this.

8.2.1.2 Further clarity on the short-term uncertainties is expected in Autumn 2022, therefore, we anticipate that work to incorporate an updated view on these uncertainties will be undertaken between draft and final DWMP publication.

8.2.2 Managing uncertainty – Overflows

8.2.2.1 The greatest uncertainty in the development of this draft plan was around the ongoing development of expectations for overflows. Full programme commenced before the recent consultation on potential overflow expectations. Therefore, in order to determine a best value plan, an assumption that overflows should try and achieve forty spills per annum or five spills per annum in a priority area such as near a potential inland amenity water was used. This was considered an appropriate assumption based on scenarios detailed in the Defra Storm Overflow Evidence Project (SOEP). However, aware there was high uncertainty in this area, UUW developed tools and cost curves to determine the potential expenditure associated with meeting a range of overflow standards.

8.2.2.2 To date, we have considered the following key scenarios to assess potential overflow investment needs:

- investment at sites identified as linked to possible ecological impacts through our Storm Overflow Assessment Framework (SOAF) investigations;
- investment at sites previously identified as causing harm but not cost beneficial on the WINEP; and
- investment at sites to meet spill frequency targets.

8.2.2.3 As part of the investigation programme during investment cycle 2020 - 2025, we have carried out 75 SOAF investigations. Of these investigations, 71 overflows have been identified as having a survey rating greater than ‘no impact’. While only three of these overflows have been identified as cost beneficial we have assumed based on the recent Defra consultation non-cost beneficial overflows will still drive investment.

8.2.2.4 To understand the potential implications of spill frequency targets, we have investigated the indicative volume of storage required to reduce overflow spill frequencies for a range of scenarios reflecting potential future legislation. Table 25 sets out the indicative ratios of 40 spills to cost using this approach for a range of new spill frequency standards. As this assessment is based on individual asset cost curves, it does not fully capture the full costs. For example, additional upgrades may be required at a wastewater treatment works to treat the additional flows which are no longer being discharged at an overflow.

8.2.2.5 The approach used to generate storage volumes and cost is aligned to the storm overflow evidence project methodology. Cost curves were developed based on historic UUW projects.

Table 25 Potential ratios of 40 spills to cost for different scenarios assessed

Overflows	Scenario	Ratio to 40 spills cost
Inland	40 spills per year	1.00
Inland	20 spills per year	2.34
Inland	10 spills per year	3.93
Inland	1 spill per year	10.16
Inland	0 spills per year	13.42
Existing Bathing Waters	3 spills per bathing season	0.43
Existing Bathing Waters	1 spill per bathing season	0.89

8.3 Medium to long-term uncertainty

8.3.1 The longer-term uncertainties require influencing actions around behaviours, partnerships, drainage regulation reform and other regulatory reform, which we have qualitatively assessed as part of this plan as 'indirect measures'. Indirect measures fit well with adaptive planning principles and will be reviewed to monitor the impact of any changes in line with the DWMP review cycles.

8.3.2 In the context of the DWMP, we have considered indirect measures as those activities driven by external organisations to review strategies, policy changes or actions that fall outside of direct drainage management. These options have the potential to affect delivery of the DWMP over the current 25 year planning horizon and beyond.

8.3.3 Examples of such indirect measures include implementation of Schedule 3 of the FWMA 2010**,** to introduce standards for and adoption of new drainage systems, making it compulsory that systems are approved before any construction work commences and assessing the role of highway drainage as a rainwater drainage system. Additionally, elimination of wet wipes and targeting improvements in misuse of sewers alongside water industry engagement on the topic is a significant part of the solution. Anticipated government support as outlined in the Government's Storm Overflows Discharge Reduction Plan consultation to deliver public action to reduce the impact of overflows will support this activity.

8.3.4 It is worth noting that, through using the option blending approach set out in this document, solution delivery will be different to previous investment cycles with more 'progress towards targets' rather than single solutions within a particular investment cycle, this may result in incremental progress at specific locations. 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. Adaptive planning supports us to make the investments required in the drainage system to meet environmental needs and evolve our services to meet changing drivers and new information.

8.3.4.1 The combination of short and long-term uncertainties gives us a clearer steer for what should be included in the first phase of work during the investment period 2025–2030, with a focus on the activities with the greatest certainty and cost benefit identified (low regrets/high benefit activity) in the optimised plan. The core plan, plus detail of the areas of greater uncertainty are outlined in detail in Section 9.

Consultation questions

33. Do you think these are the key short and medium term uncertainties?

34. Do you think that adaptive planning is a way to manage the uncertainties?

35. Any additional comments?

9. Determining our preferred plan

9.1 Summary

- **In the development of this plan, we have focused on producing an optimised programme, which meets customer and regulatory expectations and considers affordability, whilst also driving significant improvement and system resilience in areas such as flooding.**
- **Where there are opportunities we will look to deliver this investment through partnership.**
- **Further optimisation will be required between draft and final DWMP to fully integrate and optimise overflow investment requirements following publication of the Government's Storm Overflow Discharge Reduction plan and the outcome of the consultation.**

9.1.1 This section sets out the key components which make up our preferred plan. The section sets out the preferred plan dividing this into three key areas: activities which are mandated; activities which have been selected as part of the optimised plan; and, finally, activities associated with uncertain future drivers.

9.1.2 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 DMWP. 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. Further refinement of the plan will take place between draft and final DWMP publication, when it is expected there will be more clarity on the uncertainties outlined in Section 8.

9.1.3 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. All options will need further development and scrutiny ahead of inclusion in the business plan for investment cycle 2025 – 2030.

9.1.4 We have tested a range of scenarios and, whilst we have accommodated uncertainty, the preferred plan detailed is unlikely to be a complete picture of the potential long-term investment required. To provide a more complete picture of the potential long-term investment requirements we considered a range of components including those which are more uncertain. As such, we are setting out our plan through a three core components reflecting three different levels of certainty (Table 26):

(1) legal obligations – must do 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) future requirements – investment associated with uncertain regulatory guidance e.g. objectives around overflows.

9.1.5 A central view of the investment associated with each of the core components listed above are summarised in Table 26 and detailed in Sections 9.2 to 9.4. 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.

9.1.6 We have tested a range of scenarios and combinations of these three investment components. The extent to which each of these components are included can alter costs significantly; in particular for those areas associated with uncertain regulatory guidance. This includes investment on overflows and to meet certain environmental drivers where guidance has not yet been finalised. The understanding of

investment driven by emerging legislation will continue to evolve over the duration of the plan and better inform future DWMPs.

Table 26 Preferred Plan for 2025–2050 summary

Component	Area	Price base assumption (Financial Year, FY)	Cost £m (2025–2050)
Legal obligations	Permit compliance	FY21	709
Legal obligations	WINEP	FY21	1,898
Performance improvements	Optimised activity	FY21	1,016
	Total: Legal obligations + Performance improvements		**3,623**
Future requirements	Overflows (Ecology)	FY21	1,039
Future requirements	Overflows (10 spills)	FY21	15,387
Future requirements	Overflows (Bathing Waters)	FY21	1,417
Future requirements	Overflows (screening)	FY21	455
	Total: Legal obligations + Performance improvements + Future requirements		**21,920**

9.1.7 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.

9.1.8 An initial view of phasing for this investment can be seen in Table 27. This view is prior to confirmation of WINEP and overflow requirements and, therefore, may require significant adjustment between publishing the draft and final DWMP.

Table 27 Potential phasing of investment prior to consideration of overflow investment

	Expenditure (£m) per investment cycle					
Investment Category	**2025 – 2030**	**2030 - 2035**	**2035-2040**	**2040 - 2045**	**2045 - 2050**	**Total**
Legal Obligations – Permit compliance	191	191	109	109	109	709
Legal Obligations – WINEP	1,304	354	241	0	0	1,898
Performance Improvements	264	175	57	190	329	1,016
Total	**1,759**	**720**	**407**	**299**	**438**	**3,623**

9.1.9 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 – 2035.

9.1.10 In addition to the above components we have also identified two key areas for additional discussion in this section:

(1) partnership activities; and

(2) aspects of the plan likely to require significant amendments between draft and final DWMP publication.

9.2 Optimised activities to deliver performance improvements

9.2.1 Introduction

9.2.1.1 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 TA8. Copperleaf Portfolio is an industry leading asset management tool used across a number of sectors around the world.

9.2.1.2 We tested a range of approaches and scenarios (more details in Section 6.5) 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.

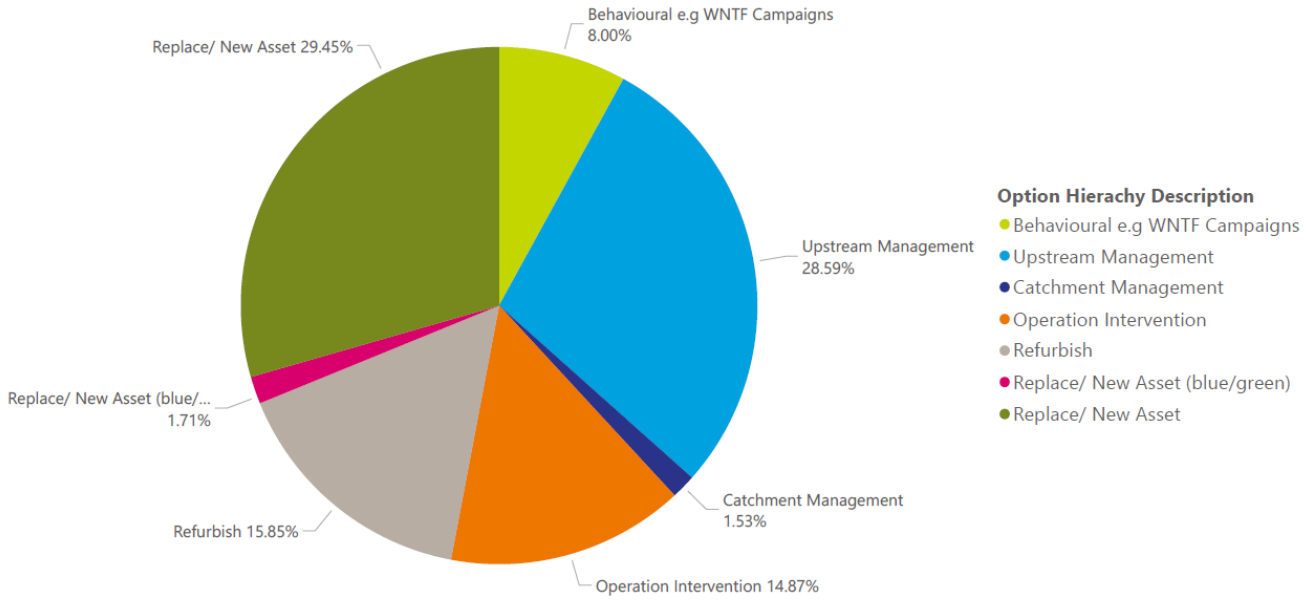
9.2.1.3 Two approaches were tested with stakeholders and ultimately the best value approach based on the option hierarchy set out in Section 6.3 was selected. This approach has, therefore, been used to identify the best set of options to meet planning objectives.

9.2.1.4 Following this optimisation, £1,016 million of interventions (over 25 years) have been identified across 400 TPUs. This includes a wide variety of different option types (Figure 33) including significant amount of surface water management activities.

9.2.2 Overview of optimised activities to deliver performance improvements

9.2.2.1 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. This was carried out before the publication of the overflow consultation.

Figure 33 Regional view of optimised activities investment by option hierarchy



9.2.2.2 At a regional level, new assets and upstream management (e.g. SuDS) make up the largest proportion of investment (Figure 33). This is generally in the form of 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 and SuDS options gained significant support from customers, owing to perceived additional benefits and getting to the 'root cause' of a problem. As such, where possible, UUW is looking to accelerate no regrets interventions such as SuDS.

9.2.2.3 Additional significant investment is found in operational interventions and refurbishment of existing assets. This investment includes activities to utilise innovative dynamic network management technologies and manage the wastewater and drainage systems using remote monitoring and artificial intelligence. Refurbishment options align to customer priorities to use existing assets and maximise asset life.

9.2.2.4 The blend of optimised activities varies between different SPAs depending on their needs and priorities (Figure 34). Further detail on the geographic distribution of optimised activities can be found in Section 10.2.2.

9.2.2.5 The optimised set of interventions would provide multiple benefits as set out in Table 28. This includes significant improvement to flood performance, which is one of the key planning objectives for this plan.

Table 28 Potential risk reduction associated with the delivery of the optimised plan

Planning objective	Regional % reduction in risk achieved through optimised activities
Internal flooding	68%
External flooding	39%
Pollution	88%
Open space flooding	56%
Sewer collapses	72%
1 in 50-year flooding	4%

The figures outlined in this table exclude specific activities to meet storm overflow needs, which may alter benefits.

9.2.3 Understanding bill impact

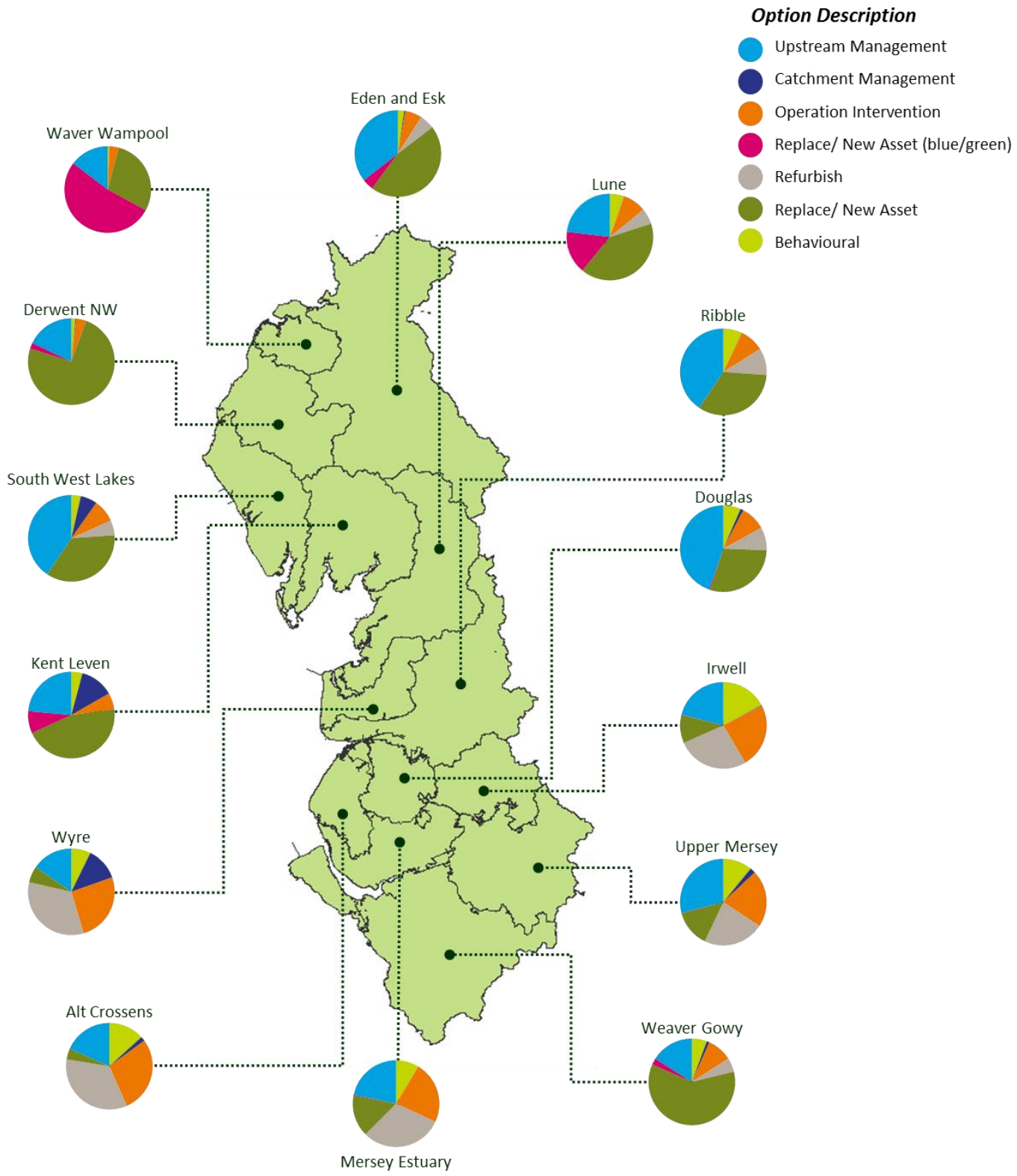
9.2.3.1 The potential bill impact of the optimised activities is estimated to be approximately £3 per year by 2030 for the average household, excluding the impact of inflation. The anticipated 2050 bill impact is approximately £6 for the average household, excluding the impact of inflation.

9.2.3.2 A significant amount of the early expenditure is associated with surface water management activities that will deliver long-term benefits and are more resilient to changes in the climate. Further details of optimised investment is contained within Section 10.

9.2.3.3 The optimised activities set out in this section constitute the areas of the plan over which there is greatest certainty. Whilst flooding is a relatively clear and certain area of the plan, it is inherently linked to capacity and, therefore, overflow performance. While part of this plan was optimised, this was conducted before the consultation on the Government's Storm Overflow Discharge Reduction Plan. As our understanding of the WINEP and overflow needs evolve in the run up to Price Review 2024 publication we will continue to optimise these key activities to ensure synergies are identified. Further optimisation will be required between draft and final to ensure a holistic view of investment required to ensure robust and resilient drainage and wastewater services over the long term.

9.2.3.4 The investment identified through this route, which has the greatest certainty, formed the basis of the information contained within the SPA Plans (SPA_01 to SPA_14).

Figure 34 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.

9.3 Legal obligations

9.3.1 Introduction

9.3.1.1 Although certain areas of this plan are discretionary and we have been able to optimise proposed investment as described in Section 6.5, it is not appropriate to do so for all investment drivers. Maintaining permit compliance, while accommodating growth or complying with 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.

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

(1) Permit Compliance; and

(2) WINEP.

9.3.1.3 In total, £2,607 million of investment has been identified to meet these mandatory activities between 2025–2050. This is associated with known regulatory requirements. Future needs driven by new and yet unknown, legislation has not been included. For example, no investment has been identified to remove micro plastics or emerging chemical contaminants. Further detail of the short and long-term uncertainty around WINEP is set out in Section 9.4. As such, the detail set out in this section is likely to change significantly before final DWMP publication in March 2023 and in future iterations of the plan as new requirements are identified.

9.3.1.4 Legal obligations have been included for 357 TPUs. In the majority of these the investment identified is fairly small. However, significant potential expenditure has been identified through this process for a number of TPUs (Table 29).

9.3.1.5 These have been identified through the BRAVA or by following the WINEP driver guidance issued by the Environment Agency.

9.3.1.6 When the geographic distribution of this investment is considered (Figure 35). It is clear that the Upper Mersey SPA, which covers a large area of Manchester, will be an area which requires significant investment. This is due to the significant investment required to address water quality issues in the Manchester Ship Canal and the significant growth projected in this area. UUW are developing a Manchester West strategy to focus on the best way to accommodate this growth with the backdrop of the environmental drivers. Further details of this can be found in the Upper Mersey SPA plan (SPA_11).

9.3.1.7 To ensure the plan proposed for the Upper Mersey is holistic and can maximise the significant opportunity for partnership solutions we are piloting place-based planning in this area, as detailed in Section 3.5.

Table 29 Locations where significant investment (greater than £50 million whole life cost) to meet legal obligations have been identified.

TPU	Legal obligation	Detail
Davyhulme	WFD_IMP	New requirements for phosphorus and Biochemical Oxygen Demand (BOD) New requirements additional storm storage to meet dissolved oxygen (DO) needs in Manchester Ship Canal
	U_MON3	MCerts certified overflow operation monitoring
Salford	WFD_IMP	New requirements for BOD and Ammonia
	WFD_ND	New requirement for phosphorus triggered by 35% increase in population forecast
	U_MON3	MCerts certified overflow operation monitoring
Wigan	WFD_IMP	New requirements for ammonia and phosphorus
	U_MON3	MCerts certified overflow operation monitoring
Sale	WFD_IMP	New requirement for additional storm storage New requirements for phosphorus and BOD
	Accommodate growth	16% increase in population forecast by 2050
	U_MON3	MCerts certified overflow operation monitoring
Eccles	WFD_IMP	New requirement for BOD, ammonia and phosphorus
	U_MON3	MCerts certified overflow operation monitoring
Nantwich	Accommodate growth	18% increase in population forecast by 2050
Huyton	WFD_IMP	New requirements for phosphorus, BOD and ammonia
	Accommodate growth	15% increase in population by 2050
	U_MON3	MCerts certified overflow operation monitoring
Stockport	WFD_IMP	New requirement for additional storm storage New requirements for phosphorus and BOD
	U_MON3	MCerts certified overflow operation monitoring
Hyndburn	WFD_IMP	New requirement for phosphorus
	U_MON3	MCerts certified overflow operation monitoring
	U_MON4	MCerts certified flow monitoring

Population increases are based upon plan based increases in domestic population from 2020 - 2050

Figure 35 Map detailing areas where significant legal requirements have been identified

Significant potential must do capital expenditure has been identified for a number of TPUs. In particular, significant investment is required in the Upper Mersey to meet environmental drivers and accommodate population growth.

9.3.2 Permit compliance

9.3.2.1 To understand the potential scale of programme that would be required to meet 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 76 TPUs; and
- DWF compliance risk, which identifies long-term investment need in 95 TPUs.

9.3.2.2 Taking into account wastewater treatment works already selected during programme optimisation, this assessment results in 81 unique new sites to be included alongside the optimised plan.

9.3.2.3 Integrated solutions for these sites have been developed, which also include any investment to meet WINEP drivers. When costs are proportionally allocated between permit compliance and WINEP we are forecasting a programme of £709 million over 25 years to continue to ensure permit compliance alongside population growth.

9.3.2.4 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.

9.3.2.5 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).

9.3.2.6 All the sites identified as part of this programme will need careful monitoring to understand the growth rate and point where capacity is 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.

9.3.2.7 The potential bill impact of investment associated with meeting permit compliance is estimated to be just under £6 per year by 2030 for the average household, excluding the impact of inflation. The anticipated 2050 bill impact is approximately £6.50 for the average household, excluding the impact of inflation.

9.3.3 Water Industry National Environment Programme

9.3.3.1 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.

9.3.3.2 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.

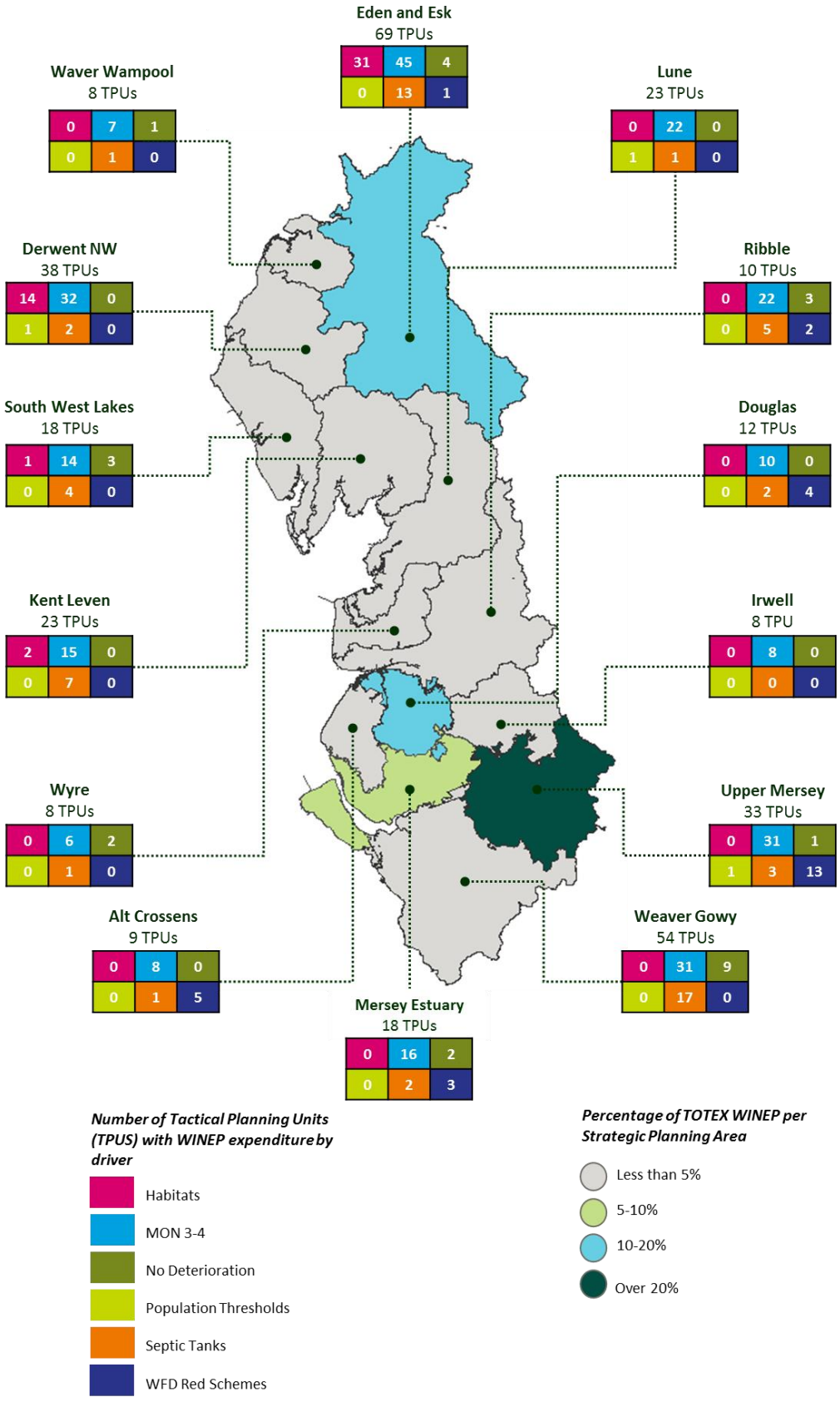
9.3.3.3 In the DWMP, we have accounted for the following unconfirmed schemes, some of which have historically been considered but found to be non-cost beneficial and, therefore, categorised as 'red' schemes through the WINEP, others where sufficient guidance has been received, that gives confidence that solutions will be required, have been included in the proposed activities (Table 30). The drivers included in this plan are currently classified as 'core'. The schemes included are likely to change between draft and final as the understanding of the WINEP requirements are finalised.

9.3.3.4 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.

Table 30 WINEP schemes included in draft plan

Driver	Justification for inclusion	Number of TPU's	Number of drivers
Septic Tank Improvements	New Urban Waste Water Treatment Directive (UWWTD) driver guidance, which requires all septic tanks discharging to surfaces need secondary treatment	59	60
Habitats Directive Improvements (or prevention of deterioration)	Investment required to support needs identified through habitats investigation outputs (draft)	48	48
MON3 and MON4 flow compliance monitoring requirements	Updated guidance on flow monitoring received February 2022	267	305
No Deterioration	Identified through revised river models (to be updated for Price Review 2024)	25	25
Population thresholds	Identified through risk analysis of growth increase and UWWTD guidance	3	3
WFD (continuous discharge)	Previously identified for improvements but historically non-cost beneficial to treat to limits identified (RED WINEP)	28	29

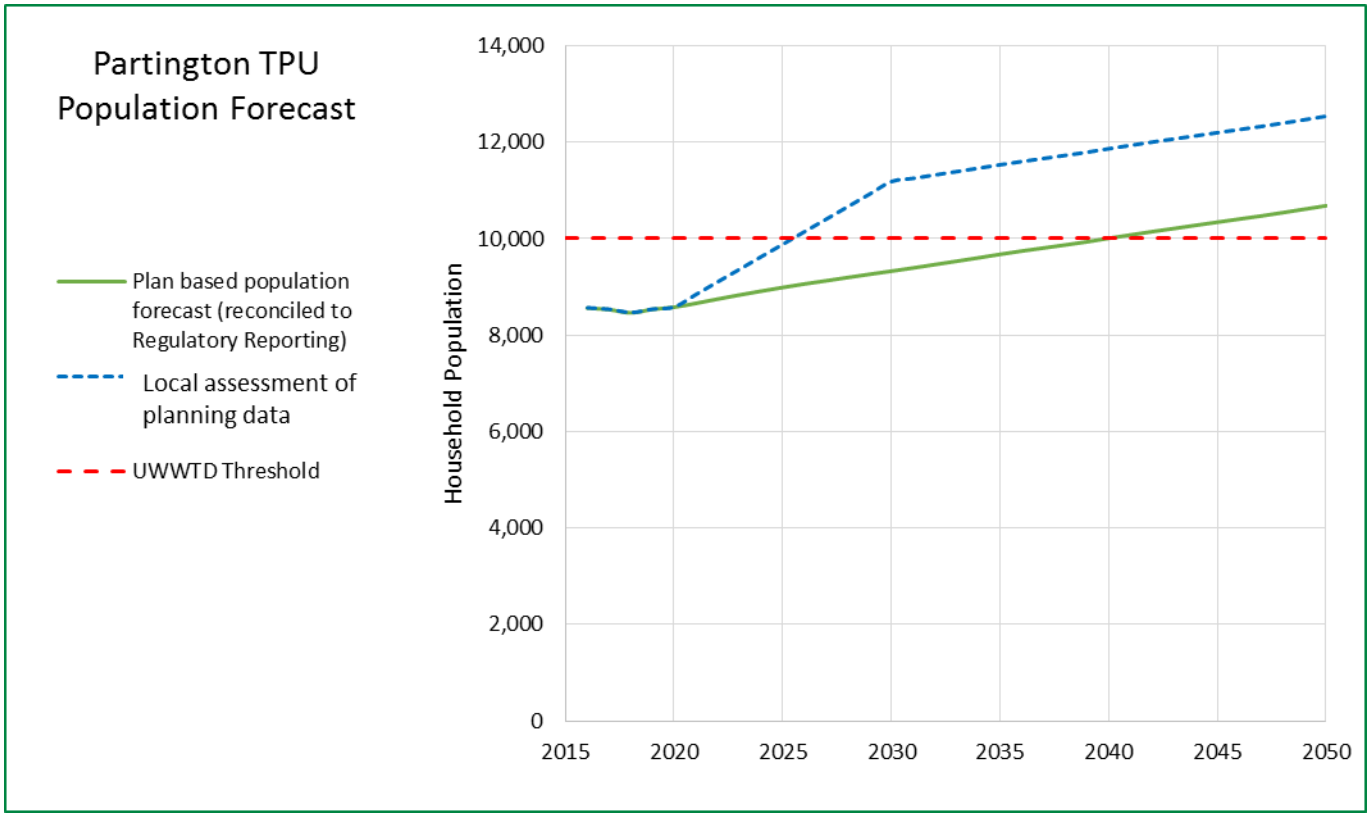
Figure 36 Potential geographic distribution of WINEP investment



Over 20% of the identified investment is located in the Upper Mersey and this is predominantly associated with meeting requirements of the WFD. The WINEP is being developed concurrently with the DWMP and therefore this is indicative rather than a confirmed picture.

9.3.3.5 Where guidance was available, that guidance has been used to conduct an assessment of where it might apply. Evidence was then gathered for locations identified to confirm whether there was likely to be a driver there. Figure 37 provides an example of the type of evidence we have gathered for a TPU before including it within this plan. In this case, an assessment was conducted to understand which sites may trigger a change in permit condition due to population growth triggers set out in the UWWTD. Under this directive, treatment works that serve populations over certain thresholds will have certain permit requirements applied.

Figure 37 Case study for Partington Wastewater Treatment Works, which has been identified as having a population threshold driver



Partington Wastewater Treatment Works discharges into Sinderland Brook, which is designated as a sensitive area under the UWWTD. Under the UWWTD sites which serve a population greater than 10,000 but less than 100,000 are required to discharge no more than 2mg/l phoshporus. As can be seen from the population forecast, it is anticipated that the population served by Partington will exceed 10,000 somewhere between 2025 and 2040. There is currently no permit requirement to remove phosphorus at Partington. Therefore, the provision of additional tertiary treatment to remove phosphorus is included within this plan. The exact timing of this investment will be determined as part of WINEP development.

9.3.3.6 Taking into account the wastewater treatment works already selected during programme optimisation, this results in 226 unique new sites requiring investment at an additional cost of £1,898 million. Further detail on our approach to WINEP development and the potential implications that may have on the plan can be found in Section 9.4.

9.3.3.7 The potential bill impact of investment associated with currently identified WINEP is estimated to be approximately £17 per year by 2030 for the average household, excluding the impact of inflation. The anticipated 2050 bill impact is approximately £19 for the average household, excluding the impact of inflation.

9.4 Future requirements – Areas of uncertain expenditure

9.4.1 Introduction

9.4.1.1 There are a number of evolving policy areas which could result in significant expenditure for wastewater. This section outlines the uncertain investment associated with future requirements, which has been considered within the draft DWMP.

9.4.1.2 A number of these will be driven by the recent Environment Act and the outcome of the Government's Storm Overflow Discharge Reduction Plan consultation. There are also ongoing discussions with the Environment Agency with regards to the development of the WINEP, which will continue up until the publication of the WINEP in March 2023.

9.4.1.3 In the longer term, emerging risks for which the industry's understanding is currently evolving, such as anti-microbial resistance and mircro plastics, may also trigger changes.

9.4.2 Government's Storm Overflow Discharge Reduction Plan

9.4.2.1 On 31 March 2022, Defra published a consultation on the Government's Storm Overflow Discharge Reduction Plan, post programme optimisation of the DWMP. This highlighted a number of potential new regulatory requirements (Table 31).

Table 31 Storm Overflow Discharge Reduction Plan Consultation: Proposed Targets

	Target
Overarching target	By 2050 water companies will only be permitted to discharge from a storm overflow where they can demonstrate that there is no local adverse ecological impact.
Ecology sub-target	The headline target must be achieved for at least 75% of storm overflows discharging in or close to high priority sites by 2035 and for all (100%) overflows discharging in or close to high priority sites by 2045.
Bathing water sub target	For storm overflows discharging into and near designated bathing waters, water companies must significantly reduce harmful pathogens by either applying disinfection, such as with ultraviolet radiation, or reduce the frequency of discharges to meet Environment Agency spill standards by 2035 (two or three spills per bathing season).
Other minimum requirements	Storm overflows must not discharge above an average of ten rainfall events per year by 2050. All storm overflows, regardless of where they discharge to, have screening controls to limit discharge of persistent inorganic material (as well as faecal and organic solids) by 2050.

9.4.2.2 Due to the timing of the Defra consultation on overflows, it was not possible to fully optioneer and optimise solutions to meet the potential standards that were set out. Instead, we have used the scenarios and tools described in Section 8.2.2 to develop a regional assessment of the potential investment required to meet these expectations.

9.4.2.3 Between draft and final publication, following publication of a final policy in September 2022, we will carry out more detailed assessments and optimisations to better understand the optimal approach to meet the proposed requirements set out in the Government's Storm Overflows Discharge Reduction Plan consultation – including any modelling required. It will then be possible to use the tools created for DWMP to fully identify and integrate overflow needs into the plan. This will include any synergies between solution and timing with the optimised cost beneficial programme and other WINEP drivers. This may lead to significant changes in the proposed optimised programme and preferred plan.

9.4.3 Ecological impact and ecology sub-target

9.4.3.1 To fully understand ecological impact requires an in depth study of the overflow and the watercourse it discharges to which includes an invertebrate study and water quality impact assessment.

9.4.3.2 From the completion of SOAF investigations to date and reviewing sites previously identified through WINEP development as causing harm but not cost beneficial, we have identified a number of overflows which would require intervention. Costs for these have been provisionally included in the next business plan period.

9.4.3.3 It is likely that as more SOAF investigations are completed more sites will be identified as having an ecological impact. However, it is not possible to quantify without the evidence from the studies.

9.4.3.4 The ecology sub-target is likely to significantly affect the phasing of the programme and results in a significant front-end loaded programme.

9.4.4 Bathing water sub-target

9.4.4.1 There are 29 designated bathing waters in the North West. Many assets which discharge into them have previously been improved. However, there are a number of assets, included in the bathing water Event Duration Monitoring (EDM) return due to proximity but where a previous investment need has not previously been identified, for example where they are more remote from the bathing water. Therefore, it is assumed that these assets will require investment to meet the expectations set out in the consultation.

9.4.4.2 The consultation indicates that overflows discharging to good bathing waters should spill no more than three times per bathing season. Those discharging to excellent bathing waters should spill no more than two times per bathing season.

9.4.4.3 It is estimated that the costs to meet the bathing water sub-target would be £1,417 million. Due to the timing of the consultation, these costs are based upon engineering cost curves for storage solutions. This approach is likely to underestimate the expenditure in some areas which require systematic change including substantial changes to wastewater treatment works. More detailed optioneering will be conducted between draft and final DWMP to better understand the specific costs for impacted areas.

9.4.4.4 Between draft and final we will also look to explore whether the use of ultra-violet (UV) treatment would be more cost effective than achieving bathing water spill targets in some locations.

9.4.5 Other minimum requirements

9.4.5.1 It is anticipated that the requirement that storm overflows should not discharge above an average of ten spills per year by 2050 will drive very significant expenditure. Through running BRAVA, over 1400 overflows have been identified as exceeding this threshold by 2050.

9.4.5.2 Using the scenario work described in Section 8.2.2, it is estimated that the potential costs for achieving this is £15,387 million. This is based upon established cost curves for individual storage solutions due to time constraints. Between draft and final, further programme optimisation will develop an optimal blend of solution types to address this requirement. This considers a range of solutions to address overflows such as improvements to surface water management. This will be key to ensuring long-term resilience with the high levels of rainfall in the North West and the currently predominantly combined sewer system.

9.4.5.3 It is challenging to provide accurate costs to provide universal screening as the spill frequency target is likely to result in a significant reduction in the volume of peak flow requiring screening. Without doing detailed optioneering to understand improvements required to meet the spill frequency target, which has not been possible in the timeframe between the Government's Storm Overflow Reduction Plan consultation and draft DWMP submission, it is difficult to get an accurate picture.

9.4.5.4 Historically, screening costs have varied considerably between overflows based on multiple different variables and, therefore, it has not been possible to develop an accurate cost curve to develop a single view of cost.

9.4.5.5 The estimated cost for providing screening, for all currently unpermitted sites, is £455 million. This is based upon an assumption that flows will only need to be screened up to a 1 in 5-year storm.

9.4.5.6 In addition to the costs of individual storage solutions to meet the various requirements in the consultation some consideration has been given to the downstream changes which would be required to drain down this storage through the wastewater treatment works. To understand the potential costs to drain down the system, we have calculated a drain down factor. This indicates that the potential additional costs at a regional level to drain down the storage is approximately £1.8 billion. In reality, drain down would be managed through additional storage and increasing pass forward flow through the wastewater treatment works. UUW will explore the potential costs of this in more detail between draft and final.

9.4.6 WINEP – Other

9.4.6.1 While some WINEP driver guidance was available at the point of finalising options for draft DWMP, there were a number of outstanding areas of guidance. This included, but was not restricted to, storm overflow guidance/policy, priority shellfish waters and designation of sensitive areas or inland bathing waters. The development of the WINEP driver guidance is happening concurrently with the latter stages of the DWMP and discussions with the Environment Agency on the programme are ongoing. In particular, there is an evolving picture with relation to 'flexible' WINEP requirements which are subject to possible phasing changes.

9.4.6.2 As such, we have provided a view of potential investment for the draft plan but, crucially, due to the integrated nature of solutions, optimising across drivers and requirements has not been possible.

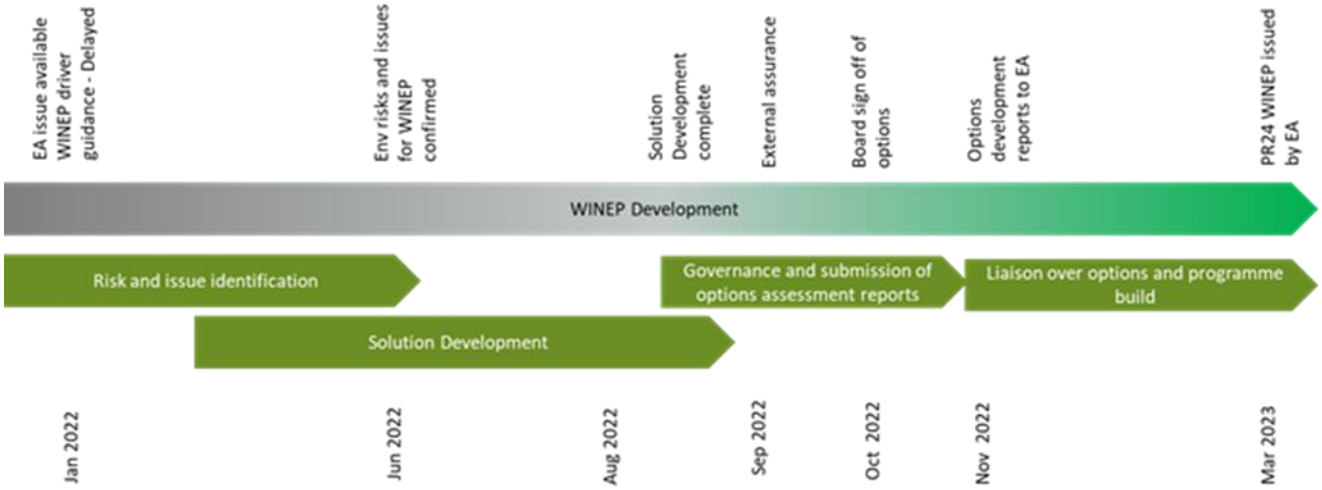
9.4.6.3 In addition to the drivers included in Section 9.3.3, new inland bathing waters locations may arise ahead of Price Review 2024. Shellfish water improvements are unconfirmed. Solutions for these will be developed through the Price Review process once guidance has been provided and we can assess any synergies with other investment needs through the DWMP.

9.4.6.4 Through horizon scanning, a number of potential sites were identified as most likely to get designated. The potential costs associated with upgrading overflows, which impact on these potential inland bathing waters is approximately £1 billion.

9.4.6.5 WFD chemical improvement drivers and requirements to prevent deterioration arose too late for inclusion in draft DWMP. Solutions to meet these will be included in the final DWMP.

9.4.6.6 Through the DWMP process, UUW has built tools to develop high level costing and strategies for these programmes of work. However, until there is further certainty on the programme and requirements this area of investment is still highly uncertain. Between draft and final we will incorporate the latest information and intelligence into the plan to give a more certain view of shorter-term investment need and the impact on the wider long-term plan. An overview of the timeline to develop the WINEP for 2025–2030 investment period is demonstrated in Figure 38.

Figure 38 WINEP development timeline and key milestones



9.4.6.7 Defra's consultation on the environmental targets, a key commitment set out in the Environment Act indicates other potential areas of future expenditure, which are summarised in Table 32.

Table 32 Requirements set out in Environment Act and Defra consultation on environmental targets directly related to drainage and wastewater

	Requirement
Nutrient Targets	Reduce phosphorus loadings from treated wastewater by 80% by 2037 against a 2020 baseline
Monitoring	Real time reporting of storm overflow discharges
Monitoring	Real time monitoring of waterbodies

9.4.6.8 The potential options to address these drivers and the cost implications will be reviewed more closely following confirmation of expectations.

9.5 Partnership

9.5.1 UUW has a long history of partnership working, which has evolved with our industry leading approach to Systems Thinking and strong innovation culture. Our partnership framework and adaptive approach allows us to maximise opportunities for partnership working, challenging traditional approaches and ways of working. We recognise the scale of potential cost savings and added value delivered through partnership, this has been evidence through historic partnership working across drainage and wastewater. Market analysis undertaken by Project Rome suggests our historic experience and the adoption of our partnership framework make UUW industry leading in this area.

9.5.2 Successful partnerships over the last ten years include the EU funded partnerships Natural Course and Ignition, the award winning Catchment Systems Thinking approach on the River Petteril and the Wyre Investment Readiness Fund. Case studies outlining the successes of some of our recent partnership work can be found in Figure 39 and Figure 40. We plan to build on this strong track record moving into the 2025–2030 investment period to drive further cost saving and public value. We have co-created a partnership framework which sets clear governance and guides our approach to partnership working.

9.5.3 The partnership framework sets out our approach to partnership working ensuring partnerships have the key building blocks in place for successful collaboration. The framework includes a series of tools to support the development partnering approaches from identifying opportunities through to the development and management of partnerships, including performance monitoring and governance.

Figure 39 Working with partners across Greater Manchester on the EU funded project 'IGNITION'

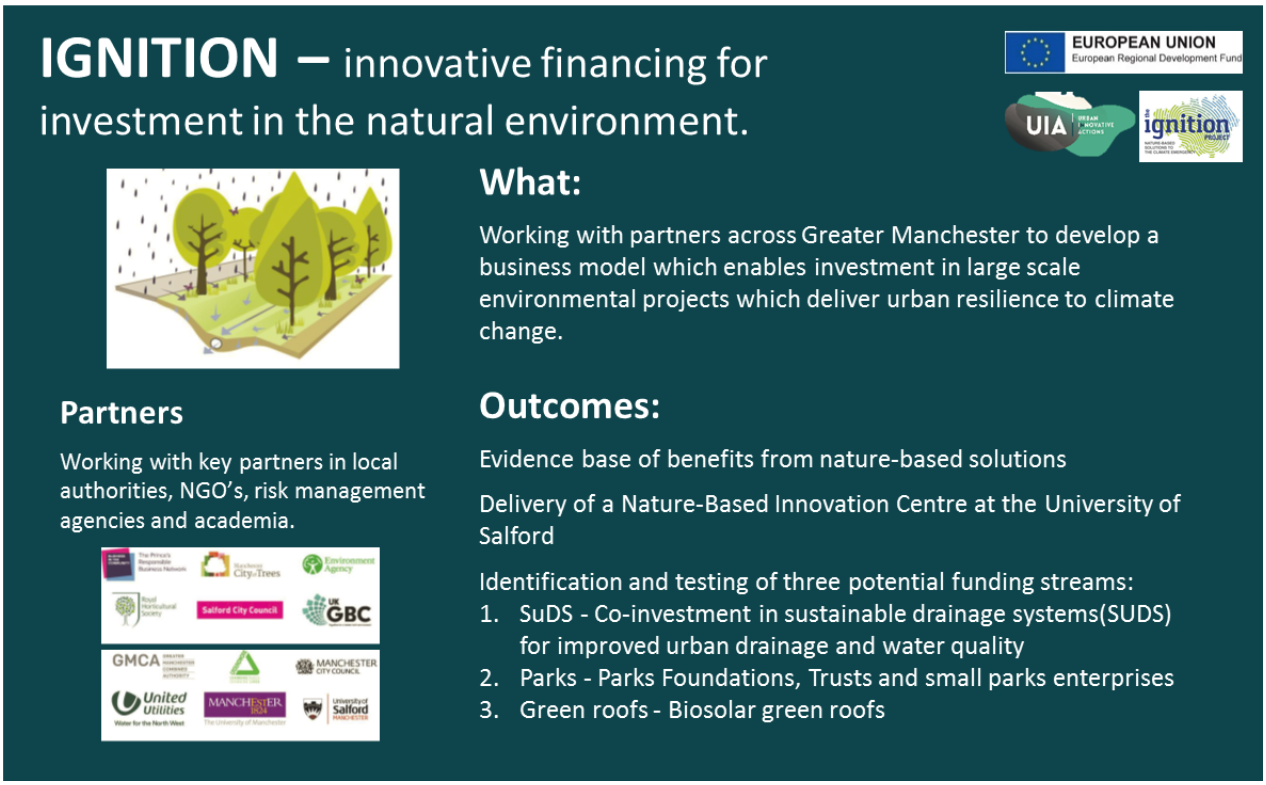


Figure 40 Working with partners in the Wyre to develop an investment model for natural flood management (NFM)

Wyre Natural Capital Approach Delivering Partnership Investment

The Wyre Natural Flood Management (NFM) investment readiness project brought together existing and new partners to create an **ecosystem service-based market.**

It offers a very serious solution for investing in natural capital improvements in our landscape, at scale, with **multiple environmental benefits for nature, climate change mitigation and adaptation**, based on repayment for social impacts valued by wider society.

A simple transaction structure was developed where a **Special Purpose Vehicle (SPV) will draw down external investment finance**, to fund the capital delivery. This will be repaid over a 9-year period through ecosystem service contracts with **buyers** (those who will benefit from the intervention) and **sellers** (farmers and landowners) who will host the NFM on the ground.

The project is one of the **first examples of an ecosystem service-based market**. It has been developed over the last 18 months and is in its final, legal stages of development prior to drawing down **£1.5 million of external investment.**

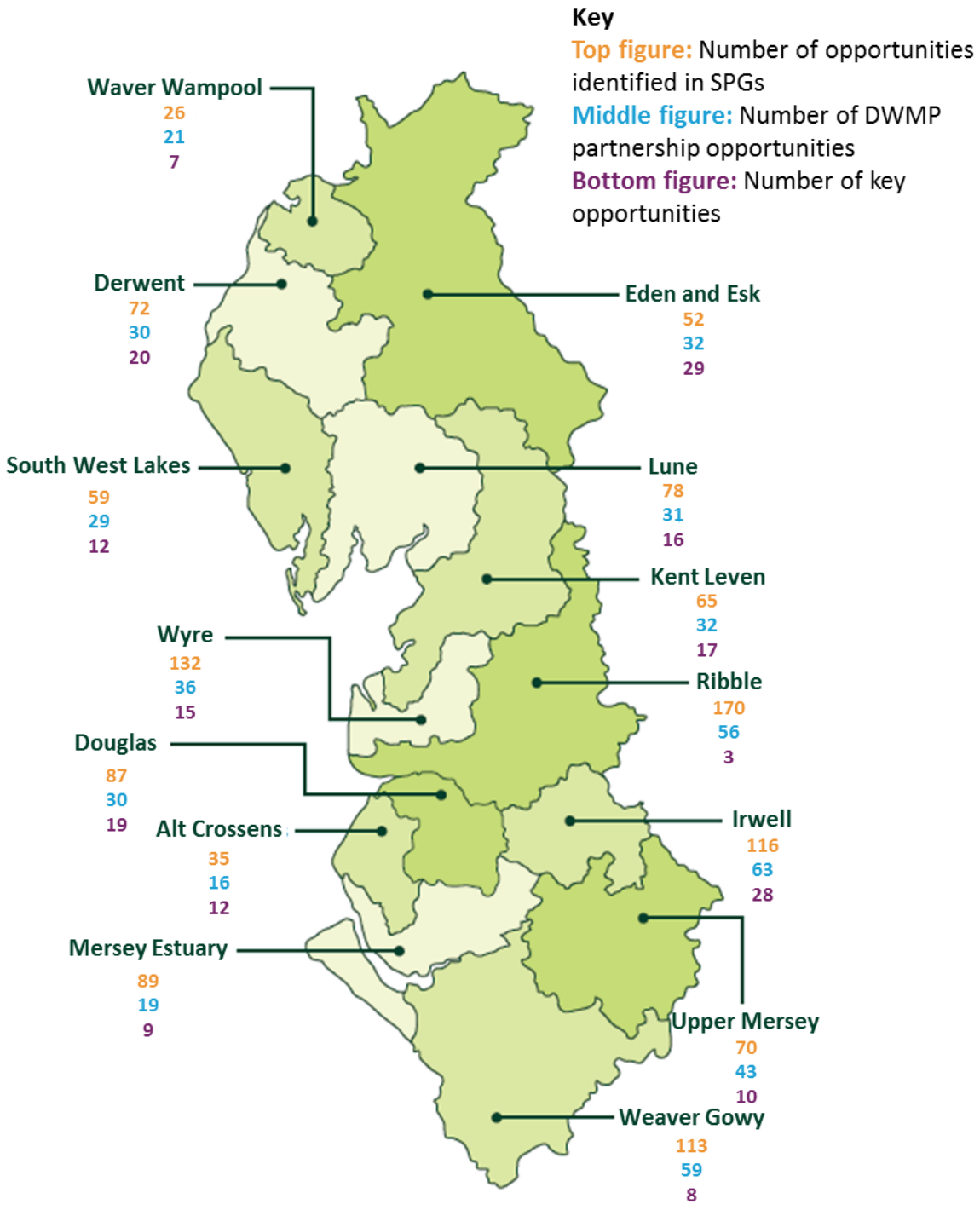
9.5.4 Throughout the development of the DWMP, we have worked closely with partners to co-create our approach to long-term planning. We have a wealth of successful partnerships already in operation focusing on a range of operational, tactical and more strategic issues. Through engagement with SPGs we have identified a number challenges in planning collaboratively for the long-term – mainly driven by uncertainty in forecasts, lack of forecasting models, short-term funding mechanisms and concern about more immediate issues.

9.5.5 Taking on board this feedback, a key focus of SPG workshops was around identifying partnership opportunities. With welcomed stakeholder input, over 1,000 potential partnership opportunities were suggested. This became the start of the partnership opportunities pipeline for the DWMP (Figure 41). 205 of these have been prioritised as linking directly to issues identified through BRAVA. This pipeline will act as a partnership solution enabler, allowing us to adapt solutions and progress further conversations about co-delivery of schemes as confidence in the need and investment is gained through investment cycle 2025 - 2030 and beyond.

9.5.6 From our experience, relationships and partnerships take time to mature and clearly define objectives. It is too early in the process to detail explicit schemes, however, we will continue to work with partners to evolve ideas into schemes which can provide demonstrable benefits to customers.

9.5.7 During the investment period 2025–2030 we aim to maximise leverage funding opportunities to deliver long-term solutions more effectively. The DWMP partnership opportunities pipeline will kick-start these conversations and allow us to target areas where we know there is an active opportunity to work with another organisation.

Figure 41 Opportunities identified through SPG workshops which form the basis of the Partnership Opportunities Pipeline



By working with other stakeholders, UUW identified hundreds of potential opportunities, these were then reviewed in the context of the BRAVA and resilience assessment findings to develop a prioritised pipeline of potential joint opportunities.

9.5.8 In addition, we will continue to build strategic relationships, such as our strategic partnership with the Rivers Trust and the trilateral partnership between Greater Manchester Combined Authority, Environment Agency and UUW. Our innovative place based planning approach, detailed in Section 3.5, will continue to develop tools alongside partners to enhance outcomes, incorporate wider social value outcomes and ecosystem services, and drive collaborative planning amongst a range of organisations.

Figure 42 Key activities of strategic partnership between the Rivers Trust and UUW

The key aims of the partnership between UUW and the Rivers Trust are wide ranging and cover a number of objectives. These include, but are not limited to developing exemplar place based plans, long-term integration of planning, positively influencing customer behaviour, improving the robustness of environmental data and building confidence in nature-based solutions.

9.6 Draft to final plan amendments

9.6.1 At the point of developing options for this plan there was an absence of guidance relating to the WINEP requirements and lack of certainty with regards to ambitions on overflows. The Government's Storm Overflows Discharge Reduction Plan consultation will run in parallel with the DWMP progressing from draft to final submissions. This draft plan has been developed with our best knowledge of guidance, and building on the constructive approach we employed to WINEP co-creation at Price Review 2019. However, we recognise that the plan will need to evolve for final DWMP submission and to support our investment plan for the 2025–2030 period.

9.6.2 In summary, we anticipate significant amendments between draft and final DWMP submission with a focus on the fuller inclusion and optimisation of:

- overflows legislation changes (including real-time monitoring requirements);
- WINEP driver guidance confirmation; and
- addition of Environment Act targets for phosphorus.

9.6.3 In addition to the inclusion of options to meet these new requirements, the plan will need to be re-optimised to ensure a fully best value plan is being presented. This could lead to shifts in the plan more widely than just these specific areas.

Consultation questions

36. Do you agree with the approach to the preferred plan based on the three components (legal obligations, performance improvements and future requirements)?

36a. If no, why?

37. Do you think that overflow improvements should be included in the preferred plan?

37a. If no, why?

38. Is there anything else you think we should have included within the preferred plan?

39. Any additional comments?

10. A summary of our preferred plan

- **In order to achieve the planning objectives, a range of different solutions will be needed alongside an adaptive approach. Our preferred plan sets out just over £3.5 billion of investment over 25 years to deliver the best value for money performance improvements against the measures in Figure 43. This plan also includes likely statutory requirements where we have reasonable certainty of these needs. The investment needs of potential storm overflow requirements have been identified separately.**
- **The preferred plan includes a range of interventions to ensure delivery of the planning objectives. A large proportion of this investment is for new assets driven by likely statutory requirements through WINEP. The second largest intervention is in upstream management (which refers to options to manage surface water e.g. SuDS).**
- **UUW is proposing a range of innovative measures such as DNM and surface water management alongside more traditional measures. We have worked with others to identify potential partnership opportunities and aim to capitalise on this in the delivery of identified interventions.**
- **Activities have been identified across all SPAs, with particularly significant investment associated with the WINEP identified in the Upper Mersey catchment in Greater Manchester.**

10.1 Introduction

10.1.1 In Section 9, we presented the building blocks that have contributed to the preferred plan. This section aims to provide an integrated view of those building blocks and provide a view of how that translates into investment across the region.

10.1.2 The preferred plan that is set out in this section is based on legal obligations (Section 9.3) and optimised activities to deliver performance improvements (Section 9.2). This totals £3,623 million of investment over the 25-year period 2025–2050, which addresses the planning objectives set out in Section 1.4.2.

10.1.3 Successful delivery of planning objectives will also depend on partnership working, innovation and legislative change. Key legislative changes which will support improvement include the implementation of Schedule 3 of the Flood and Water Management Act; reviewing the role of highway drainage as a rainwater drainage system; eliminating the use of wet wipes; and supporting public action to reduce the misuse of drains and sustainable drainage. As part of UUW's adaptive approach, we will continue to monitor the progress of these areas and adjust the plan accordingly.

10.1.4 The preferred plan includes a range of interventions to ensure delivery of the planning objectives (Figure 43). This is done by mitigating the long-term risks identified through the BRAVA. These risks vary from drainage area to drainage area. The process to select options within programme appraisal is outlined in Section 9, a summary of the options selected for the regional preferred plan is outlined below. Further detail for each SPA is included in our 14 bespoke SPA Plans (SPA_01 – SPA_14).

10.1.5 All options will need further development ahead of inclusion in the business plan for investment cycle 2025 - 2030 and, ultimately, detailed design will be required before the implementation of any scheme.

Figure 43 How activities in the plan ensure achievement against planning objectives

Planning objective	We will collect, treat and recycle wastewater in compliance with our permits, now and in the future, to protect the natural environment	We will protect, restore and improve the natural environment of the North West through our actions	We will sustainably reduce the risk of sewer flooding in the North West
Metric	Wastewater Quality Compliance Pollution Incidents	Storm Overflow Performance Environmental Obligations (WINEP)	Internal Flooding External Flooding Flooding of Open Spaces Sewer Collapses Risk of 1:50 Year Storm
Addressed by	Legal Obligations: Permit Compliance Performance Improvements	Legal Obligations: WINEP	Performance Improvements

Legal obligations – permit compliance: activities help to ensure delivery against ensuring compliance with permits by ensuring that consideration is given to the impact of growth on discharges to the environment.

Legal obligations – WINEP investment: ensures delivery against improving natural environment through ensuring environmental obligations are captured. It is anticipated that investment in this area will grow substantially following further clarification of the areas of uncertainty detailed in Section 9.4.

Performance improvements: through optimised activities ensure flood risk and pollution risk to protect the natural environment are reduced significantly.

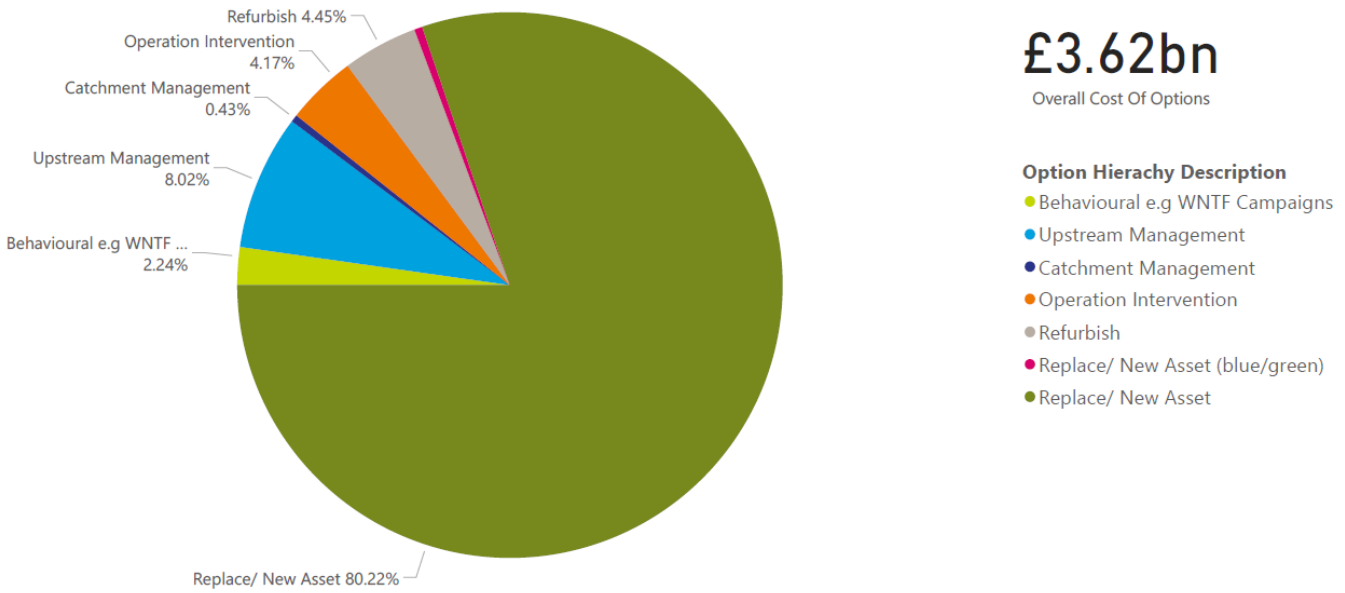
10.2 The preferred plan

10.2.1 Types of option included in the plan

10.2.1.1 Our options hierarchy, as described in Section 6.3, prioritises customer led change and sustainable natural processes. However, due to the scale of change needed, the biggest investment that will be required is in new assets (Figure 44). This is predominantly due to the scale of investment required to meet legal obligations set out in the WINEP. The majority of the investment identified is associated with meeting new permit conditions. In order to provide certainty in compliance with these standards, this almost always requires construction of additional treatment capacity and capability. Over the coming months, UUW will continue to work with the Environment Agency to ensure an optimised programme is developed and opportunities for the application of the CaBA are considered.

10.2.1.2 Requirements for storm overflows will be integrated in the preferred plan once details are clear. These requirements will be optimised with the other interventions in the preferred plan as there will likely be synergistic benefits between the overflow interventions and wider planning objectives. For the time being the potential storm overflow investment requirements have been identified separately. Our provisional view is that a potential further £18 billion may be needed to meet the Government's Storm Overflow Discharge Reduction Plan requirements, based on our understanding of them as they are currently set out in the consultation.

Figure 44 Proposed breakdown of investment by options hierarchy of likely statutory requirements and optimised activities to meet planning objectives



10.2.1.3 As described investment associated with delivering legal obligations for the WINEP predominantly requires new assets to meet new permit conditions. In delivering performance improvements and ensuring permit compliance there is much greater variety in the types of options selected. A more detailed view of the types of options selected to deliver performance improvements and ensuring permit compliance is detailed in Table 33. For most areas a blend made up of a number of different options has been selected. Option types ranked as a priority in our options hierarchy (namely, school education, customer engagement and upstream management) are each selected in over 200 TPUs. These types of interventions are all delivered more efficiently when run as wider programmes targeted as high priority TPUs.

Table 33 Intervention type breakdown for legal obligations - permit compliance and optimised activities to deliver performance improvements

Intervention type	Generic Sub-Option Reference	Description	Number of TPUs where the option is selected
School education	CM5.1	Schools programme covering issues such as the water cycle, wastewater treatment and water efficiency	211
Customer engagement	CM5.2	Targeted 'what not to flush' marketing to high risk areas	241
Dynamic Network Management (DNM)	N1.1	Implement widespread sewer and pumping station monitoring, live network modelling linked to operational responses	280
Increase drainage capacity	N2.1	Provide additional sewer or offline storage capacity	174
Sewer separation	N2.2b	Separation of existing combined sewers into foul and surface water sewer	2
Enhanced maintenance	N7.1	Pro-active and targeted maintenance programmes (including inspection – e.g. high consequence sewers)	14
Targeted sewer repair and rehab	N9.1	Targeted repair and rehabilitation of sewers	39
Upstream management (Surface water management)	SW	Surface water source control and pathway interception measures such as SuDS	256
Wastewater treatment works upgrades (blue/green)	W2.6	Additional green process streams such as reed beds	4
Wastewater treatment works upgrades	W2.n	Additional conventional process streams such as primary treatment, chemical dosing or tertiary treatment or monitoring	203
Wastewater treatment works transfers	W4.1	Replace existing treatment works and transfer flows to another treatment works (additional upgrades may be required at receiving site)	4
Permitting	W6.6	Apply to the Environment Agency for a change in permit e.g. DWF	31
Overflow treatment	W7.4	Treatment of overflow discharges to the environment e.g. reedbed	36

10.2.2 Geographic distribution of the preferred plan

10.2.2.1 As part of programme optimisation, it is important to consider the individual priorities of each SPA in addition to regional priorities. In collating a regional view of how planning objectives can be achieved, UUW has ensured that key priorities for all SPA are included.

10.2.2.2 For every SPA, a variety of different interventions are proposed, which are bespoke to that area. The regional breakdown of interventions can be seen in Figure 45 and Figure 46.

10.2.2.3 In Figure 45, the Upper Mersey catchment (Greater Manchester) stands out as an area of significant investment relative to the others regionally. The Upper Mersey is the largest SPA by population served so significant investment is to be expected. However, the large investment has also been driven significantly by the magnitude of environmental requirements anticipated in the WINEP in this area.

10.2.2.4 Figure 46 provides a view of proposed investment outside of the Upper Mersey. This highlights the wide variety of intervention types included for each area, which is predominantly made up of the optimised activities to drive performance improvements.

10.2.2.5 The geographic distribution of optimised activities to deliver performance improvements highlights the Upper Mersey, Mersey Estuary and Ribble SPAs as areas of significance. This is to be anticipated as these areas contain some of the most densely populated areas, including the conurbations of Manchester, Liverpool, Preston and Blackburn, which consequently have more sewer networks and wastewater treatment assets.

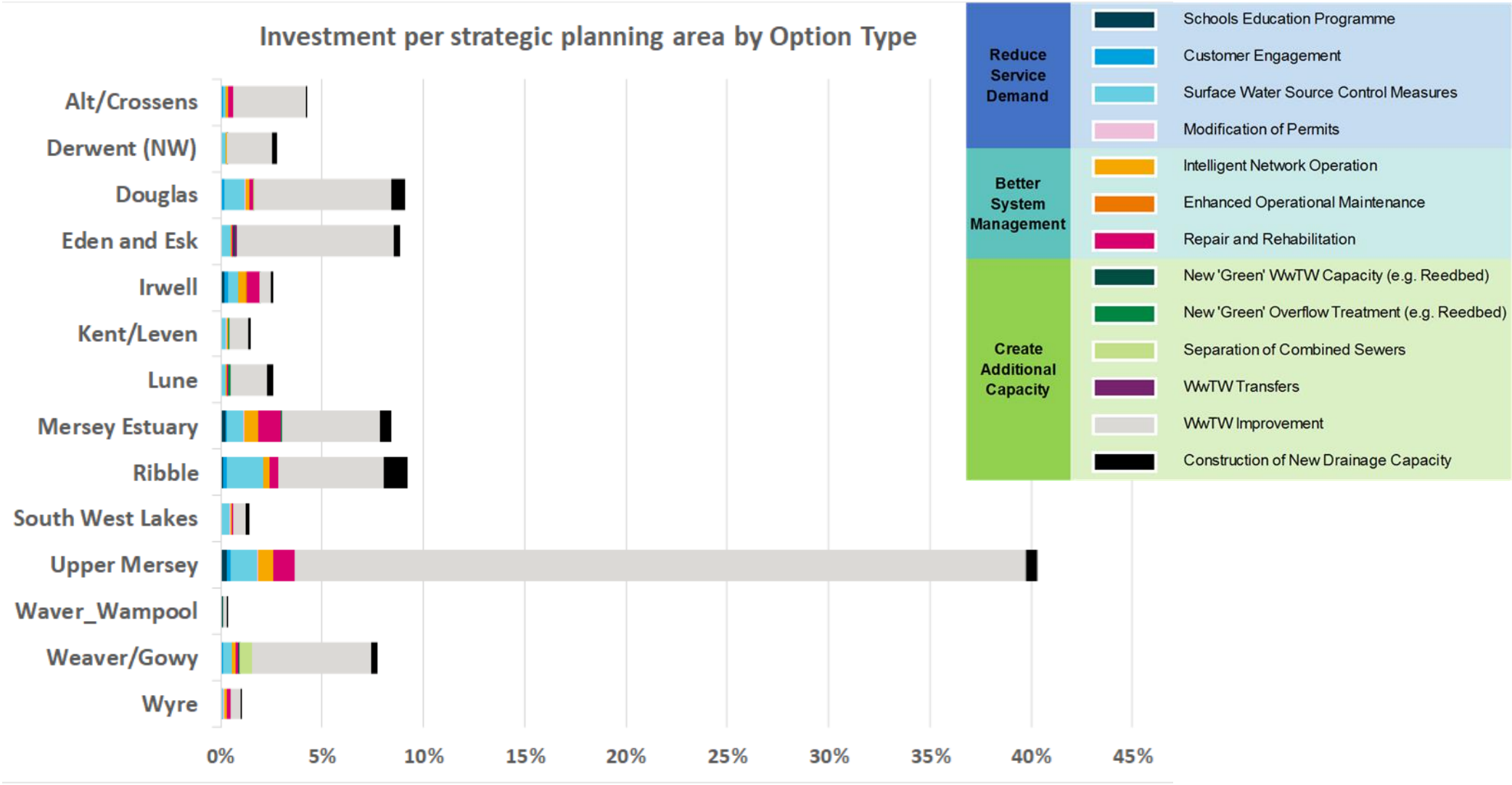
10.2.2.6 Urban areas are potentially more susceptible to being impacted by changing climate (particularly changing rainfall levels and patterns). Higher urbanisation equates to a larger proportion of rainfall (resulting from climate change) reaching the sewer network and these networks historically being combined. Therefore it is key that surface water management options feature significantly in these areas.

10.2.2.7 In this plan, over 60% of the investment identified for upstream management is in our more urban catchments of the Ribble, Upper Mersey, Mersey Estuary and Douglas (which contains the major conurbation of Wigan TPU, Figure 47).

10.2.2.8 Overall, this plan demonstrates the need for a step change in drainage capacity and capability across the North West, and across RMA responsibilities, to resolve complex cross party drainage problems and mitigate the risks of climate change. The preferred plan proposes significant investment in surface water management, which is a no regrets intervention and a core pathway activity. Over time, by following this approach there will be a change in the asset base away from the majority combined sewer system. This will provide greater resilience as systems will no longer be inundated with surface water. To successfully deliver these interventions in places will require a joint ambition from more than ourselves, for example from local authorities and the Environment Agency. UUW will continue to work with stakeholders to realise identified partnership opportunities. This will also require significant legislative reform as described in the Government's Storm Overflow Reduction Plan consultation.

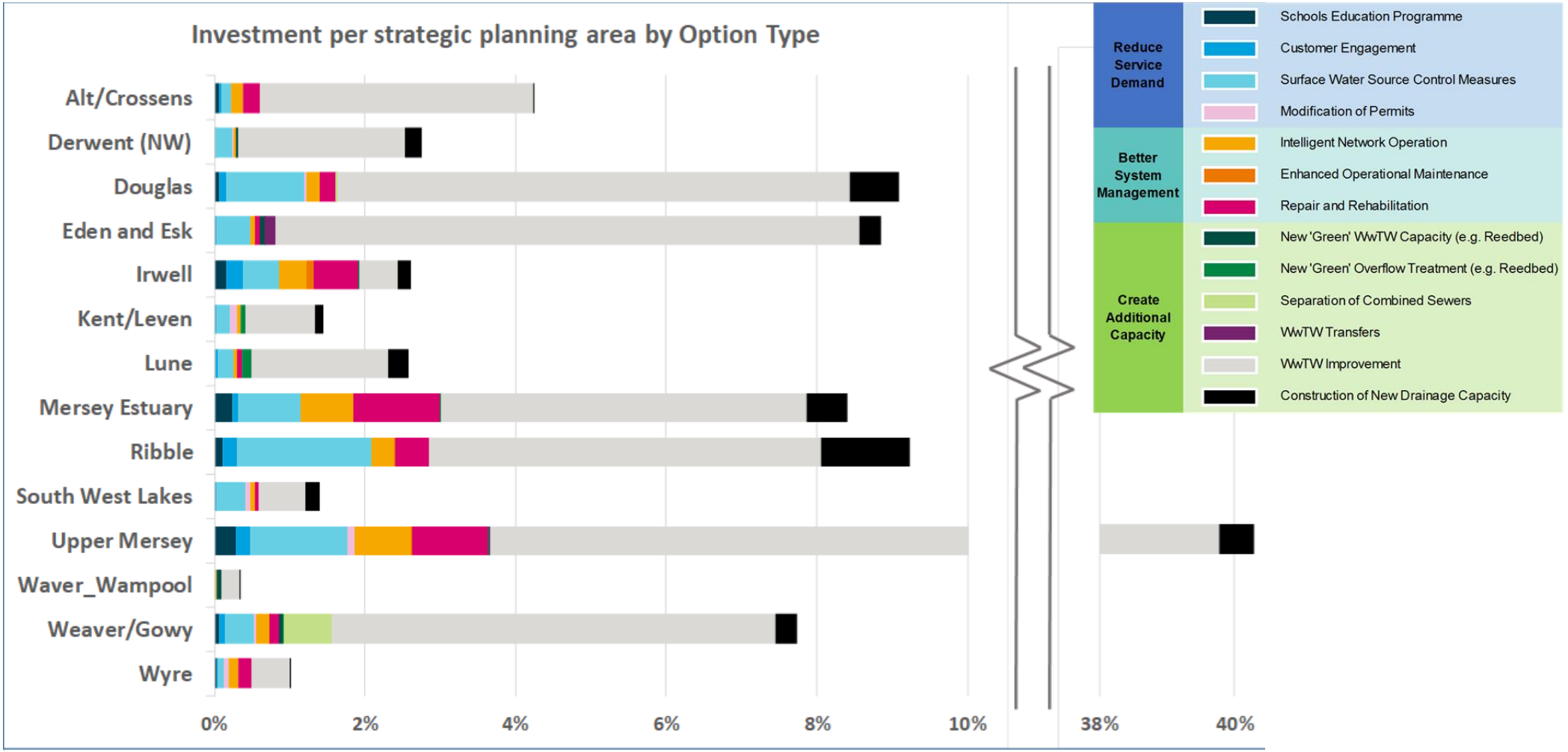
10.2.2.9 The distribution of proposed catchment management investment is more focused on rural catchments with the Kent Leven, South West Lakes and Wyre areas of particular significance (Figure 47). Despite being predominantly urban, a significant amount of proposed catchment management investment is in the Upper Mersey. This reflects the scales of the challenges in this area and the fact that UUW are piloting place-based planning here.

Figure 45 Distribution of investment per SPA by option type as a percentage of total proposed investment



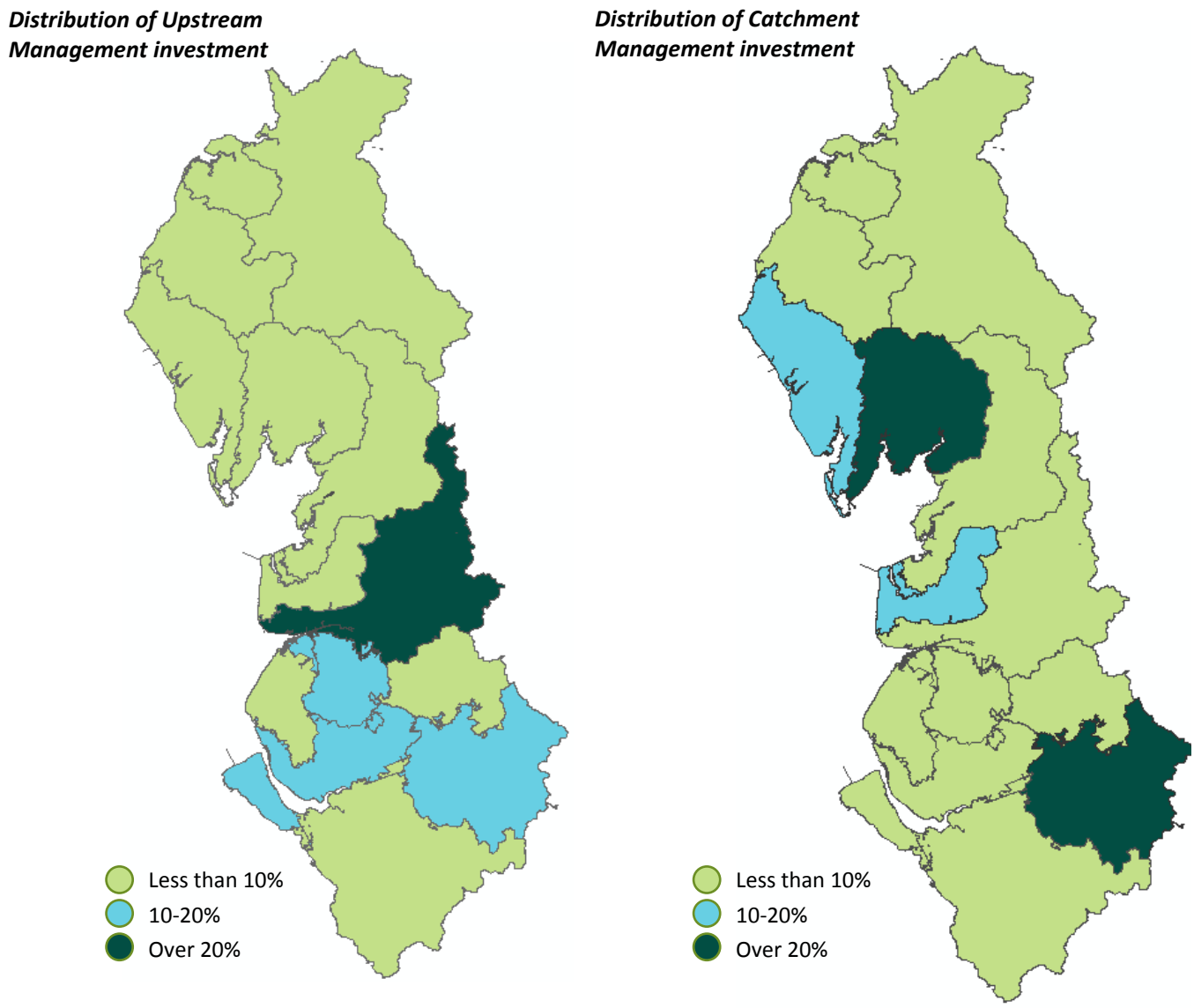
Significant investment is proposed across all SPAs. However, the Upper Mersey stands out as an area of major expenditure with over 40% of proposed investment in this area. Legal obligations associated with the WINEP are driving the majority of investment in the Upper Mersey.

Figure 46 Distribution of investment per SPA by option type, with focus on investment outside of the Upper Mersey



When focus in on proposed investment outside of the Upper Mersey, the plan contains a wide range of options to address the risks identified through the BRAVA to ensure delivery of planning objectives. This includes significant expenditure on surface water source control measures. Different combinations of options can be seen for different areas which reflects the different drivers and priorities of that area.

Figure 47 Geographic distribution of upstream management and catchment management interventions by percentage of proposed investment



Over 60% of proposed upstream management activities are in the Ribble, Upper Mersey, Mersey Estuary and Douglas SPas, which are amongst the most urban in the North West. Conversely proposed catchment management interventions are predominantly focused on more rural areas such as the Kent Leven, Wyre and South West Lakes SPAs.

10.2.3 Summary of potential overflow investment

10.2.3.1 In summary, it is anticipated that the costs to meet the expectations set out in the Government's Storm Overflow Discharge Reduction Plan consultation are detailed in Table 34.

10.2.3.2 The expenditure would not be evenly distributed across the region with the majority of expenditure in the Upper Mersey, Mersey Estuary and Irwell SPAs, which cover the major urban conurbations of Manchester and Liverpool (Figure 48).

10.2.3.3 The phasing of the expenditure would not be evenly distributed either. Using the timescales indicated in the consultation and the expectations for high priority sites an indicative phasing of the investment can be seen in Table 35.

Table 34 Potential overflow expenditure to meet expectations in the Government's Storm Overflow Discharge Reduction Plan consultation

	Cost (£m)
Ecology sub-target	1,039
Bathing Waters sub-target	1,417
Other minimum requirements – 10 spills	15,387
Other minimum requirement – screening	455
Total	**18,297**

Table 35 Proposed phasing of overflow investment to meet objectives set out in consultation

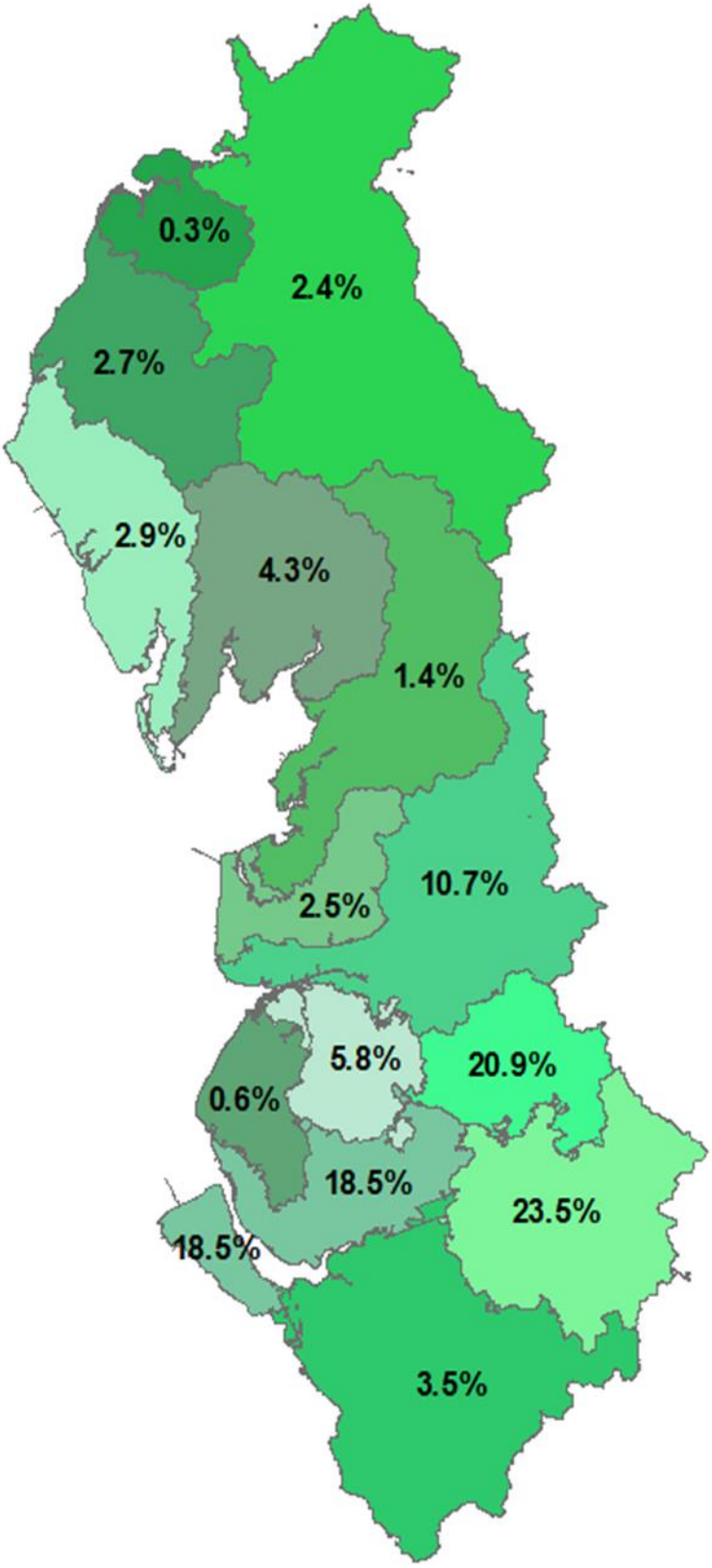
	Investment cycle				
	2025 - 2030	2030 - 2035	2035 - 2040	2040 - 2045	2045 - 2050
Future requirements – Overflows (£m)	6,287	5,130	3,802	2,783	295

10.2.3.4 The potential bill impact of investment associated with overflows expenditure detailed in Table 34 is estimated to be approximately £55 per year by 2030 for the average household, excluding the impact of inflation. The anticipated 2050 bill impact is anticipated to be approximately £144 for the average household, excluding the impact of inflation.

10.2.3.5 The costs detailed in Table 34 and Table 35 are based on individual storage solutions as the consultation was published after programme optimisation. This is unlikely to be the best value solution following optimisation. By using some of the cost unconstrained scenarios that were tested UUW has explored the potential costs of a hybrid solution to overflows of SuDS and storage. This could increase the investment required from £18.3 billion to £25.9 billion but would deliver additional natural and social capital benefits alongside increased resilience.

10.2.3.6 Between draft and final UUW will also explore the additional system costs due to the impact of upgrading multiple overflows within one TPU. Significant storage within the drainage system can have knock on implications downstream which can further increase costs as the system needs draining after a rainfall event e.g. the receiving wastewater treatment works has to be upsized to treat more flows. To understand the potential cost implications of this we have calculated a drain down factor based upon additional storage at the treatment works to manage the returning flows from new storage in the network. When applied across the region the potential costs at wastewater treatment works to drain down the additional storage is in the region of £1.8 billion in addition to the costs in Table 34.

Figure 48 Proportion of total overflow investment by SPA to ensure an average spill frequency of no more than ten spills by 2050



10.3 Overall bill impact

10.3.1 Introduction

10.3.1.1 While understanding of some areas of the plan are likely to evolve between draft and final UUW has carried out bill impact assessments on the most certain costs of each of the components contained within this document. The overall bill impact for the investment cycle 2025 - 2030 will be determined through PR24.

10.3.1.2 This section summarises the potential bill impacts referenced within this document.

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

10.3.2 Summary of bill impact

10.3.2.1 The overall bill impact for each of the components is summarised in Table 36.

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

Table 36 Summary of potential bill impacts

Component	Total enhancement expenditure (£m)	2030 bill impact (£)	Anticipated 2050 bill impact (£)
Legal obligations – Permit compliance	709	5.90	6.47
Legal obligations – WINEP	1,898	17.12	19.01
Performance improvements – Optimised activity	737	3.29	6.26
Future requirements – Overflows	18,297	55.38	144.88
Total	**21,641**	**81.69**	**176.62**

10.4 Case study of SPA plan

10.4.1 Introduction

10.4.1.1 This section provides examples of information available in the 14 SPA documents and how the preferred programme would be implemented in this area over the next 25 years.

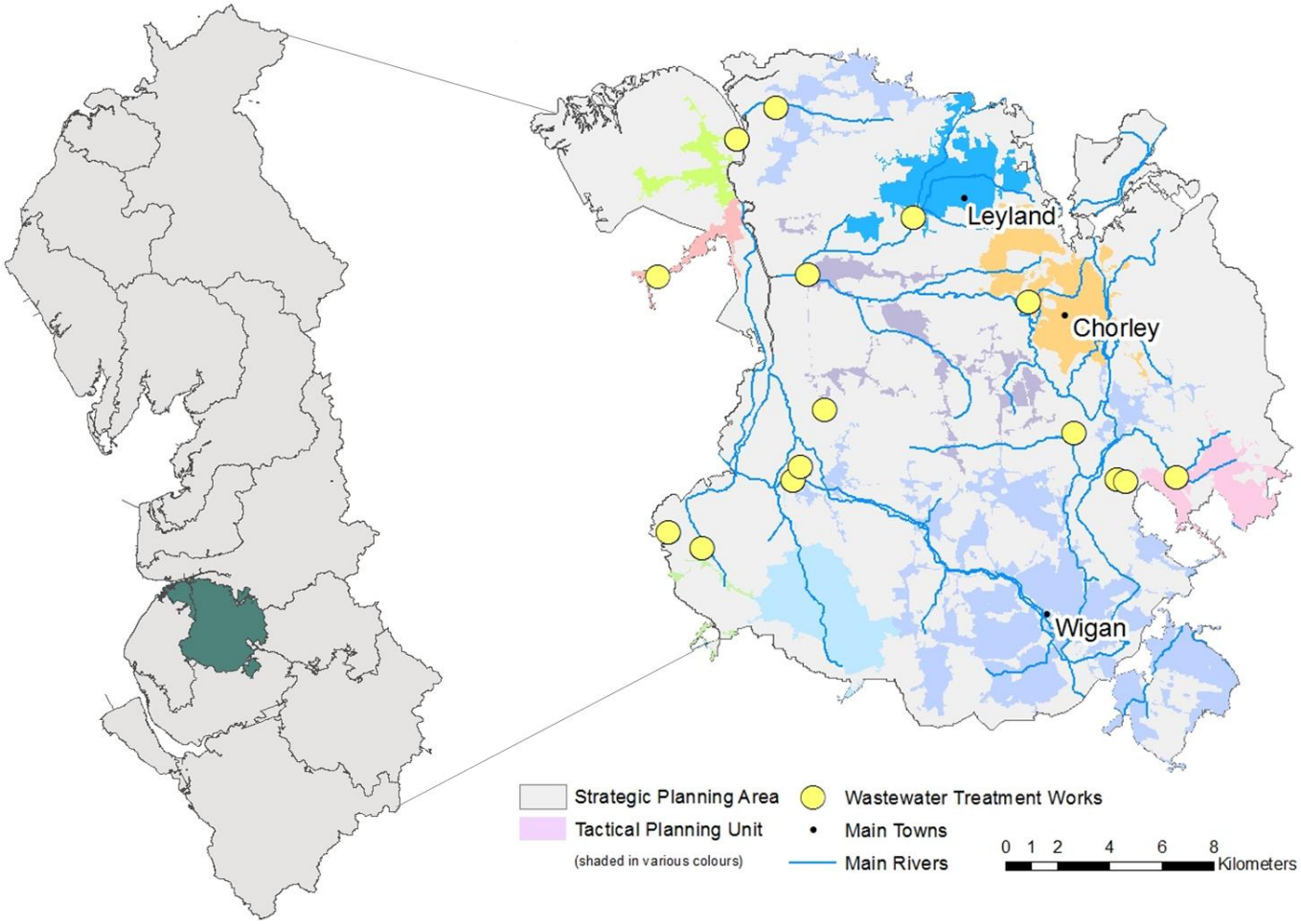
10.4.1.2 Within these documents we set out for consultation the risks identified in the area and the proposed approach to addressing that risk.

10.4.1.3 As with earlier sections this information was developed prior to the consultation on the Government's Storm Overflow Discharge Reduction Plan. Therefore, potential investment required to meet requirements set out in the consultation are not captured in these documents.

10.4.2 Case study: Douglas SPA

10.4.2.1 The Douglas SPA is located in the centre of the UUW region (Figure 49) and is made up of a range of urban conurbations (including Wigan) and agricultural land. Following analysis of the current and future risk a number of potential issues were highlighted in this SPA, particularly regarding flooding.

Figure 49 Map of the Douglas SPA



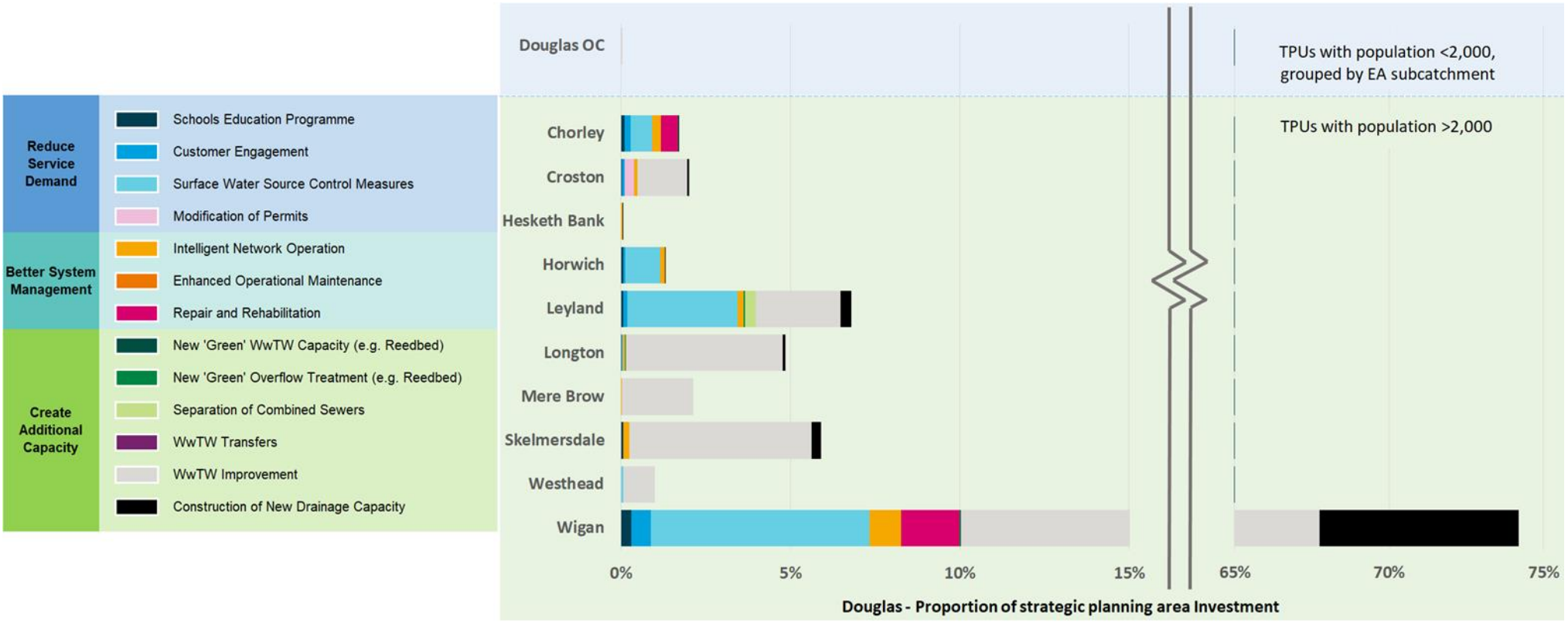
The Douglas SPA contains 15 TPUs, Wigan is the largest of these shown by a mid-blue colour.

10.4.2.2 Further details of the risks identified through RBCS and BRAVA can be found in the Douglas SPA Plan (SPA_03).

10.4.2.3 Thousands of potential options were considered for the Douglas as part of options development before selection of preferred options. The breakdown of the selected options can be seen in Figure 50.

10.4.2.4 For ease of communication, investment has also been broken down for stakeholders as environmental (activities which support delivery of planning objectives for treating wastewater and protecting the natural environment) and flooding (Figure 51 and Figure 52). This allows stakeholders to better understand areas which matter to them.

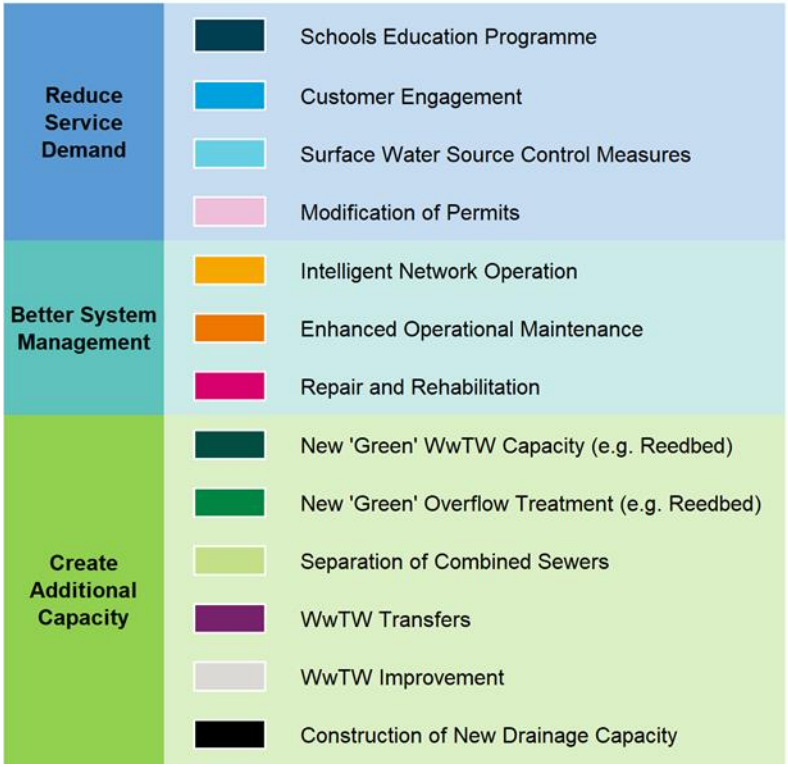
Figure 50 Summary of proposed interventions in the preferred plan for the Douglas TPU

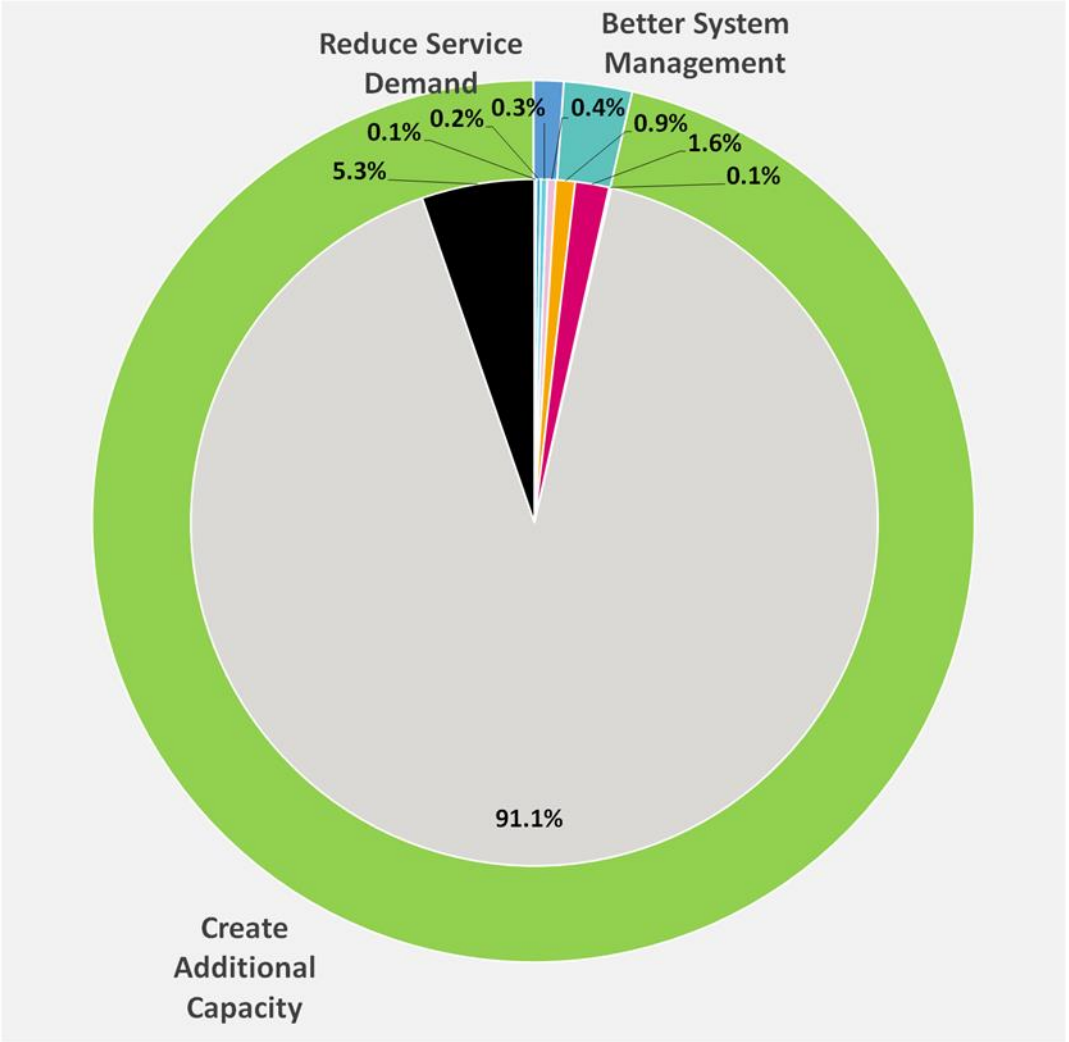


A range of options are selected in Wigan, to meet environmental drivers and to reduce the flood risk. The delivery of these options will be phased over the duration of the plan.

Figure 51 Douglas SPA: Distribution of environmental investment by option type

This is an example of how investment in different options types may be used to address the environmental planning objectives. The vast majority of potential investment could be through improvements in wastewater treatment works. This chart does not show planned investment in improving overflow performance as these are not based on cost beneficial assessments.



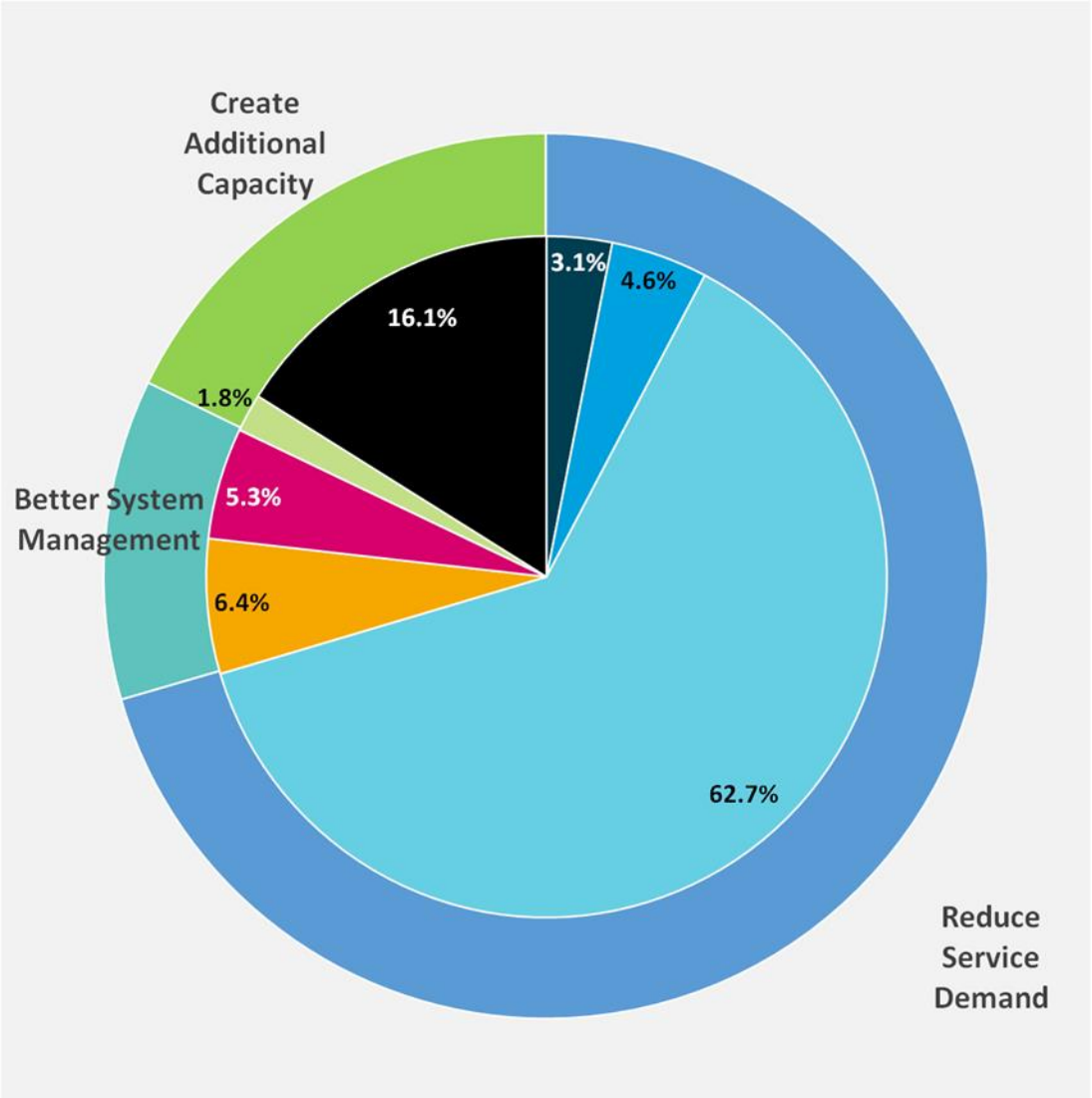


The majority of environmentally driven investment proposed in the Douglas is associated with meeting anticipated WINEP requirements in Wigan.

Figure 52 Douglas SPA: Distribution of flooding investment by option type

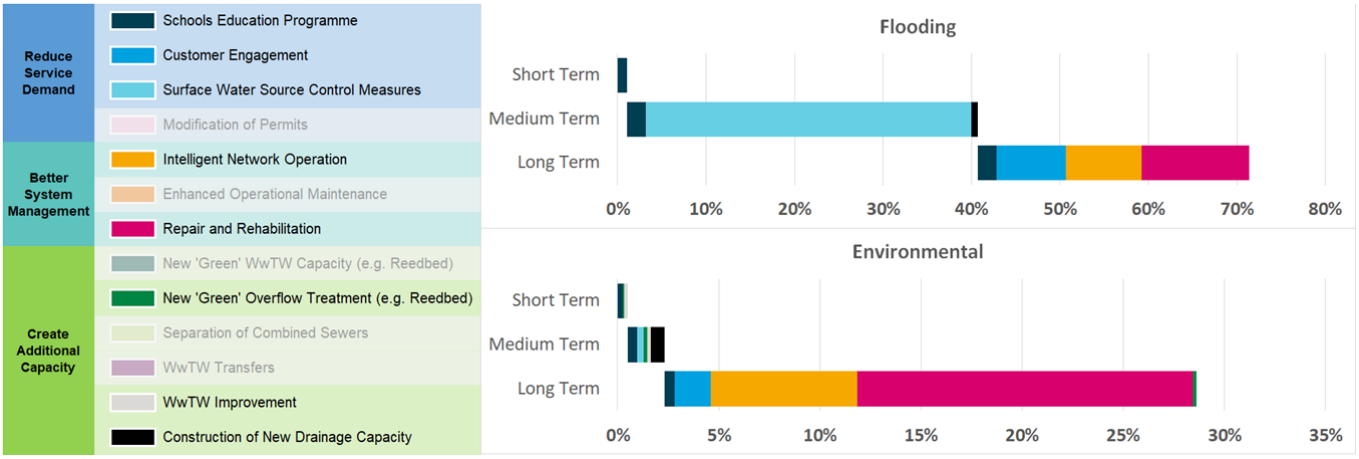
This is an example of how different options types may be used to address flooding planning objectives. Almost two thirds of the investment could be through a stratgey to reduce demand on the sewer system, seen here through surface water source control measures such as SuDS, and schools and customer engagement programmes.

Around 12% of investment could be in improving existing system management, and 18% of the investment could be in the construction of new stormwater storage capacity, including the separation of combined sewers.



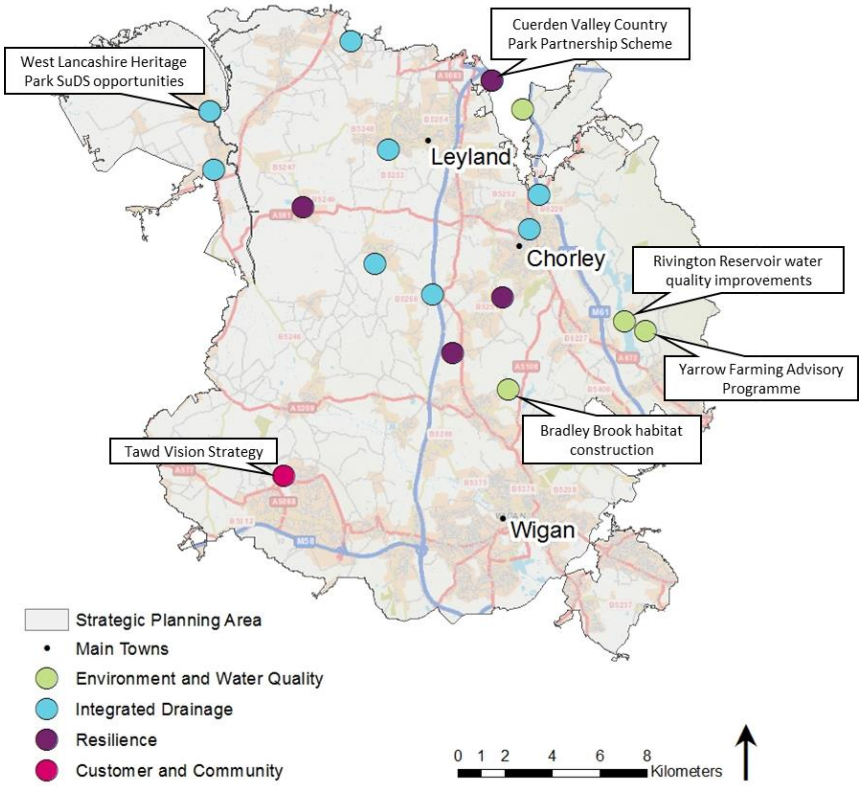
10.4.2.5 More granular detail is also available at a TPU level, including indicative phasing of proposed investment (Figure 53). For example, in Chorley, where the predominant long-term issue identified is flood risk, an education programme is initially proposed to try and reduce the risk. If further improvements are needed this would be supported with surface water source control measures.

Figure 53 Short, medium and long-term investment in Chorley TPU, distributed by option type



10.4.2.6 Potential partnership opportunities are also identified. These have been developed through the SPGs. Eighty-seven opportunities were initially identified, these were then filtered down to 30, which form the basis of the partnership opportunities pipeline in this area. Of these, 19 have been identified as priorities for further development (Figure 54).

Figure 54 Priority partnership opportunities in the Douglas identified through the SPG



A number of potential opportunities with partners have been identified as having the potential to deliver joint benefits. The opportunities mainly fall into four main categories.

Consultation questions

40. Do you think that the preferred plan adequately address risk across the North West?

41. Do you agree that the success of the plan depends on partnership working, innovation and legislative change?

42. Do you agree with the preferred plan intervention types?

42a. If no, why?

43. Do you agree with the risk-based approach to permit compliance?

44. The preferred plan demonstrates the need for a step change in drainage capacity and capability through significant investment in surface water management. Do you agree that this is a reasonable intervention to focus investment?

45. Any additional comments?

11. Concluding summary

- **UUW has taken a robust approach to the development of the draft DWMP.**
- **The draft plan set out in the document would enable significant performance improvements to achieve the original planning objectives.**
- **There are a number of external factors which could have a material impact on the plan including the recent consultation on the Government's Storm Overflow Discharge Reduction Plan.**
- **An adaptive approach is, therefore, critical to delivering long-term resilience to drainage and wastewater services in the North West.**

11.1 Process

11.1.1 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 Environment Agency (February 2022)[5];
- We have demonstrated throughout the development of the draft 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 draft 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.

11.1.2 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 its view will be particularly material:

- the Government's Storm Overflow Discharge Reduction Plan is currently out to consultation with new scenarios and some areas of considerable uncertainty, for example around the assessment of ecological harm, which underpins initial phases for overflow reductions. While we are able to give a quantum of what this policy would require for draft DWMP, re-assessment between draft and final DWMPs is needed to assess and optimise requirements into the planning process (also dependant on the final outcome of the consultation on the overflow reduction plan);
- there have been significant delays to WINEP drivers, which also impact on the overall DWMP process in terms of possible interactions between WINEP drivers and other wastewater needs, and the time available for option development has been constrained; and
- delivery of the needs set out in the DWMP delivery is dependent on separate future Price Reviews processes, requires partnership working into the future and future regulatory reform is needed (for example, those set out in the consultation on the Government's Storm Overflow Discharge Reduction Plan). Uncertainties around future regulatory reform and partnership opportunities are particularly note-worthy:
  - 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

[5] Guiding principles for drainage and wastewater management plans. Accessed at: https://www.gov.uk/government/publications/drainage-and-wastewater-management-plans-guiding-principles-for-the-water-industry/guiding-principles-for-drainage-and-wastewater-management-plans

– similarly, the nature, timing and impact of regulatory reforms will be critical to sewerage infrastructure performance and the cost and deliverability of improvements.

11.2 Planning objectives

11.2.1 The preferred plan delivers against progress towards our planning objectives with four of our six key metrics forecast to be met: internal flooding, flooding open spaces, 1 in 50-year flooding and sewer collapses. Potential over achievement is forecast for these targets, resulting from the integrated nature of drainage – options to resolve risk in one performance area often have numerous secondary benefits to other parts of the system.

11.2.2 Two of our objectives, external flooding and pollution, have proved challenging to meet in a cost effective manner. These 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 should be capable of substantially closing the gap in these planning objectives by 2050.

11.2.3 To ensure wastewater treatment compliance into the future, the plan has identified significant potential expenditure for a small number of wastewater treatment works due to likely future permit changes and growth. The expenditure profiled is based on best assessments of likely regulatory requirements, however, short and long-term uncertainty around the WINEP will necessitate changes between draft and final DWMP.

11.2.4 Similarly, storm overflows performance still requires finalisation of the Defra Storm Overflow Reduction Plan requirements before we can optimise this within our overall plan. The analysis we have carried out has indicated expenditure in this area could be significant and continued engagement on the matter with both regulators and customers will be paramount in agreeing the approach.

11.3 The future

11.3.1 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 to fully meet planning objectives and outcomes in some instances, 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.

11.3.2 Where uncertainty exists, we have identified this and outlined our approach to manage the uncertainties. We have also set out the actions required to be completed between draft and final DWMPs, in addition to acting on the feedback we receive through the consultation process.

11.3.3 The plan outlined within the draft 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.

11.3.4 UUW believes that the DWMP submission is of high quality and, as an iterative and adaptive process, can form the basis of our enhanced wastewater planning now and into the future.

Consultation questions

46. Overall, I believe that the draft DWMP is of high quality and meets the requirements of the DWMP planning process?

47. What did you like about the draft DWMP?

48. Having reviewed the draft DWMP are there any other specific areas that you consider should be a priority for improvement?

49. Are there any specific ways in which you prefer to be engaged or contacted as we develop the plan, including any ideas for collaboration that we could consider?

50. Any additional comments?

12. Environmental Assessments

- **UUW are undertaking 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.**

12.1 Introduction

12.1.1 This section sets out the work undertaken to understand the environmental effects of the plan. This incorporates the Strategic Environmental Assessment (SEA), Habitats Regulation Assessment (HRA) and a Water Framework Directive (WFD) Assessment.

12.2 Strategic Environmental Assessment (SEA)

12.2.1 Introduction

12.2.1.1 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.

12.2.1.2 UUW is considered a planning authority for the purposes of the SEA Regulations. As the first iteration of publication of the DWMP is not a statutory plan, there is, therefore, no regulatory requirement for UUW to undertake an SEA.

12.2.1.3 However, taking into account the purpose of a SEA, it is concluded that even though a SEA is not a regulatory requirement, it should be undertaken in order to strengthen the DWMP plan development process.

12.2.1.4 The outputs from the SEA can be found in the draft DWMP Strategic Environmental Assessment (SEA): Environmental Report (C004).

12.2.1.5 The purpose of the SEA of the draft DWMP will be to:

(1) identify the potentially significant environmental effects (adverse and beneficial) of the draft plan in terms of the drainage and wastewater management options being considered;

(2) help identify appropriate measures to avoid, reduce or manage adverse effects and to enhance beneficial effects associated with the implementation of the draft plan wherever possible;

(3) give the statutory SEA consultees, stakeholders and the wider public the ability to see and comment upon the anticipated effects that the draft plan may have, and encourage them to make responses and suggest improvements to the draft plans; and

(4) inform the selection of drainage and wastewater management options to be taken forward into the final version of the plan.

12.2.2 Key SEA issues relevant for the DMWP

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

12.2.2.2 A framework of assessment criteria relating to the key issues relevant to DWMP has been developed and is outlined in Table 37. 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.

Table 37 SEA assessment framework for the draft DWMP

Topic	DWMP SEA assessment criteria
Biodiversity, Flora and Fauna	To protect, restore and enhance biodiversity, including designated sites of nature conservation interest and protected habitats and species, enhance ecosystem resilience, habitat connectivity and creation and contribute to the sustainable management of natural habitats and ecosystems
Soils, Land Use and Geology	To protect and enhance soil quantity, quality and functionality and geodiversity and ensure the appropriate and efficient use of land
Water – Quantity and Quality	To protect and enhance the quality and quantity of surface and groundwater resources
Water – Flood Risk	To reduce or manage flood risk
Air	To minimise emissions of pollutant gases and particulates and enhance air quality
Climatic Factors	To reduce greenhouse gas emissions
Climatic Factors	To adapt and improve resilience to the threats of climate change
Population	To promote a sustainable economy and maintain and enhance the economic and social well-being of local communities
Human Health	To protect and enhance human health and well-being
Material Assets - Water Resources	To promote and enhance the sustainable and efficient use of resilient water resources
Material Assets – Waste and Resource Use	To minimise waste, promote resource efficiency and move towards a circular economy
Cultural Heritage	To conserve and enhance the historic environment including the significance of heritage assets and their settings and archaeological important sites
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity

12.2.3 Assessment methodology

12.2.3.1 The effects of the draft DWMP are assessed in a staged process, complementary to the development of the plan, and reflecting the decision making requirements, as follows:

(1) high-level interventions to address planning objective per drainage area will be considered with environmental constraints identified, assessed and implications for mitigation identified, drawing where appropriate from other assessments (such as the WRMP24 where interventions are common between plans, e.g., behavioural change);

(2) preferred programme of interventions per identified drainage area, combining generic and location specific options with a particular focus on the complex and strategic locations. This will ensure that the effects of the draft Plan have been identified, described and evaluated; and

(3) alternative plan assessments if alternative plans or plan pathways are identified for the draft DWMPs, the cumulative effects will be identified, described and evaluated for consideration along with the preferred plan. It is assumed that the alternative plans will comprise alternative selections of options that have already been assessed.

12.2.3.2 Scoring for each stage of the assessment is undertaken using a matrix as outlined in Table 38 and Table 39.

Table 38 Example SEA Interventions Assessment Matrix using scoring outlined in Table 39

Option	Stage	Biodiversity	Geology and soils	Water quality and quantity
Option name	Construction (negative)	–	–	0
	Construction (positive)	0	0	+
	Operation (negative)	-/?	0	0
	Operation (positive)	+	?	+++

Construction

A description of the likely significant effects of the option under consideration on the SEA objectives during construction has been included here.

Operation

A description of the likely significant effects of the option under consideration on the SEA objectives during operation has been included here.

Table 39 SEA scoring system

Score	Description	Symbol
Major positive effect	Significant positive effect of the option/intervention on this objective	+++
Moderate positive effect	Moderate positive effect of the option/intervention on this objective	++
Minor positive effect	Minor positive effect of the option/intervention on this objective	+
Neutral	Neutral effect of the option/intervention on this objective	0
Minor Negative Effect	Negative effect of the option/intervention on this objective	-
Moderate Negative Effect	Moderate effect of the option/intervention on this objective	--
Major/Significant Negative Effect	Significant negative effect of the option/intervention on this objective	---
Uncertain	The option has an uncertain relationship to the objective or the relationship is dependent on the way in which the aspect is managed. In addition, insufficient information may be available to enable an assessment to be made.	?

12.2.3.3 The full assessment methodologies for each stage of the process is detailed in the draft DWMP Strategic Environmental Assessment (SEA): Environmental Report (C004).

12.3 Habitats Regulation Assessment (HRA)

12.3.1 Introduction

12.3.1.1 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.

12.3.1.2 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.

12.3.1.3 The HRA aims to determine whether there will be any 'likely significant effects' on any European site[6] 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'.

12.3.1.4 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.

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

12.3.2 Assessment methodology

12.3.2.1 Options are initially reviewed to determine whether a 'screening' type assessment can be reasonably undertaken, or whether such an assessment would be largely speculative. For sites classified as 'complex' or 'strategic', the assessments aim to identify the location and the anticipated outcomes of each option.

12.3.2.2 A broader 'European site led' assessment at a catchment level has been undertaken for 'standard' TPUs. Many options are not stand alone, so consequently the assessment identifies European sites potentially exposed to the catchment-scale effects of the option blends being considered.

12.3.2.3 The possible effects of each option on European sites and their interest features are assessed, based on:

(1) the anticipated operation of each option and predicted zone of any hydrological influence;

(2) any predicted construction works required for each option;

(3) the European site interest features and their sensitivities; and

(4) the exposure of the site or features to the likely effects of the option (i.e. presence of reasonable impact pathways, taking into account species mobility and functional habitats).

12.3.2.4 The HRA applies all of the normal principles and practices associated with 'HRA screening' but will also take account of the deliverability of the options or option mix including potential mitigation opportunities. The review assumes that normal best-practice project level planning, avoidance and mitigation measures will be employed at project delivery.

12.3.2.5 The HRA review considers implementation and operational effects and, where appropriate to the option, decommissioning.

[6] Sites designated under the Habitats and Birds Directive and Ramsar sites (SACs, SPAs and Ramsar and their candidates).

12.4 Water Framework Directive (WFD) Assessment

12.4.1 Introduction

12.4.1.1 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 February 2016 and are anticipated to be updated in September 2022.

12.4.1.2 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.

12.4.1.3 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.

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

12.4.2 Assessment methodology

12.4.2.1 A source-pathway-receptor approach to identifying effects on WFD Assessment Objectives has been undertaken. Using this approach, the source of change refers to the construction or operational activity. The pathway includes physical environment changes such as water quality variation, flow velocity/rate of discharge, etc. The receptor is the WFD status element or the WFD protected area.

12.4.2.2 Water quality changes are often associated with river flow reductions as a result of the change of dilution of water quality pressures. Existing known pressures are listed by the Environment Agency/Natural Resources Wales' Reasons for Not Achieving Good (RNAG) datasets and these are reviewed within the assessment.

Consultation questions

51. Do you think that the Environmental Report has correctly identified the likely significant effects of the draft DWMP?

51a. If not, what other significant effects do you think we have missed, and why?

52. Do you agree with the conclusions of the Environmental Report and the recommendations concerning the mitigation and enhancement of significant effects?

53. Do you agree with the proposed arrangements for monitoring the significant effects of the implementation of the DWMP?

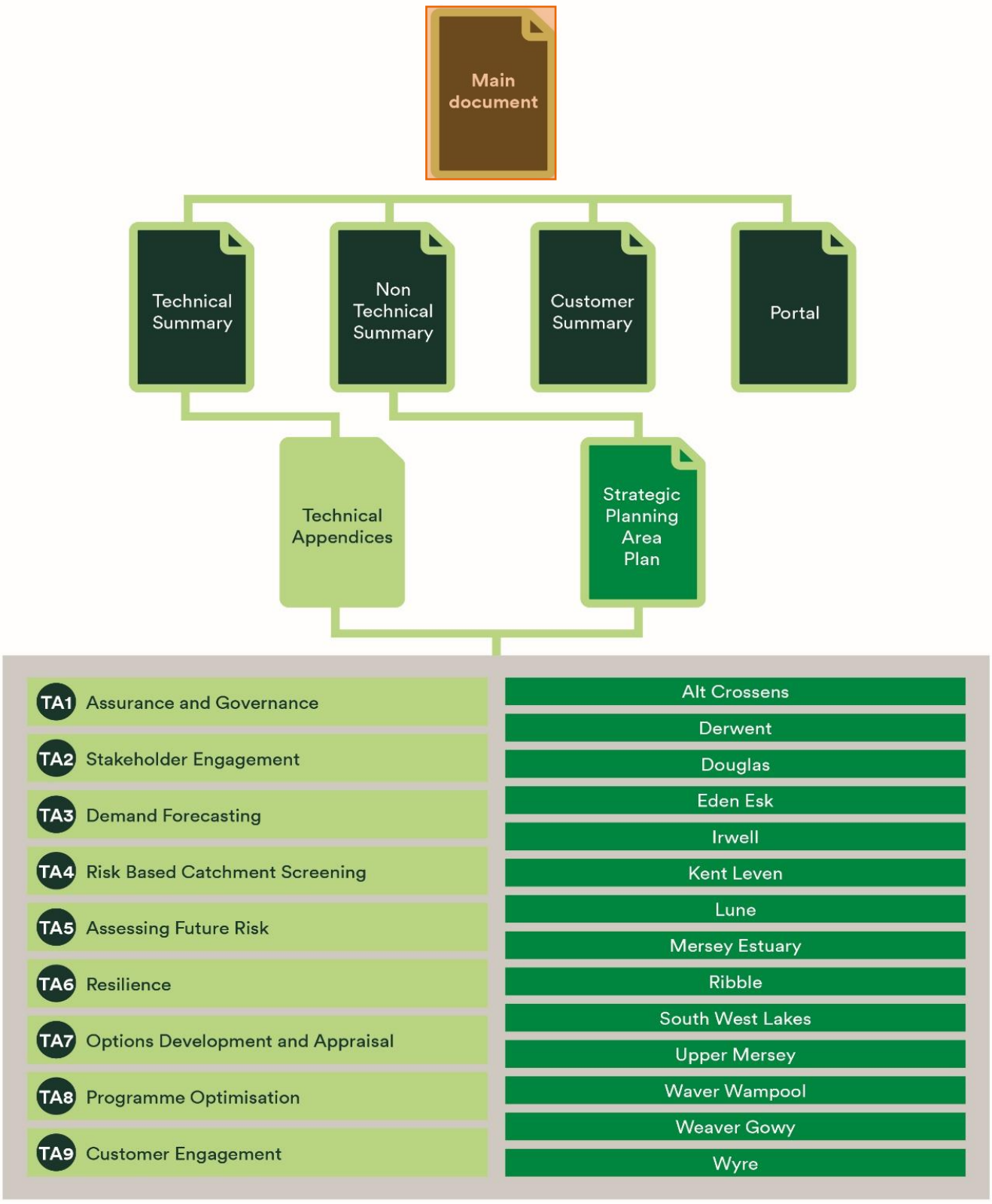
53a. If not, what measures do you propose?

54. Any additional comments?

Appendix A

An overview of UUW DWMP documents published for consultation.

Figure A1 Full suite of documents making up draft DWMP



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