

Drainage and Wastewater Management Plans

Level 1 Non-Technical Report
Draft DWMP (June 2022)



WONDERFUL ON TAP

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Introduction

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We take our responsibility seriously to ensure that our wastewater assets continue to safely take away the water we flush down the sewers and can cope with the rainwater that falls on our roofs and streets. Over decades we have developed tools to understand the risks and improvements needed to ensure our assets can cope with the challenges in the future. Climate change, population growth and urban creep are all forecast to increase this risk over the coming years, meaning that flooding will affect more customers, more frequently, with greater severity which will have knock on impacts to the environment and service levels for our customers. In fact, flood risk is third on the UK national risk register^[1], surpassed only by the risk of a pandemic and large scale CBRN (Chemical,

Biological, Radiological and Nuclear) attacks. There are several complex interactions between our assets and systems and the role of other authorities such as local councils, highways authorities, developers and it is important that we take a collaborative and long-term approach to sharing information and identifying the best way to meet the future challenges.

The combination of high risk and complex share of responsibilities is why Defra published a strategic framework, finalised in February 2022^[2] for all water companies to follow. The framework standardises the process for evaluating the risks and developing plans to ensure the sustainability of drainage infrastructure and the services it provides.

What is a DWMP

The national framework for the Drainage and Wastewater Management Plan (DWMP), sets the challenge for water companies to work collaboratively and develop ambitious, long-term plans. It recognised that if the water industry is to meet future pressures associated with climate change, population growth and urbanisation in an affordable way, a step change is needed to improve how we work together. There are often interactions with wider drainage systems including rivers, surface water management and groundwater which is the responsibility of other risk management authorities such as the Environment Agency, Lead Local Flood Authorities (LLFA), local and district councils (where they are not the LLFA), Internal Drainage Boards and Highways Authorities. By following common guiding principles and then sharing our understanding of these risks, and discussing them with the communities we serve, we can collaborate to identify the choices we have and how they may interact with others to achieve a best value plan for delivering a multi benefit, sustainable and affordable wastewater service. A collaborative and aligned plan then facilitates the co-design and creation of solutions which are designed for and with the communities who live in them.

The scope of the DWMP is not to provide detailed scheme level solutions, such as which assets need to be replaced to alleviate property level flood risk or accommodate new development. Instead, it will provide visibility of the current and future challenges and what strategic interventions are best to mitigate the future pressures and to understand views on the appropriate pace of investment to meet the long term aims. It is underpinned by a desire for greater transparency and consistency across the industry to drive future investment decisions whilst balancing competing needs.

¹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/952959/6.6920_CO_CCS_s_National_Risk_Register_2020_11-1-21-FINAL.pdf

² <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>

1.1 Why are we consulting on our Draft DWMP?

To prepare for future challenges and ensure our communities are resilient, we need a collaborative approach. Through this consultation we aim to continue the conversation and seek a broad range of views for three main aims:

1. To improve the rigour and completeness of our application of the guiding principles and therefore our understanding of the current risks and the future challenges. This will help us to develop a plan that ensures we can extend, improve, and maintain a robust and resilient wastewater system for our customers;
2. To help us identify the best value plan for the next five years that puts us on the right trajectory to meet the long term aims and also provide both value for money and consider wider societal benefits; and
3. To get feedback on the way we plan to monitor performance and risks and how we could share information to ensure we can adapt to changing circumstances and priorities and ensure our DWMPs remain live and relevant for our catchments and communities. This is particularly important as it is the first planning cycle and we must continually improve all key aspects – ranging from the rigour of the analysis, understanding and articulation of the risks, the value of the benefits of the interventions we make (including those made by others) and the effectiveness of our engagement.

The feedback we get from this consultation will inform our long-term plan and help us prioritise the investment needed to achieve the best value plan for the next five years to ensure we remain on the right long term trajectory. This five year slice of the long term plan will form part of our 2025-2030 price review submission to Ofwat in October 2023.

1.2 Consultation questions

This is our draft plan, we have put forward our proposal for the long term, your views are important to us. We welcome feedback on any aspect of the first cycle of our DWMP and we will be hosting a number of customer and stakeholder events to provide as many opportunities as possible to engage with us. More detail about the next steps is provided in section 11, but here is a summary of the questions / statements that we would like you to think about whilst reading through our Draft DWMP documentation

Questions

1. Do you agree Severn Trent Cycle 1 DWMP represents a fair interpretation of the DWMP framework?
2. Do you agree with the strategic priorities and pace set out by Severn Trent?
3. Do you agree the planning scenarios used represent a fair assessment of likely future?
4. Do you support the ambition of zero properties being at risk of being flooded internally with sewage, which would cost all households £2.12 per year, with the bill being £53 higher by 2050?
5. Would you prefer less ambition on flooding risk, with around 145,000 properties remaining at risk of internal sewer flooding, costing £0.63 per year, with the bill being £16 higher by 2050?
6. Do you support the ambition of each Storm Overflows only discharging into the environment a maximum of 10 times per year, which would cost all households £0.51 per year, with the bill being £13 higher by 2050?
7. Would you prefer less ambition, with each Storm Overflows discharging into the environment a maximum of 20 times per year, which would cost all households £0.2 per year, with the bill being £5 higher by 2050?
8. Do you agree with outperformance of statutory minimum requirements particularly for the benefit of environmental quality?
9. Do you agree that Severn Trent should place a greater emphasis on Blue/Green (nature based solutions) and the use of partnership activities to solve future challenges over more traditional increases in asset capacity?
10. Please rank these areas of investment in order of priority for you, Water quality, Flood risk reduction, Habitat creation, Carbon, Source separation.
11. Do you support the draft plan proposed by Severn Trent?
12. How would you prefer us to engage with you in the future?

1.3 How to navigate this consultation

We want a wide range of stakeholders and customers to engage so we have structured it in a way that aims to enable people to access the information at the level of detail that suits them.

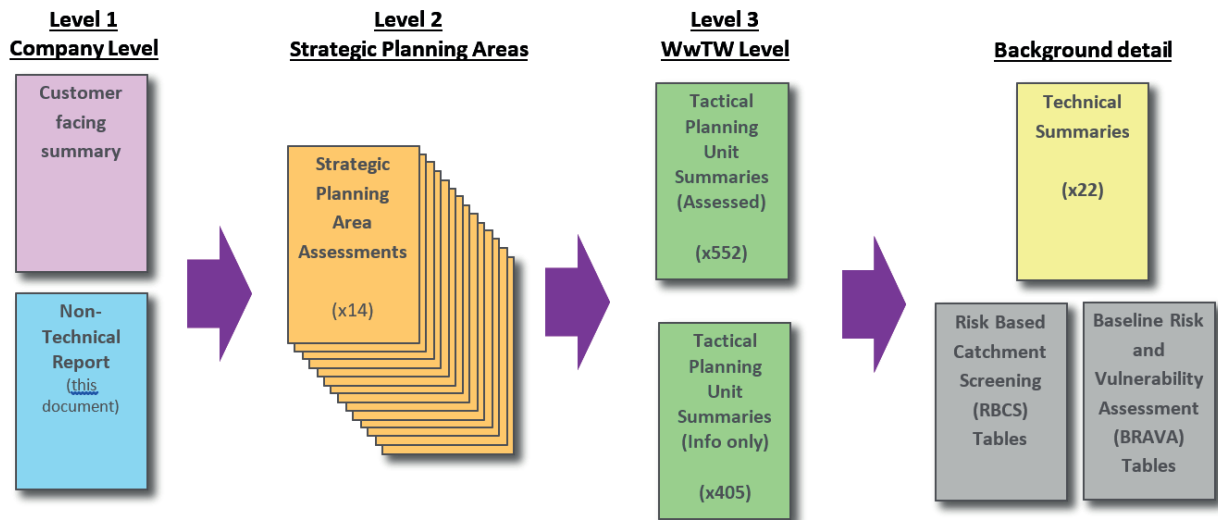


Figure 1. Structure of our DWMP documentation

- Customer facing summary – this explains the aims of the DWMP and our long-term objectives. It provides an easy-to-read summary of what we are proposing to deliver in the short, medium and long term and explains how people can inform these plans.
- Non-technical overview (Level 1 plan) – this document, which is aimed at regulators, planners, other drainage or infrastructure providers or informed customers who wish to get an overview of the approach that we have followed and understand the findings. It also sign posts a series of technical summaries which then provide fuller details into each aspects of the process.
- Strategic Planning Area Assessment Level 2 catchment plans – detailed findings which can be explored for the 14 strategic catchments across our region.
- Tactical Planning Unit Summaries Level 3 WwTW plans – the detailed analysis behind the level 2 findings.
- Technical Summaries – a series of more technically focused documents which provide more insight into how we have undertaken our DWMP. These are signposted from the Level 1 non-technical overview.
- Data Tables – these show the outputs of our Risk Based Catchment Screening (RBCS) and Baseline Risk and Vulnerability Assessments (BRAVA)

The structure of this document (non-technical overview) –

Section 1	Introduction
Section 2	Vision and strategic aims <ul style="list-style-type: none"> • Overview of our ambitions and service levels (planning objectives) • How the DWMP relates to other frameworks and strategies
Section 3	Who we serve and performance to date <ul style="list-style-type: none"> • Overview of the catchments across our region • Summary of current performance to understand our starting position
Section 4	Application of the key principles and planning framework
Section 5	Understanding risks now and in the future <ul style="list-style-type: none"> • Screening assessments • BRAVA • Risk consultation/ results? • Sensitivity testing and dealing with uncertainty
Section 6	Our approach to option development, appraisal and decision making <ul style="list-style-type: none"> • Overview of the hierarchy of options • Our approach to cost benefit and establishing best value plan • How we are learning from current innovative projects to drive efficiency and efficacy of the options
Section 7	Investment proposals for a range of scenarios and the emerging preferred plan
Section 8	Adaptive planning and how we will monitor and adapt to changing circumstances
Section 9	Customer and stakeholder engagement <ul style="list-style-type: none"> • Engagement to date • How it has shaped our thinking so far • How we will continue to engage
Section 10	Board sign off and assurance
Section 11	Next Steps

1.4 Key terminology

One of the main aims of DWMPs is to stimulate collaboration and ensure consistency in approach to understand the risk across England and Wales. It is full of new terminology and therefore ensuring clear and consistent use of terms is also critical to achieving this shared understating of risk and best value interventions. For the avoidance of doubt, we are defining key terms used in this document.

Table 1. Summary of the key terms used in this document

Term	Meaning
Planning cycle	The planning cycle of a DWMP is 25 years. For our first DWMP (Cycle 1) this will cover 2025 to 2050. As DWMPs are due to be refreshed every 5 years the next DWMP (Cycle 2) will cover 2030 to 2055.
Common planning objective	These are planning objectives which are common to all water and sewerage company DWMP. These are Internal Sewer Flooding, Pollutions, Collapses, WwTW permit compliance, Storm Overflows and Risk of Flooding in a Storm.
Opportunity Indicators / Bespoke planning objective	These represent planning objectives which have been determined following consultation with stakeholders. For our DWMP we have identified four additional areas for DWMP to focus on; supporting other organisations to reduce risk from non-sewer sources, sustainable accommodation of growth, effective resilience and supporting availability of water resource. As setting targets for this are wider than the modelling remit of DWMP, we have referred to these as 'Opportunity Indicators' rather than planning objectives. The objectives of these being for DWMP interventions to maximise opportunities in these areas which may need further assessments.
Core pathway	The core pathway should describe a company's current preferred approach to achieve its ambition and vision up to 2050. This will reflect investment needs to be undertaken to meet short term needs of a catchment but phased in a way which allows longer-term investment to be scheduled later.
Alternative pathway	An alternative pathway is one which considered how investment may need to change in response to a range of uncertainties, for example what if climate change was higher than originally envisaged?
(emerging) Preferred plan	Our preferred plan is what is needed to align to our strategic ambition and vision to get to zero internal flooding and zero serious pollutions by 2050, with no storm overflow causing environmental harm by 2045 and not spilling more than 10 times per year by 2050.
Baseline risk	This is based on an assessment of baseline risk. In the case of Cycle 1 of DWMP (2025 to 2050) this is assessed using a 2020 snapshot of catchment performance.
Basic investment	Basic investment is what is needed to ensure catchments do not move into 'Band 2'. This option is focussed on ensuring catchments are removed from the highest risk bands but may result in catchments in lower bands deteriorating but would only trigger investment to prevent them from deteriorating into Band 2. This is more aligned to a fix on fail approach rather than being proactive.
Baseline indicative cost	This indicates the level of investment required to maintain performance at baseline (2020) levels. This considers climate change, new development, and urban creep to determine investment levels needed to maintain baseline performance but does not include improvements.
Enhanced investment	This is the cost options to improve baseline performance. Where investment proposes a reduction in, this is categorised as being an enhancement in addition to what is needed to maintain baseline performance.
Blue/ Green/Grey Interventions	Blue/Green interventions are those which aim to mimic natural ways of managing surface water using sustainable techniques (such as ponds, detention basins and swales). These can offer wider social, amenity and biodiversity benefits compared to transitional hard engineering interventions (such as concrete pipes) which are often referred to as 'Grey' interventions.

See our supporting documentation for a full glossary of acronyms and terminology used within our DWMP.

1.5 How to feedback

We want to give you the opportunity to have your say on our Draft DWMP. To enable us to take on board your comments for the publication of our Final DWMP by 31st March 2023 we would encourage you to take part in our consultation. Our consultation will run over 12 weeks from 30 June to 30 September 2022. We request that you complete our online response form which will give you the opportunity to provide comments on specific questions and any additional comments you may have. Should you have any further comments or questions we encourage you to email us at DWMP@severntrent.co.uk.

During that time, we will be taking on board your comments and the responses will be collated and analysed. We will also be taking in to account the outcome of the Government's Storm Overflows Discharge Reduction Plan which will be presented to Parliament on the 1st September 2022.

Vision and strategic aims

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In this section we provide an overview of our vision and long-term ambition for the environment, our customers, and our assets. One of the key expectations of DWMPs is that they provide clear plans for delivery over the long term. In this section we set out the outcomes we are targeting to ensure we can provide a resilient wastewater service in the face of future challenges that don't just cope with pressures, but also challenge ourselves to find solutions that provide wider benefits to society and the environment at an affordable price.

The DWMP is just one of several strategic planning frameworks that we work within. In this section we show how the DWMP relates to the other relevant

If you want to know more, further details to support this summary include the following Technical Summaries:

- What is a DWMP?
- How we have developed our DWMP
- Planning Objectives

2.1 Vision and ambition

We want to be a positive force for good in our community and environment. We want to be proactive and at the forefront of Government policy, we want rigour and confidence in the data to ensure we can make data led decisions. If we need to amend our programmed investment plan to balance affordability, we want to ensure we understand the risk and have monitoring in place that allows us to keep investment decisions under review and trigger changes if the data suggests we should.

We recognise that the future is uncertain, and we cannot fully predict what will happen, however the key trends and resultant challenges for our business are clear as are our priorities to do more to enhance our operational performance, resilience, better support our customers and deliver a positive environmental and social impact.

statutory frameworks to demonstrate how we are approaching all of the drivers of improvement in a holistic catchment led way.

The final part of this section includes performance data to demonstrate our track record to provide stakeholders and customers with the evidence to show we are capable of delivering on these plans and that our culture for innovation and continuous improvement is exactly what is needed to deliver on these long-term ambitions. We provide a few cases studies to bring to life the work we have been doing to integrate nature-based solutions into our everyday tool kit which we think is a key enabler to balancing the risks in a resilient and affordable way.

Our Strategic Direction Statement sets out eight priorities shaped by our customers, regulators, investors, employees, and wider society:

- Guarantee future water supplies
- Ensure water is used wisely
- Deliver a high quality, affordable service
- Lower the risk of flooding and pollution
- Protect and enhance our environment
- Support a more circular economy
- Make a positive social difference
- Maintain a safe, inclusive, and fair workplace

Delivering on these will require a multi-AMP perspective, a greater emphasis on innovation, collaboration, progressive regulatory frameworks, and a step change to our collective management of rainfall.

We have translated these priorities into a set of ambitious targets for our wastewater system.

Table 2. Our strategic outcomes and vision for the wastewater system

Strategic Outcomes	Lower the risk of flooding and pollution	Protect and enhance the environment	Support a more circular economy (Carbon Net Zero)
By 2030	Based on Environment Agency measures (RNAGs) our operations will not be the reason for unhealthy rivers by 2030 We will reduce spills from our storm overflows to an average of 20 per year by 2025 We'll improve 50km of rivers in Warwickshire and Shropshire, creating 15km of bathing quality rivers by 2025 and have plans to double the amount of bathing quality rivers in the Midlands within 10 years We will deliver 100% monitor coverage at our treatment works and on our storm overflows by the end of 2022 We will work with other sectors to help deliver the Governments 25yr Environment Programme We will aim to reduce process emissions (CO2e) across our assets by 70%		
By 2045	Delivered sewer overflow improvements to remove harm in 100% of Defra outlined priority areas (SACs, SSSIs, etc) within our region.		
By 2050	No storm overflow will operate more than 10 times per year or cause harm as defined by the EA storm overflow guidance Reduced risk of properties flooding up to a 1 in 50-year storm event Zero serious pollutions caused by our assets or operations		

Along with our Strategic Outcomes we recognise the need to continually investigate and monitor our assets. We will do this following industry standards and proactively incorporating new guidance from Defra, OFWAT and the EA.

Some of these ambitions are statutory, and others need to be prioritised based on risk and optimised with other drivers to create the best value plan. The feedback we receive through this consultation and wider PR24 engagement will inform the pace and sequence that we work towards these ambitions. But to facilitate robust engagement we have set out our emerging preferred plan in Section 6, this plan will be revised based on feedback from this consultation before publishing our completed DWMP plan in March 2023.

2.2 Levels of service and long-term outcomes

The key first step is to agree the key levels of service against which current and future performance has been and will be assessed – these are termed planning objectives.

Through our Strategic Context consultation in October-November 2019, we used the opportunity to raise awareness of DWMPs with stakeholders, identify challenges and obtain confirmation that our planning objectives addressed the needs and expectations of our stakeholders. Over 100 organisations were consulted including Local Planning Authorities, Lead Local Flood Authorities, Environment Agency, rivers trusts and other environmental organisations.

The feedback we received on the planning objectives confirmed unanimous agreement with the six common planning objectives, but also indicated the wider context that we need to be considering getting better value and synergies into our planning. Therefore, we have added a further four bespoke planning objectives that supplement the six common planning objectives used by all wastewater companies. During this

consultative period, it also exposed a clear desire to explain how our plans contribute to wider benefits that stakeholders value. See our supporting documentation for a fuller description of how the planning objectives have evolved and how we will be using them in our decision making to identify the best value plan and how we will use them to demonstrate delivery of service levels over the long term.

Table 3. Our planning objectives/opportunity indicators

Ref	Measure	units	Type	2020	2025	2050
CP01	Internal sewer flooding risk (CA)	Total number of internal sewer flooding incidents / escapes	Common	780 (Start of AMP7 actual)	563 (End of AMP7 target)	Zero
CP02	Pollution risk (CA)	Nr of category 1-3 pollution incidents	Common	190 (Start of AMP7 actual)	182 (End of AMP7 target)	Zero
CP03	Sewer collapses risk (CA)	Number of sewer collapses	Common	715 (Start of AMP7 actual)	740 (End of AMP7 target)	Zero
CP04	Risk of sewer flooding in a 1 in 50-year storm (CA)	Percentage of properties at risk of sewer flooding in a 1 in 50 storm	Common	2.6%	2.6%	Zero
CP05	Storm overflow performance (ST)	Storm overflows - more than 10 spills per year	Common	1380	Average of 20 per year as outlined in our 'Get River Positive Pledge'	Zero
CP06	Risk of wastewater treatment works quality compliance failure (ST)	Permit compliance at WwTW	Common	Maintain 100% WwTW permit compliance despite future pressures associated with increased demand and tightening of environmental obligations.		
O11	Supporting others with reduction of surface water, fluvial & groundwater flood risk	Reduction in the number of properties at risk of surface and fluvial flooding	Opportunity Indicator	Maximise number of schemes which, through the delivery of co-created partnership schemes, will support other risk management authorities with meeting post 2027 Flood and Coastal Erosion Risk Management (FCERM) targets.		
O12	Sustainable accommodation of future growth	Number of developments not connecting to a public foul sewer	Opportunity Indicator	Supporting local development plans and developers to negate the need for a 'right to connect' discharge of surface water from a new development into a public foul sewer.		
O13	Ensuring our critical wastewater assets remain resilient	Number of WwTW and major pumping stations not resilient to fluvial flooding, electricity failure and/or communication outages	Opportunity Indicator	Alignment of DWMP delivery strategies to ensure wastewater capacity interventions consider resilience of WwTW and major pumping stations to mitigate or reduce risk of asset failure associated with inundation from rivers, interruption to electricity supplies and/or communication outages.		
O14	Supporting Water Resource Water Planning	Volume of surface water removed from the public sewers to offset ground and river abstractions	Opportunity Indicator	Maximising opportunities whereby delivery of surface water management strategies undertaken as part of DWMP also support with offsetting groundwater and river abstraction constraints within Water Resource Management Plans (WRMP). This approach aligns to ongoing discussions with the Environment Agency with regard to the Idle and Torne abstraction and flooding catchment strategy.		

NOTES:

The focus of our Draft DWMP has been the assessment of capacity demand balance within CP04, CP05 and CP06.

The wider objectives associated with CP01, CP02 and CP03 are factors that will be part of the cost benefit analysis when deriving the final PR24 plan for 2025-2030 which is subject to asset deterioration modelling ahead of the Final DWMP and PR24 submissions.

We have indicated the planning objectives which have statutory targets (ST), and which ones are based on company ambition (CA), informed by customer and stakeholder views. We have used the same planning objective definitions to model and estimate how performance changes over time using a range of assumptions about climate change, population growth and urban creep.

2.3 Relationship with other frameworks and strategies

Although the DWMPs are not yet statutory there are several other statutory frameworks within the management of drainage infrastructure that

overlap. It is important that we understand the interfaces and timing of the interactions. The figure below illustrates the connectivity between them.

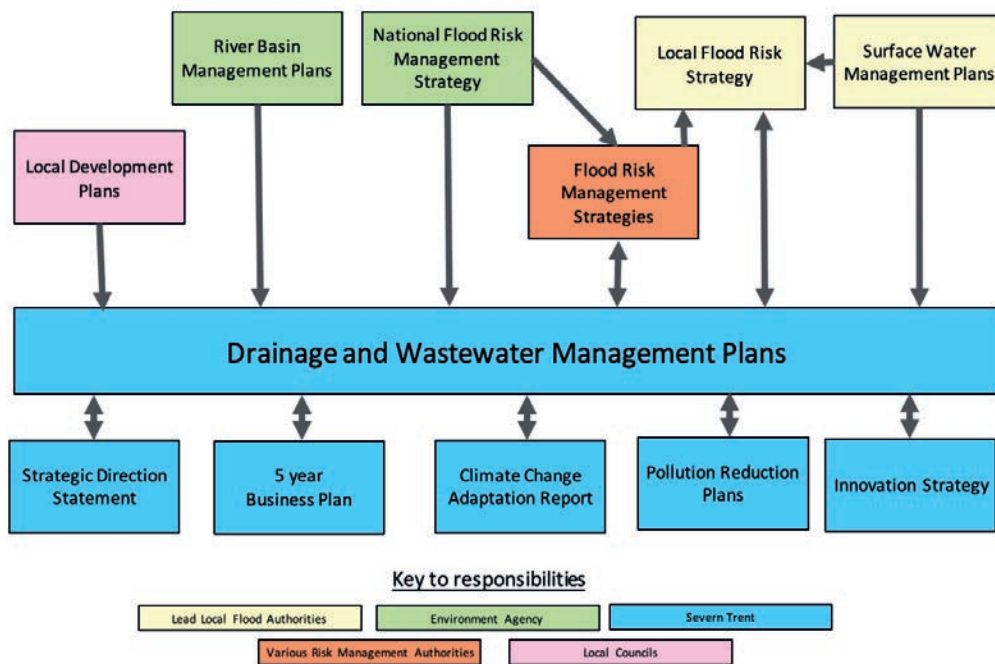


Figure 2. Inter-relationships of other frameworks and strategies to DWMP

There are five key areas of legislation and policy that are key inputs into our DWMP.

Water Industry Act

The Water Industry Act 1991^[3] sets out the general roles and responsibilities of a water and sewerage company. It sets out that it is the duty of every undertaker to provide, improve and extend the public wastewater network to ensure catchments are and continue to be effectually drained, with the principal duty of a public sewer being to drain roofs, associated areas and highways by agreement. The Act also provides developers with the right to connect to the existing public sewerage system whereby surface water can be connected to a foul water sewer where no separate surface water sewer exists.

Environment Act 2021

Since the DWMP Framework was first published in 2018, things have now moved on and within the Environment Act 2021^[4], provision is made for measures to be put in place for Cycle 2 of DWMP to become statutory. This is expected from April 2023 through a secondary legislation. Within this act is several other elements that also relate to the implementation of our DWMP. This specifically includes policy on storm overflows, reporting of these assets and additional monitoring within watercourses in England.

Government policy on storm overflows

Our Rivers and the quality of our environment is very important to us and is at the heart of what we do. River health is essential not only to the communities that we serve, but also to our ability to provide vital water on tap. So, we aim to take a leading role in not only protecting them but enhancing them too. In support and recognition of the changes to Government policy on storm overflows we have made five firm commitments to act now, which we are calling our Get River Positive Pledges^[5].

- Ensure storm overflows and sewage treatment works do not harm rivers
- Create more opportunities for everyone to enjoy our regions' rivers
- Support others to improve and care for rivers
- Enhance our rivers and create new habitats so wildlife can thrive
- Open and transparent about our performance and our plans.

Throughout the development of our Draft DWMP we have been fully cognisant of the ongoing industry and Governmental discussions regarding storm overflows. Storm overflows play a vital role in protecting our customers from experiencing flooding, however we understand the concern around them and the impact on our rivers. The DWMP, therefore acts as a key evidence base and mechanism for supporting us to deliver on these commitments. Between 31st March and 12th May 2022 Defra consulted on the Government's Storm Overflows Discharge Reduction Plan^[6], the results of which will be announced to Parliament on the 1st of September 2022. The contents of this announcement have a clear impact on the expectations of the DWMP. In recognition of the Storm Overflow Discharge Reduction Plan, we have aligned our emerging preferred plan in this Draft DWMP with these specific elements and timeframes.

³ <https://www.legislation.gov.uk/ukpga/1991/56/contents>

⁴ [Legislation.gov.uk, 2021. Environment Act 2021 \[c.30](https://www.legislation.gov.uk, 2021. Environment Act 2021 [c.30)

⁵ <https://www.stwater.co.uk/get-river-positive/our-river-pledges/>

⁶ <https://consult.defra.gov.uk/water-industry/storm-overflows-discharge-reduction-plan/>

WINEP

The WINEP is a programme of actions that all water companies in England undertake to improve the environment. The WINEP, and its predecessor the National Environment Programme (NEP), has been the main mechanism for improving the state of the water environment since 1995. To date, these have included obligations arising from environmental legislation such as Urban Wastewater Treatment Regulations, Water Environment (Water Framework Directive) Regulations, Bathing Waters Regulations, and Conservation of Habitats and Species Regulations. We develop our WINEP programme with the Environment Agency and Natural England.

However, it is recognised by all parties that despite continued significant investment; a growing population, increasing pressures from pollutants and climate change are impacting the effectiveness of the WINEP programme. Through the development of the DWMP we have a better understanding of these risks and therefore we are using these to inform our WINEP programme for 2025 – 2030.

2.4 Track record

We are extremely proud of the continued improvements we have made across many aspects of wastewater service; we have consistently met and in many cases exceed our targets, having been awarded the highest 4-star rating by the Environment Agency in 2021 for the second consecutive year and on track for a third in 2022 with strong delivery against our customer driven Outcome Delivery Incentives (ODIs). But we also recognise that the challenges are getting tougher and expectations from the communities we serve more demanding. In developing our plan to achieve these long-term goals it is important to understand

Flood and Water Management Act 2010

The Flood and Water Management Act (FWMA) outlines several statutory requirements between the Environment Agency, Lead Local Flood Authorities and us, the water companies. This includes the LLFA to create and maintain a local Flood Risk Management Strategy (FRMS) which then collates up to the EA outlying a national Flood and Coastal Erosion Risk Management strategy (FCERM). We have supported both LLFAs and the EA in their creation of programmes and annual reporting. The current EA programme covers 2021 to 2027 with the DWMP Cycle 1 planning horizon covering 2025-2050. Our current investment cycle covers 2020-2025, within this programme there are several joint collaborative flood resilience projects. These are outlined in further detail within this document and in the 14 Level 2 Strategic Planning Area draft DWMP documents. Our aim is to continue with this approach of working collaboratively, using our DWMP outputs to help focus our stakeholder engagement.

the starting position and what has been achieved over the recent past to validate the ambition going forwards. We also provide an overview of our experience of promoting collaborative approaches on a wide range of projects from small-scale local solutions to catchment-wide trials of nature-based solutions. The purpose of this section is to provide reassurance that we are starting from a strong position and have the capability to deliver our long-term plans and to demonstrate that we are developing the key skills needed to meet the future challenges.

We have split this section into four themes:

<p>Wastewater 'service now' metrics (represent the service customers receive now)</p>	<p>Asset health measures that represent indicative measures of future service to demonstrate that we are not storing up problems for the future</p>	<p>Delivering wider benefits to demonstrate our commitment to delivering in a way that promotes wider social value</p>	<p>Collaborative schemes to demonstrate our track record and ambition for embracing this future model which is central to DWMP framework.</p>
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2.4.1 Wastewater service performance

For our wastewater system there are several key performance metrics which measure how well we are performing now. The most important metrics to our customers in relation to wastewater service provision is the number of incidents of sewer flooding that affect people’s homes and gardens, the number of times we pollute a watercourse and the percentage of time our wastewater treatment works are compliant with the standards set by the Environment Agency. We have been very successful at driving improvement in these areas and our performance is amongst the best in the industry.

27%

Improvement in internal sewer flooding incidents since 2020

33%

Reduction in blockages over the past two years

40,000

Sewer sensors being installed in the network to let us know where there are problems

27%

Improvement in category 1-3 pollutions performance over the last 5 years

99.5%

Compliance at our WwTW in 2021

5,000 ha

On track to complete biodiversity and environmental improvements by 2025

4* EPA

Industry Leading performance retaining 4* Environmental Performance Assessment in 4 of the last 6 years

5

Get River Positive Pledges

2.4.2 Asset health indicators

These are not specifically planning objectives or model outputs of the DWMP but are part of our overall approach to managing and delivering reliable, resilient wastewater services. We also think it is important to ensure that any enhancement investment is delivering demonstrable service or resilience improvements and not masking underlying deterioration in our assets.

Below are graphs showing our performance trends

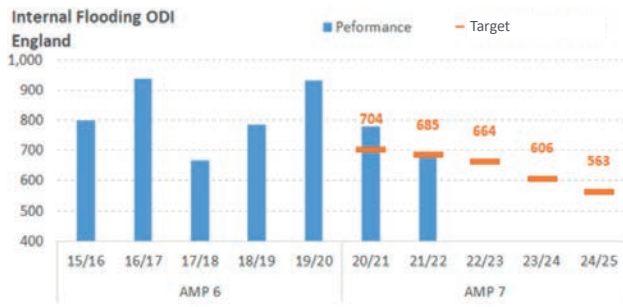


Figure 3. Internal sewer flooding performance

Internal sewer flooding – This is a count of properties suffering internal flooding due to rainfall, blockages, collapses, and equipment failure. Annual performance can be variable due to external influences associated with adverse weather patterns.

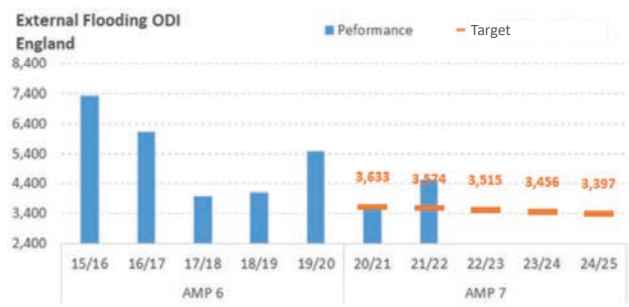


Figure 4. External sewer flooding performance

External sewer flooding – This counts flooding to the curtilages of properties due to rainfall, blockages, collapses, and equipment failure. Annual performance can be variable due to external influences associated with adverse weather patterns.

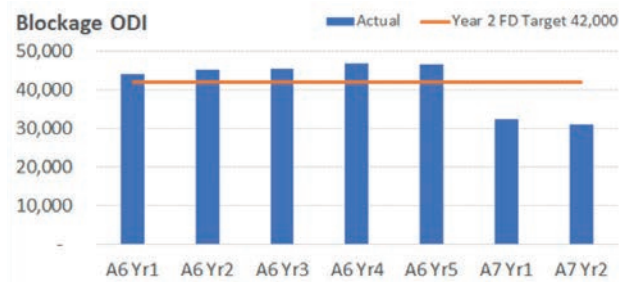


Figure 5. Blockages performance

Sewer blockages – These occur when the normal flow of sewage is temporarily held back due to a blockage. This can occur due to inappropriate items being flushed down toilets (such as wet wipes, sanitary products, and nappies) or fats, oils and greases being poured down kitchen sinks which then solidify on the walls of pipework.

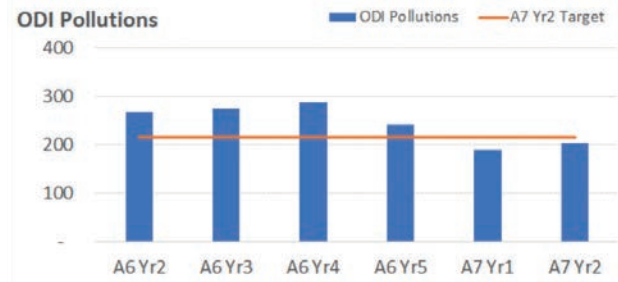


Figure 6. Category 1-3 sewer related pollutions performance

Sewer related pollutions – These can occur due to blockages and equipment failure but also due to private misconnection of foul discharged into surface water drainage.

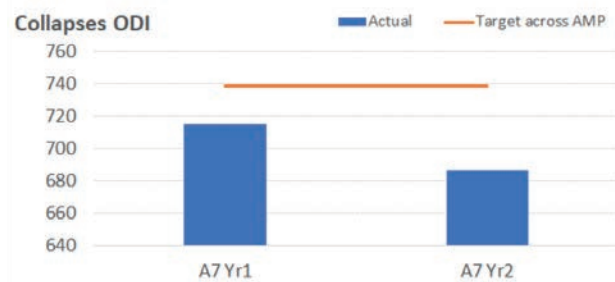


Figure 7. Collapses performance. Note: Reporting of collapses has a new definition for AMP7, hence only two years shown

Sewer collapses – Sewer collapses often occur due to the age of pipes but can also be affected by changes in the use of the ground above a sewer, such as increased road usage or construction of buildings over sewers. We used closed circuit television (CCTV) surveys to help us identify the deterioration in the condition of our sewers to reduce the risks of sewer collapses, but this can be a challenge across our 92,441km of pipework.

2.4.3 Delivering wider social value

We're committed to taking actions that, in the course of delivering our obligations, go above and beyond the strict targets by considering better ways of achieving the outcomes to drive greater benefits. Some examples of this include:

- Our Get River Positive Pledges recognise that as an industry we have not always kept pace with our customers' emotional connection to rivers and commit to ensuring we cause no harm to rivers, as well as working to enhance them
- We are the first water company to get our carbon reduction plan approved by the global Science Based Targets initiative (SBTi), as part of our ongoing commitment to tackling climate change.
- Great Big Nature Boost^[7] - where we've committed to planting 1.3 million trees and restoring over 2000km of rivers.
- Interactive programme of school visits^[8] - building awareness of the wonderful world of water, educating customers on the precious resource of water and how to take care of our wastewater system to avoid blockages.
- Community Fund^[9] - where we are awarding over £10 million in grants during this AMP to support new projects by local charities and community groups.
- Official Nature and Carbon Neutral Supporter of the Birmingham 2022 Commonwealth Games – leaving a lasting legacy by playing a leading role in making the Birmingham 2022 the most sustainable and lowest carbon commonwealth games ever, planting 2022 acres of trees in new Commonwealth Forests in addition to 72 Tiny Forests representing each of the nations and territories of the Commonwealth.

We feel passionate about finding ways to improve our core services but doing so in a way that offers greater social value – the thing all these initiatives have in common is about restoring our natural environment which helps it act as natural flood resilience assets.

2.4.4 Collaboration as default ambitions

We see the benefits of working with other flood risk management authorities to reduce flood risk and we have a dedicated team who are responsible for identifying opportunities to deliver co-created schemes. During AMP6 (2015-20) we set a target to deliver 21 partnership working schemes, yet we were able to deliver 26 schemes as we were able to build on our experiences. Within our current AMP7 period (2020-25) we are continuing to build on our experience through our commitment to deliver at least 360 properties towards the 2021-27 FCERM programme to better protect 336,000 properties through our Community Flood Resilience programme.

A case study representative of the co-created partnership schemes we are delivering is in Stoke-on-Trent. As part of a SuDS retrofit partnership project in Stoke will reduce local surface water flooding around a local Care Home which has

suffered flooding previously. This project is a pilot project with a view to delivering similar projects across Stoke. The scheme utilises and enhances three urban green spaces. In addition to managing surface water runoff in a sustainable way, the project will deliver enhanced water quality within urban green spaces, which in turn will provide enhanced amenity and biodiversity value. The project is part of the wider Stoke and Urban Newcastle Rediscovering Its Secret Environment (SUNRISE) Programme. The project is led by environmental regeneration charity Groundwork West Midlands, working in partnership with City of Stoke on Trent Council, the Environment Agency and ourselves at Severn Trent. Work started on site in February 2022 and is due for completion in June 2022. The scheme is funded by Flood Defence Grant in Aid, Local Levy, European Regional Development Funding and by Severn Trent. The cost breakdown and contributions can be provided once the project is complete, however, the total combined investment is well over £500,000.

⁷Severn Trent, 2022. Great Big Nature Boost

⁸Severn Trent 2022. Education Zone

⁹Severn Trent, 2022. Severn Trent Community Fund



Figure 9. Birds Eye view of 2 of the 3 swales in the Hilton Road area of Stoke. February 2022
 Note: Taken during construction, to indicate the scale of the SuDS being built

Using the findings from our early DWMP work and our recent partnership working experience, we were able to develop our Mansfield Green Recovery proposals.

Working closely with Mansfield District Council and Nottinghamshire County Council we will be investing £76m to transform Mansfield by using nature-based solutions to protect the town from flooding. The scale of this catchment-wide investment has never been seen in the UK before and will help be the blueprint for how the issue of surface water flooding can be tackled in the future.

We are looking to install 20,000 blue/green features across the catchment with the aim to remove and store 58,000m³ of rainwater from entering the sewerage system with a wide range of intervention types being planned:

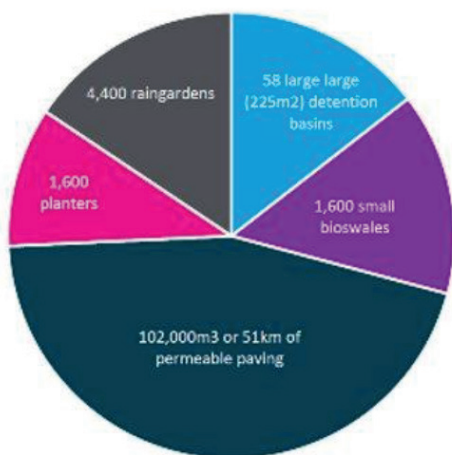


Figure 8. The breakdown of the green-blue infrastructure to be implemented in Mansfield

This will not only reduce the risk of flooding to customers from the sewers, but also alleviate risks from surface flooding using solutions which will greatly improve local recreational amenities.

As we move further forward with our DWMP implementation, we will be using the learning from Mansfield, together with experiences over recent years of delivering partnership working schemes elsewhere across our region to accelerate our blue/green ambition. Clearly this requires input from other organisations, but our experience demonstrates that a sustainable ambition is deliverable.

Who Are We and Where Do We Serve?

WONDERFUL ON TAP



Severn Trent is one of the largest of the 11 regulated water and sewerage companies in England and Wales. We take our name from the two main rivers which run through our region – the Severn and the Trent. We provide high quality services to around 4.4 million households and businesses in the Midlands. We supply 1.9 billion litres of drinking water and collect and treat 2.9

billion litres of wastewater per day and safely return it to the environment across 958 catchments. Our region stretches across the heart of the UK, from the Bristol Channel to the Humber, and from Shropshire to the East Midlands. We serve a diverse region, with more urban conurbations than any other water company, yet also serving predominantly rural counties.

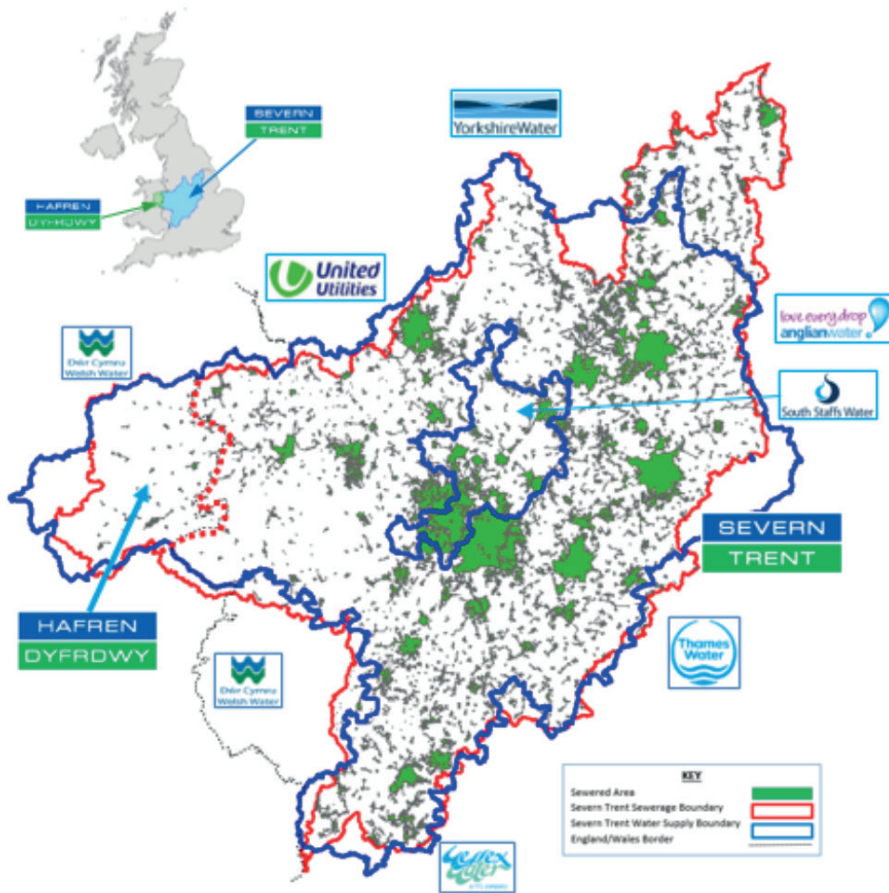


Figure 9. Severn Trent service areas, showing our Wastewater Treatment Works (WwTW) catchments in green.

19,547km²

area served in the Severn Trent Region

32,294km

watercourses in our region

9,295,000

Population served by wastewater services

2,485km²

Wastewater Treatment Work Catchment area

92,441km

Sewer pipes

4,626

Sewage Pumping Stations

2,590

Storm Overflows

957

Wastewater Treatment Work Catchments

3.1 Strategic planning areas

Our region is split into 14 strategic planning areas, which broadly align to the river basin catchments.

Table 4. Level 2 Strategic Planning Areas and associated River Basin Management Catchments

DWMP L2 Strategic Planning Area	River Basin Management Catchment
1: Upper Severn	Severn Uplands
2: Tern	Severn Middle Shropshire
3: Teme	Teme
4: Upper Trent	Trent Valley Staffordshire
5: Dove	Dove
6: Derwent	Derwent Derbyshire
7: North Notts	Idle and Torne
8: Lower Trent	Lower Trent and Erewash
9: Soar	Soar
10: Trent Confluence	Tame Anker and Mease*
11: Central	
12: Avon	Avon Warwickshire
13: Middle Severn	Severn Middle Worcestershire
14: Lower Severn	Sever Vale

*We have split the 'Tame, Anker and Mease' River Basin into two areas to reflect the WwTW catchments the area serves





Figure 10. Level 2 Strategic Planning Areas

To allow the DWMP to provide meaningful outputs for customers and stakeholders it has been based around a three-level management structure. We start at the most detailed level and then aggregate the results:

- Level 3 – Tactical Planning Unit - Catchment:** This is the wastewater treatment works (WwTW) and their associated upstream sewerage catchment. Across the Severn Trent region we have 957 catchments ranging from our largest catchment serving Birmingham and the Black Country (1.8 million people) down to tiny rural treatment works draining a few houses.
- Level 2 – Strategic Planning Areas:** These are intended to be an amalgamation of Level 3 areas collated into what are referred to as Strategic Planning Areas (SPAs). Our

SPAs have been aligned to river basin management catchments, of which there are 14 across the Severn Trent region. Due to the nature and history of how wastewater catchments have evolved over time, we made a few minor adjustments to our SPA boundaries to ensure individual WwTW catchments don't overlap into different SPAs. For reporting purposes, we have split the Tame Anker and Mease river basin area into two SPAs to recognise the large urban conurbation served by the Tame.

- Level 1 – Water Company DWMP:** This is an overarching company level plan. As the Upper Severn, Teme and Tern SPA areas overlap between the Severn Trent and Hafren Dyfrdwy company regions these are split accordingly. (Note: there is a small area of the Tern SPA which lies in the Hafren Dyfrdwy area, but this small area is not served by any wastewater provision.)

Application of the key guiding principles

Whilst this is our first DWMP, we are building on a wealth of knowledge gained from decades of wastewater planning. We have applied the new approach but that builds upon a strong baseline position when it comes to our asset data, hydraulic sewer models and technical catchment knowledge. This has allowed us to develop robust processes, with trusted data inputs and assumptions to provide a strong evidence base. Appendix 4 sets out a

brief history and evolution of our drainage plans, this long history and evolutionary process adds reassurance that the data and underlying drainage models are fit for purpose.

The framework sets out the requirements for how companies should develop their plans.



Figure 11. Summary of the key process stages undertaken in developing our DWMP

In addition to the guidance on the specific elements of the process, there are 6 key principles which we are expected to meet. The table below indicates our view on the maturity of our application of the principle and signposts to the relevant section of this document.

Table 5. Evidence of compliance of the DWMP against OFWAT’s guiding principles

Principle	Evidence of compliance
<p>Be comprehensive, evidence based and transparent in assessing, as far as possible, current capacity and actions needed in 5, 10 and minimum 25-year periods considering risks and issues such as climate change. Plans should also align, as far as possible, with other strategic and policy planning tools.</p>	<p>We have assessed baseline and future catchments risks using our comprehensive hydraulic sewer modelling stock, built, and maintained in accordance with latest industry standards. We have aligned our plans with latest local development plans and used the outputs of other strategic planning tools (such as surface water flood risk maps) to inform our assessments. Using our analysis, we have inferred the 5, 10 and 25-year planning horizons using the best available data available.</p>
<p>Strive to deliver resilient systems - that will meet operational and other pressures and minimise system failures.</p>	<p>As part of our DWMP we have assessed the resilience of our WwTW and major pumping stations against the risks of fluvial flooding, power outages and failure of remote communications.</p>
<p>Consider the impact of drainage systems on immediate and wider environmental outcomes including habitats and in developing options for mitigation to include consideration of environmental net gain and enhancement</p>	<p>Through our surface water separation options, we have considered wider drainage risks which could benefit from surface water management strategies. We have also undertaken an assessment of Natural Capital net gain potential for each of our catchments and, alongside our Strategic Environmental Assessment, we will use this to inform our Final DWMP with support from ongoing PR24 research.</p>
<p>Be collaborative - recognising the importance of sectors working together to consider current and future risks and needs and to deliver effective solutions, setting out how they will do this, how they have engaged with and responded to stakeholders.</p>	<p>DWMP builds upon the track record we have with working with our stakeholders to deliver effective co-created solutions. As part of our Baseline Risk Stakeholder Consultation during Autumn 2020 we shared catchment risk information with our stakeholders ahead of our Option Development & Appraisal assessments. As part of the roll out of our Draft DWMP we will be sharing our finding with our stakeholders to help develop more detailed catchment level proposals to support our AMP8 business plan.</p>
<p>Show leadership - in considering the big picture for an organisation’s operational capacity to develop and deliver the plan, and mindful of linkages with other strategic planning frameworks.</p>	<p>Throughout the development of our DWMP we have been keeping our Executive Team aware of progress, with a focused director level to discuss the detail. We have maximised the business intelligence and catchment knowledge that already exists within the organisation on the back of our Sewerage Management Plan programme. We have also been using our existing dedicated team who are already working closely with risk management organisations to support others with their strategic planning frameworks. We are therefore confident that we have the appropriate level of leadership the deliver and ultimately deliver DWMP interventions on the ground.</p>
<p>Improve customer outcomes and awareness and that solutions and actions provide both value for money and consider societal benefits</p>	<p>Our Final DWMP will be supported by PR24 customer research which is presently ongoing. Ensuring alignment is going to be essential to ensure the findings of our DWMP provide a balanced, informed and affordable PR24 business plan.</p>

Understanding risks now and in the future

WONDERFUL ON TAP



The three steps, shaded yellow in Figure 14, are explained briefly in this section (5.1 to 5.3), and set out in more detail in the following Technical Summaries:

- How we have selected catchments (RBCS)
- Our Approach to Modelling BRAVA
- Accounting for Growth
- Assessing Climate Change
- Modelling of Urban Creep
- Assessing WWTW Capacity
- Resilience Assessment
- Utilisation of Stakeholder Data

Key take away

In summary, our analysis indicates that climate change is the principal risk to our catchment performance by 2050, which is exacerbated by new development and urban creep. Modelling indicates that in a current baseline:

- Risk of properties at risk of internal sewer flooding in a 1 in 50 year storm will increase from 2.59% to 3.86% by 2050 under a 2°C climate change scenario, increasing to 4.11% for a 4°C scenario.
- Storm overflow performance is forecast to see average annual flood volumes increase by 43%, with total spill counts increasing by 14%. This not only indicates the extent of the baseline legacy performance challenge but also the size of the additional problem that needs to be mitigated.

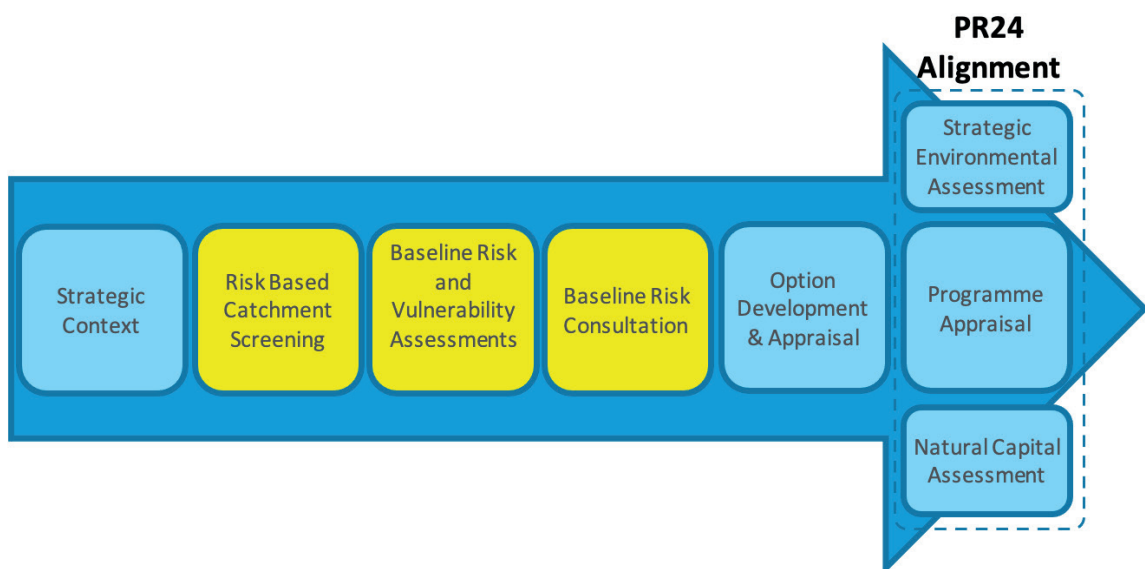


Figure 12. Summary of the key process steps undertaken in developing our DWMP. Yellow boxes indicate the steps undertaken to understand the asks now and in the future

5.1 Risk Based Catchment Screening (RBCS)

RBCS is an initial screening stage within the DWMP process to identify which catchments, based on an assessment of a range of risk indicators, would benefit from further assessment. We have 552 (58%) catchments that meet the criteria, and those catchments represent 99.4% of the population we serve, which shows that our analysis is comprehensive and representative of the company level risk.

The first step is Risk Based Catchment Screening (RBCS) which is an assessment of current and identified risks on all of our catchments to then allow us to focus further efforts on the areas of greatest risk. The screening process analysed catchment knowledge and data available in July 2019 against 17 indicators to determine which catchments should proceed for further assessment. As our catchments are continually evolving, for example some catchments are joined together through rationalisation of WwTW, there have since been changes to the number of catchments proceeding through the remaining stages of DWMP. As of 31st March 2022, there are 957 WwTW catchments of which 552 catchments proceeded to BRAVA. The results of the RBCS assessment are included within the RBCS Data Table within our supporting documentation showing results at catchment level. More detail on the process we undertook is included in the How we have selected catchments (RBCS) Technical Summary.

5.2 Baseline Risk and Vulnerability Assessments (BRAVA)

The next step is the baseline risk and vulnerability assessments (BRAVA). We have applied the DWMP Framework^[10] and whilst this is new it has built upon existing approaches and best practices already in existence across the industry, and utilised key tools and approaches developed out of the 21st Century Drainage programme including the Capacity Assessment Framework (CAF)^[11], Storm Overflow Assessment Framework (SOAF)^[12] and the wastewater resilience metric which ultimately became the 'Risk of Sewer Flooding in a Storm' common performance commitment^[13] that Ofwat incorporated into their 2019 price reviews in England and Wales. More detail can be found in Our Approach to Modelling BRAVA Technical Summary.

This means that we were building these assessments on solid foundations and already had 100% model coverage through our hydraulic sewer models from our 'live' Sewerage Management Plan programme. For each catchment, baseline performance modelling was undertaken during Summer 2020.

5.3 Drivers of change and risk future scenarios

The next part of this step is to use the BRAVA hydraulic models to forecast performance of our waste systems under different assumptions. There are four exogenous variables that we have modelled to provide an estimate of future service against the common objectives listed in Table 6.

Table 6. Drivers of change which have been assessed through the DWMP

Driver of change	Low future scenario	High future scenario
Climate change	2 degree warming RCP6.0 concentration pathway	4 degree warming RCP8.5 concentration pathway
Population growth	ONS data used to inform WwTW projections, local planning data used for sewerage modelling. Water consumption rates aligned to Water Resources Management Plan projections	ONS data used to inform WwTW projections, local planning data used for sewerage modelling. Water consumption rates aligned to Water Resources Management Plan projections
Urban creep	Industry standard best practice guidance	Industry standard best practice guidance
Policy/ statutory ambition	Aligned to the Defra 'Storm Overflows Discharge Reduction Plan' consultation of 10 spills	Aligned to the Defra 'Storm Overflows Discharge Reduction Plan' consultation of 10 spills

¹⁰ Water UK, 2018. A framework for the production of Drainage and Wastewater Management Plans

¹¹ <https://www.water.org.uk/wp-content/uploads/2018/12/Capacity-Assessment-Framework-Project-Report-Final.pdf>

¹² <https://www.water.org.uk/wp-content/uploads/2018/12/SOAF.pdf>

¹³ https://www.ofwat.gov.uk/wp-content/uploads/2019/04/Reporting-guidance-Risk-of-sewer-flooding-in-a-storm_final_290319.pdf

Climate Change

The 'Independent Assessment of UK Climate Risk' report^[14] published by the Climate Change Committee (CCC) recommends that the UK should plan for an average annual global temperature range of 2°C (aligned to the Paris Agreement), but assess the risk for 4°C. The 2°C scenario being generally representative of Representative Concentration Pathway (RCP) 6.0, and 4°C to RCP8.5. We have therefore used the Met Office's latest "UK Climate Projections 2018" (UKCP18) to inform 2°C and 4°C future 2050 performance in line with CCC recommendations. This aligns with the High scenario within the Ofwat Common Reference Scenario^[15]. The low climate change Common Reference Scenario of RCP2.6 has been modelled as our baseline climate scenario.

To inform storm overflow assessments, we have used recently recorded actual rainfall records to determine a representative typical year of rainfall. The outputs of this modelling work are intended to be indicative only and are not representative of actual spills. For actual performance of storm overflows these are recorded through Event Duration Monitoring (EDM)^[16] submissions to the Environment Agency. To assess how climate change may affect future storm overflow performance, we have used industry standard tools to uplift this rainfall to determine what a typical year of rainfall could look like in 2050. More detail is available in the Assessing Climate Change Technical Summary.

New Development (growth)

We have used best available intelligence from our day-to-day liaison with Local Planning Authorities to inform the assessment of new development. Our approach combined planning applications with local plan sites, supported by population projections provided by the Office for National Statistics to inform the future new development flows to 2050. We have used the same development information to inform both our DWMP and WRMP. More detail is available in the Accounting for Growth Technical Summary.

Urban Creep

This is a term to describe where green land that naturally soaks up rainwater runoff is removed by impermeable surfaces such as flagstones, block paving, tarmac or concrete. This is typically associated with front gardens being paved over which can increase the amount of rainfall which runs off into sewers, watercourses and rivers which originally would have soaked into the ground. To inform the future impact of this we have used industry standard best practice methodology. More detail is available in the Modelling of Urban Creep Technical Summary.

Policy/ statutory ambition (currently just covers storm overflows)

We have used this information to provide investment scenarios to limit annual typical year spill counts to no more than 40, 20, 10 and zero. In line with the Storm Overflows Discharge Reduction Plan consultation, our focus is on 10 spills and ahead of the Governments storm overflow policy announcement to Parliament in September 2022 announcement we are incorporating 'harm' into our assessment. We will update our analysis ahead of our Final DWMP (due for publication by 31st March 2023) once Government policy is confirmed.

5.4 Baseline risk consultation

During Autumn 2020 we shared the initial findings of our baseline risk assessments with key stakeholders. The purpose of this being to provide an early overview of risks across our catchments and to provide an opportunity for stakeholders to feedback if there were anything we had not identified which could influence development of DWMP catchment strategies. This used an interactive (Geographical Information System) GIS mapping platform to share flood risk, environmental and new development information, with stakeholders given the opportunity to comment and feedback as necessary.

5.5 Summary of the results

As part of our Baseline Risk and Vulnerability Assessments (BRAVA) modelling we undertook baseline modelling to inform current performance of the wastewater network for sewer flooding (in a 1 in 50 year storm) and to understand the potential impacts on storm overflow performance we have used historic rainfall records to assess theoretical performance in an average year. We then repeated this modelling to understand the risk of how performance is likely to deteriorate by 2050, due to the impacts of climate change, new development, and urban creep.

For WwTW we have used population and new development projections to inform when capacity planning. Collectively these inform us how much bigger the problem is getting over time.

This indicates that under a 2°C climate change scenario the increased intensity of storms is forecast to increase the number of properties at risk of internal flooding from sewers by 49%, increasing to 58% under a 4°C scenario. The additional climate change rainfall is also expected to increase the number of properties at risk of flooding from surface water flooding. This category of flooding is caused where rainwater stays on the ground surface and does not enter the sewers,

¹⁴ Climate Change Committee, 2021. Independent Assessment of UK Climate Risk

¹⁵ Ofwat, 2021. PR24 and beyond: Long-term delivery strategies and common reference scenarios

¹⁶ Severn Trent, 2022. Get River Positive – Event Duration Monitoring

principally because of limitations within the capacity of road gullies. The Lead Local Flood Authorities are responsible for surface water flooding and whilst wider drainage needs of a catchment form part of DWMP, assessing non-sewer flood risk has been limited as this goes beyond the remit of our modelling. We have used the latest surface water mapping to support our DWMP assessments, however we have been limited as to how we can assess deterioration in third party responsibility flood risks as this data is not available for 2050. Our storm overflow modelling indicates that, without intervention, the total volume of spills from all overflows could increase by 43% by 2050 in an average year. This would increase the total number of spills in an average year by 14%. This does not consider annual spill thresholds, nor whether spills are causing environmental harm, but this analysis does indicate further pressures which need to be mitigated in addition to addressing legacy performance challenges.

As we have other non-DWMP tactical operational interventions to mitigate the risks from non-rainfall induced internal sewer flooding, sewer blockages, sewer collapses and pollutions, we are not envisaging DWMP to deliver improvements against such objectives. Our DWMP therefore assumes our operational activities will maintain stable performance, with enhancement plans being set out in our PR24 business plan.

5.5.1 Internal Sewer Flooding

Modelled Risk (under which 2°C climate change scenario)

Across the Severn Trent region our modelling indicates that currently there are around 112,000 properties which could be at risk of sewer flooding from a 1 in 50-year storm. This amounts to approximately 2.59% of connected properties. By 2050, assuming no upgrades were undertaken, this would increase by 49% to just over 166,500 properties, or 3.86%. Over half of the total risk is associated with just four of the Strategic Planning Areas; Central, Lower Trent, Upper Trent and Lower Severn.

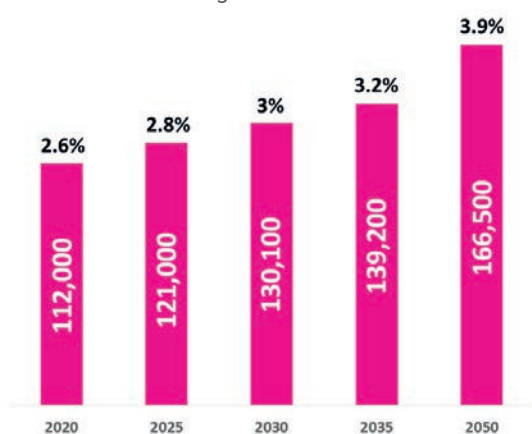


Figure 13. The number and percentage of properties at risk in a 1 in 50 year storm, without interventions

For more detail on the process we undertook to understand the risk see the Assessing Risk of Sewer Flooding in a Storm Technical Summary.

5.5.2 Storm Overflows

Modelled Risk

Using our sewer models, we have assessed the likely levels of risk and investment needed to limit typical year spill counts to 40, 20, 10 or Zero spills. Following publication of the final Storm Overflows Discharge Reduction plan due to be presented to Parliament on the 1st September 2022, further analysis is planned ahead of the Final DWMP. By 2050, assuming no upgrades the volume of storm overflow spills is predicted to increase by 43% and the number of spills by 14%.

In terms of intermediate planning horizons, we have used a straight-line profile. This is due to limitations within the current tools available to the industry to determine future rainfall. We have used the best available industry approach to assess storm overflow performance. This uses a tool produced from the 2017 UKWIR research to evaluate the future impacts of climate change. This tool takes actual rainfall time series records and uplifts it to reflect a 2050 epoch, considering the spatial location of each WwTW catchment. This uplifted rainfall can then be modelled to understand future performance. This tool is limited as it does not include the ability to uplift to intermediate time horizons, and so as the rate of climate change is directly linked to global temperature, the rate of change has been assumed to be linear. In addition, running analysis using time series rainfall is resource intensive and so we have adopted

a pragmatic approach to infer performance deterioration from baseline to 2050.

For more detail on the process undertaken to assess the risk see the Modelling Storm Overflow Performance Technical Summary.

5.5.3 Wastewater Treatment Works (WwTW)

Modelled Risk Levels

We have both a statutory duty and legal obligations to ensure our WwTW remain in compliance with their permits. Investment at WwTW is heavily linked with the water industry national environment programme (WINEP), where the Environment Agency set out further tightening of existing permit levels to ensure that the water sector can deal with future environmental pressures and challenges. This includes impacts from climate change, population growth, pollutants such as microplastics and chemicals; and issues around flooding and storm overflows are of real concern.

Our investment decisions also need to consider operational investment to account for normal wear and tear and aging of physical structures to ensure we maximise the design life of past investments to the full.

We have banded each catchment depending on the level of risk in line with the DWMP Framework (Band 0/1/2), where Band 0 is the lowest risk and Band 2 the highest risk. Our risk assessments are not an indication of failure to meet permit compliance as non-compliance is not an option. Within our risk assessments we have considered current permit headroom, both in terms of flow and quality, we have also considered limitations of current best available technology and physical constraints which could hinder additional treatment capacity being provided. By 2050, assuming no upgrades, our assessments indicate that 15% of our WwTW will be in the highest risk band.

For more detail on the process we undertook to understand the risk see the Assessing WwTW Capacity Technical Summary.

5.6 Planning Horizons

As the DWMP is a 25-year plan, our assessments have identified the investment options up to 2050. However, in reality, this investment will need to be phased across the next 25 years, considering the risk level of priority and strategic investment which will provide assurance of 'no regrets' considering future uncertainty. As such, our investment requirements are structured according to Time Horizons, planning periods covering 0-5 years

(AMP8), 5-10 years (AMP9) and 10-25 years.

Through our DWMP analysis we have identified which catchments have greater levels of risk to inform their investment priorities. However, there will be lower priority catchments where more immediate localised interventions will be required as part of a phased long term strategy, and so using our DWMP findings we can ensure that immediate intervention needs are aligned with the long term direction of the catchment. This is something that will be assessed in more detail as we move towards implementing DWMP findings in AMP8 and beyond.

5.7 Sensitivity testing and dealing with uncertainty

The wealth of experience we have developed on the 30+ year journey we have been on to develop hydraulic models and drainage plans, has put us in a strong position to implement DWMP and have a reasonable level of confidence in the outputs of the baseline assessment. As part of building confidence in our assessments we have ensured all our catchment sewer models have are built and verified in line with industry best practice guidance. To further improve the value from our models, we have recently moved away from cyclic updates to our models whereby we now routinely update our hydraulic modeling stock to incorporate changes with a catchment, whether this be new development, changes to network configurations resulting from upgrade schemes or better information from verification to validate model confidence. Collectively this ensures the foundations of our DWMP are solid and provides confidence that our findings are robust.

We have used independent data sources to estimate the future drivers of change posed by climate change, growth and urban (impermeable area) creep on our current system. Which have all been through various stages of independent verification. To align with the recommendations within the 'Independent Assessment of UK Climate Risk'^[17] report (published by the Climate Change Committee in June 2021) to 'plan for 2°C, prepare for 4°C', we have assessed the uncertainty for both 2°C and 4°C scenarios (these align to Representative Concentration Pathway/RCP 6.0 and 8.5). The RCP2.6 scenario is representative of current baseline climate.

During the progression of our modelling there have been various check points to validate model outputs using catchment experts' knowledge and that error variance was addressed.

¹⁷ <https://www.theccc.org.uk/publication/independent-assessment-of-uk-climate-risk/>

Option development and appraisal

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This section outlines the process and resulting analysis from the step shaded in yellow. These steps are explained in more detail in the following Technical Summaries:

- Option Development and Appraisal Screening
- Assessing Risk of Sewer Flooding in a Storm
- Assessing Surface Water Separation
- Modelling Storm Overflow Performance
- Catchment Optimisation Software
- Adaptive Pathway Thinking
- Natural Capital

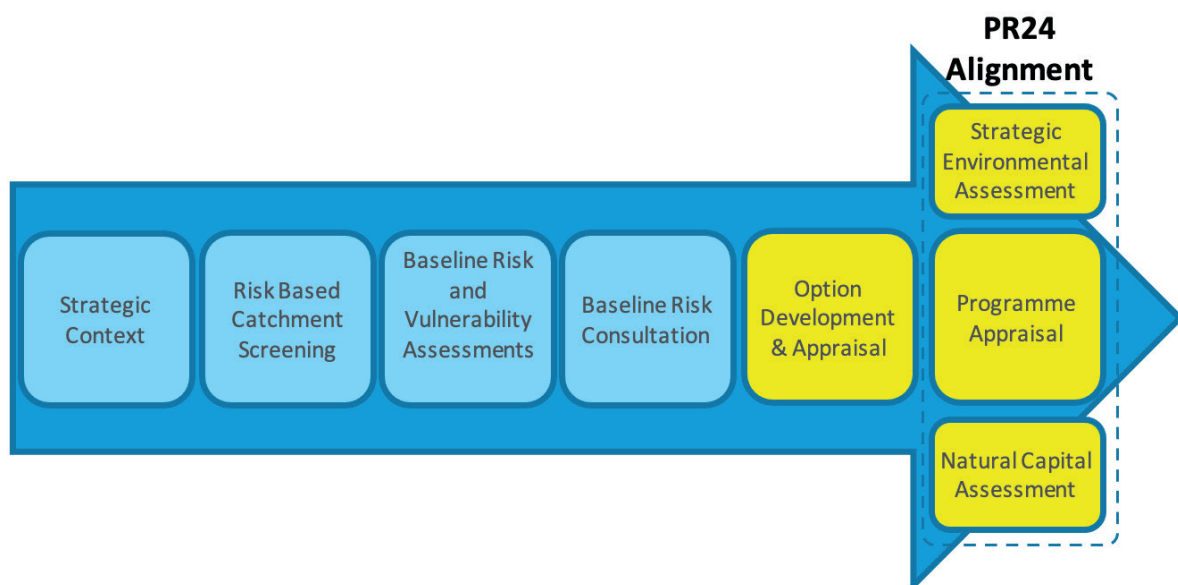


Figure 14. Summary of the key process stages undertaken in developing our DWMP. Yellow sections refer to steps undertaken in Option development and appraisal stages.

The focus of this step of the plan is to determine the best value means of addressing the wastewater needs, whilst working together with other stakeholders to consider potential wider benefits. For example, a wastewater problem could be resolved by building a traditional wastewater solution, such as building bigger sewers, providing attenuation tanks or increasing the capacity at wastewater treatment works (WwTW). However, these interventions don't support others with meeting their objectives, such as mitigating the risks associated with surface water flooding or flooding from watercourses. Thus, the scope of DWMP is to identify potential intervention strategies

which will meet the wastewater needs but do so in a way which can support others with their objectives. This includes working together to develop co-created and nature-based solutions to manage surface water by removing inflow into the sewerage network in a way that also alleviates surface water and river flood risk. This does not mean that we will be responsible for funding the entire solution, but by working together in partnership it should provide efficiencies and reduce flood risk to customers from multiple sources. For further detail see the Roles and Responsibilities of Risk Management Authorities (RMAs) Technical Summary.

6.1 Overview of hierarchy of options

Our option development and programme appraisal stage has been built on proportionate optioneering which balances resources with future uncertainties. Using our pre-existing catchment knowledge, as well as the results from the BRAVA modelling and Baseline Risk consultation, we have undertaken a structured assessment of our catchments. This option screening process aimed to understand the long-term needs and combined this with the catchment characteristics to determine what

Reduce Demand Remove inflow to release capacity

e.g Surface water separation, addressing groundwater infiltration and customer water use education

Optimise Supply Maximise existing asset capacity

e.g 'smart' technology to manage flows in existing network

Increase Supply Building capacity where needed

e.g building bigger sewers and Wastewater Treatment capacity

intervention options are likely to be beneficial. We assessed our catchments against a long list of over 40 options to determine how feasible a range of different intervention options would be in each catchment. This enabled us to develop a short list of feasible options which will best address the identified needs of a catchment. The options were largely split into 3 main themes; reduce demand, optimise existing capacity and increase the supply of capacity i.e through building bigger sewers.

Through use of our hydraulic sewer models, we have assessed strategic options to alleviate risks associated with sewer flooding and storm overflow spills. These options include optimising existing assets to manage flows, increasing supply by providing greater capacity in the network, as well as assessing the benefits of removing surface water from the public sewers. More detail on the approach taken for assessing options including the screening process, Internal Sewer Flooding and Storm Overflow strategic option modelling and surface water separation scenarios can be found in our Technical Summaries section.

Figure 15. Main categories of options assessed through the DWMP

6.1.1 Surface Water Removal Options

Reducing inflow into the sewers through separating out surface water connections from roads, footpaths and car parks is thought to be a more sustainable approach to managing future flows, reducing the need for large 'grey' traditional solutions of building bigger sewers and having multiple biodiversity, amenity and natural capital benefits by focussing on 'green' nature-based solutions such as Sustainable Drainage Systems (SuDS). It also provides good potential to work with other flood risk management authorities to support with the development of partnership working solutions. We have appraised three scenarios focussing on public realm separation of surface water from roads, footpaths and car parks summarised in Table 7. Each of these scenarios focuses on public realm separation which is deemed to be more cost effective and less disruptive to our customers compared with property level separation of roofs. These scenarios give an indication of potential benefits to reducing flood risk, based on a percentage reduction of impermeable area in hectares which is currently connected into the combined sewer in our hydraulic models. This enables us to determine a high-level direction of travel within the scope of DWMP, however as this moves to more detailed feasibility of specific schemes, we recognise that some localised management of roof drainage may be viable. See the Assessing Surface Water Separation Technical Summary for further detail.

Scenario	Reduction in surface water runoff area	Description
Realistic	10%	What is likely to be deliverable based on current ways of working.
Stretch	30%	What could be achieved if organisations work together better to deliver surface water management strategies.
Aspirational	50%	What could be achieved with changes to legislation to make it easier for a sewerage company to build SuDS as part of wider surface water management remits.

Table 7. Surface water separation scenarios

6.1.2 Partnership Opportunities

We recognise there is a need for greater collaborative and integrated planning with other Risk Management Authorities (RMAs) which have responsibilities relating to drainage, flooding and protection of the environment. The DWMP provides the platform for working together to develop solutions which can have wider benefits for both drainage (rivers, surface water and groundwater) and wastewater (sewerage system). By gaining visibility of the wider drainage and wastewater needs of a catchment, this can allow wastewater benefits to be delivered in a more sustainable way, through co-created solutions. As a high-level strategic plan, the DWMP doesn't develop detailed scheme level solutions (or ready build 'shovel ready' schemes), however it does provide the mechanism for identifying locations where future partnership working can be beneficial. In line with existing regulatory requirements, the DWMP and PR24 submissions are only intended to provide investment for activities which are the responsibility of the water and sewerage company.

Developing opportunities for partnership working with other risk management authorities to support our PR24 plan is also something we are building upon from previous experience. Our PR14 plan which identified the investment needs for 2015-2020 provided the mechanism to invest in partnership working, which enabled us to successfully deliver 26 schemes alongside our partners worth £27.6 million. This measure evolved in our PR19 plan (2020-2025), designing resilience into our performance commitments through our Collaborative Flood Resilience target. This focuses on working with other stakeholders, including local authorities, communities and wildlife trusts to deliver a collaborative solution to protect properties and that has benefits wider than just sewer flooding. While many opportunities exist, gaining commitment to a project from all interested parties can be difficult and time consuming. Although this commitment is very resource intensive, it is the right thing to do to deliver wider benefits for our customers and communities. Our DWMP

seeks to identify further opportunities for working collaboratively with stakeholders to develop co-created and co-funded solutions to support future iterations of Collaborative Flood Resilience in PR24.

As outlined earlier we have a good track record in delivering partnership schemes, but we also acknowledge that this is an area where more needs to be done. Our Mansfield Green Recovery project is a great example of our future ambition of sustainable surface water management at a catchment wide level. This is the first time the UK has seen investment at this level for blue/green initiatives and the learning from this scheme will prove to be invaluable to understand what barriers exist and how best to overcome them. It will also help provide an evidence base to inform if any legislative changes would be beneficial to make the implementation of blue/green solutions quicker and more efficient.

We will be using the findings from Mansfield and the outputs from our DWMP modelling assessments to help drive similar initiative across other catchments and build on the positive working relationships we have developed and fostered with our flood risk partners. Our ambition is to 'do a Mansfield' with other catchments and so our DWMP catchment knowledge is going to be instrumental to supporting this.

6.2 Investment Options

To mitigate the increased risk into the future we have assessed several options. These range from no intervention, through to getting to zero risk and multiple options in between. We used an approach which banded our catchments depending on the level of risk and associated investment needed to address that level of risk. We used three bands following guidance within the Framework (Bands 0/1/2), where Band 0 is lowest risk and Band 2 is highest risk. The catchment level summary of the current and future risk bands can be found in the Level 2 Strategic Planning Area SPA and Level 3 Tactical Planning Unit documentation.

6.2.1 Internal Sewer Flooding

Our aspiration is to reduce the risk of sewer flooding in a 1 in 50 year storm to zero by 2050 where detailed design indicates a solution is cost beneficial. Based on traditional interventions, investment in the region of £1.9 billion would be needed by 2050 to maintain current levels of flood risk, whereas over £8.2 billion would be required to get to zero flood risk, with subsequent funding being needed to maintain that level. We have developed options in between which are based on setting thresholds based on the percentage of properties at risk of internal sewer flooding. The

'Basic Investment' includes the cost to ensure no catchments are within the highest risk band (Band 2), however would result in some catchments with lower risks (Band 1 & 0) deteriorating within their current risk banding whilst there is focus on the highest risk bands. 'Enhanced Investment' represents the cost to ensure no catchments are within the medium or highest flooding risk band (Band 2 & 1). Basic and Enhanced investment provide cheaper options, but the level of risk would deteriorate above baseline levels which is not deemed to be acceptable. Thus, as a minimum, getting all catchments within Band 0 by 2050 is likely to be the optimal approach.

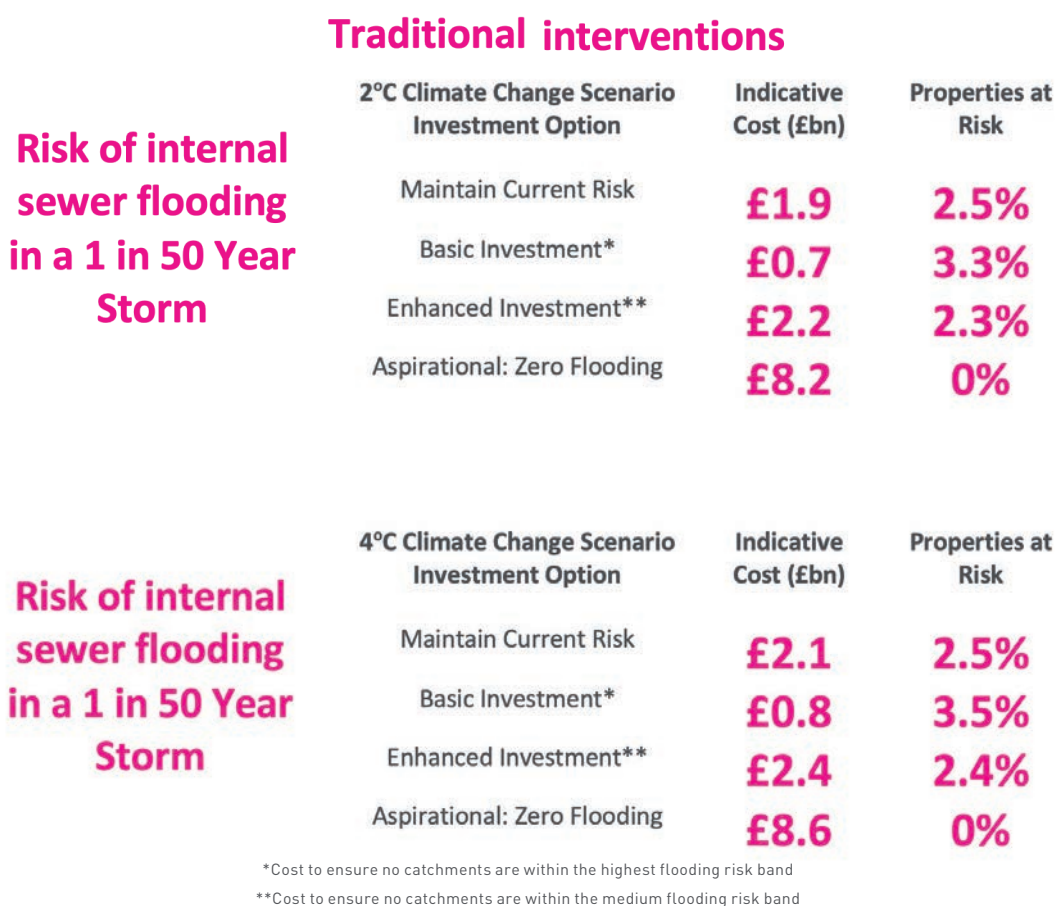


Figure 16. Investment options to address internal sewer flooding risk in a 1 in 50 year storm

The above options relate to the cost of building traditional 'grey' storage; however, we recognise that removing surface water inflow will reduce the demand for bigger sewers and 'green' nature-based solutions such as SuDS have the opportunity for wider environmental and natural capital benefits. Surface water separation options provide the opportunity to work with other Risk Management Authorities to develop multi-benefit solutions. Where a catchments characteristics indicate surface water separation is likely to be beneficial,

we have compared the cost of different separation scenarios against the traditional 'grey' interventions to deliver the same reduction in flood risk. Whilst separation alone can deliver the desired performance levels for some catchments, for the majority there is a residual risk which requires traditional solutions. Therefore, the separation options consider a hybrid approach, for example the residual risk not resolved by 10%, 30% or 50% surface water separation is mitigated through traditional grey solutions.

On the whole, we are finding that traditional solutions are more cost effective than separation-based solutions, but this does not consider valuation of potential wider benefits associated with the social and biodiversity benefits of supporting nature-based infrastructure in current built up fully paved communities. As part of our Final DWMP we will be incorporating valuation of natural capital to align with our PR24 best value appraisal.

**Surface Water Separation:
Risk of internal sewer flooding in a 1 in 50 Year Storm**

2°C Climate Change

Investment Option	10% Indicative Cost (£bn)	30% Indicative Cost (£bn)	50% Indicative Cost (£bn)	Properties at Risk
Maintain Current Risk	£1.9	£2.1	£2.4	2.5%
Basic Investment*	£0.8	£1.2	£1.6	3.3%
Enhanced Investment**	£2.2	£2.5	£2.8	2.3%
Aspirational: Zero Flooding	£8.2	£8.4	£8.6	0%

*Cost to ensure no catchments are within the highest flooding risk band

**Cost to ensure no catchments are within the medium flooding risk band

Figure 17. Investment options to address internal sewer flooding considering surface water separation

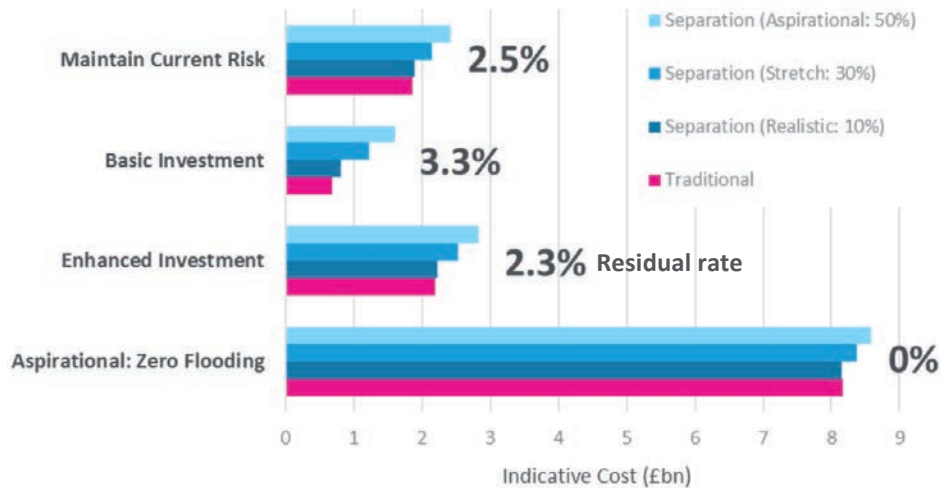


Figure 18. Comparison of indicative costs of hybrid separation options against traditional 'grey' option for different investment options showing the percentage of properties at risk. Basic Investment represents the cost to ensure no catchments are within the highest flooding risk band and Enhanced Investment represents the cost to ensure no catchments are within the medium risk band.

These indicative costs show the total investment needed across all catchments by 2050. However, the profiling of investment will need to be determined as part of PR24 which will consider wider investment needs (such as what is needed for Water Resource Management Planning and meeting statutory obligations) to ensure our overall PR24 plan is balanced, and customers' bills are affordable. In aligning our DWMP investment plan with PR24 we are prioritising investment over the next 5 to 10 years (AMP8 and AMP9) on our highest risk larger WwTW catchments (with populations over 10,000 people) which are deemed to be within or expected to be within the highest risk band (Band 2) by 2030. These catchments are intended to be the focus of our AMP8 and AMP9 investment plans and so we are already committing resources to use the high level DWMP findings to support development of catchment specific option feasibility, with a focus on Blue Green Infrastructure. The details from this will support our Final DWMP and PR24 investment. In addition to the larger catchments, we also intend to include proposals to address risks across our smaller catchments, which due to their local characteristics are less constrained and therefore less complex to alleviate.

6.2.2 Storm Overflows

To mitigate the future risk, we have assessed the cost to reduce storm overflow risks to different performance levels, including 40, 20, 10 and Zero spills. This cost is based on the volume of storage required to limit the number of spills to desired performance levels (Figure 22). Most of the investment is required to address the current baseline risk, with additional funding required to meet the increase in risk in the future.

At a catchment level we have categorised the level of risk into three risk bands (Band 0/1/2), where Band 0 is the lowest risk and Band 2 the highest risk. This aligns with the Capacity Assessment Framework (CAF)^[18] approach, which only scores overflow performance based on spill thresholds of 40 or 20 spills to provide a catchment average. The number of catchments deemed to fall into Band 2, with higher levels of annual spills in a typical year, increases from 163 in 2020 Baseline to 182 by 2050. This allows us to prioritise catchments for investment depending on their level of risk to support PR24. Our focus is to focus initially on catchments within Band 2 where catchment wide interventions are expected to deliver wider benefits. Where there are other localised intervention needs within other catchments these will be addressed by local interventions but with schemes designed to be adaptable to future phasing.

However, this analysis does not currently consider 'harm' as indicated in the possible scope of the Storm Overflows Discharge Reduction Plan. The CAF approach used to score overflow risks for the 'Common Planning Objective' is based on typical year spill thresholds of 20 or 40 spills, and so in its current state does not consider an asset level typical year spill limit of 10 spills or 'harm' as set out in the Storm Overflows Discharge Reduction Plan. Ahead of our Final DWMP we will take on board the Government's policy requirements concerning storm overflows.

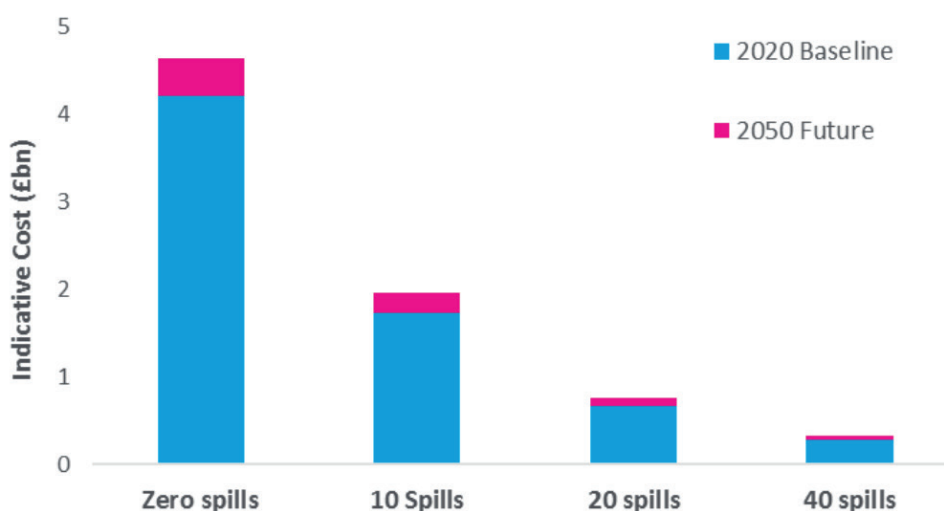


Figure 19. Indicative investment cost for meeting the range of storm overflow spill threshold levels

¹⁸ <https://www.water.org.uk/wp-content/uploads/2018/12/Capacity-Assessment-Framework-Project-Report-Final.pdf>

6.2.3 Wastewater Treatment Work Investment Options

We have taken it as read that we will maintain WwTW permit compliance, but as part of our risk assessments we have considered factors such as how much spare headroom we have within existing processes (both in terms of daily volumes of sewage we need to treat, but also how well our processes are working to meet the required quality standards). Whilst this indicates how much spare capacity we may have, we have also assessed what could hinder us when it comes to providing additional capacity as and when we need to do so, again to ensure we maintain permit compliance. These additional factors consider if there are any environmental constraints in the receiving waterbody which may require higher levels of treatment which is beyond the levels of what is currently achievable. These are often referred to as 'Technically Achievable Limits' (TAL) or beyond what is 'Best Available Technology Not Exceeding Excessive Costs' (BATNEEC). Where assets are already at TAL/BATNEEC limits, the only options available will be to either transfer inflow to another WwTW where there is capacity, diverting parts of the upstream sewerage catchment to another catchment, reducing inflow

by managing groundwater infiltration (if applicable), extending the treated effluent discharge to a point where there is environmental capacity, or look at catchment permit balancing (i.e. treating flows from upstream WwTW to a higher standard to balance off constraints lower down a river).

For our Draft DWMP we have identified WwTW which, based on our DWMP analysis and other asset specific assessments, are likely to require investment in AMP8. Due to the detailed process level evaluations needed to determine investment options at WwTW, we do not think it is appropriate to assess intervention needs beyond 2030. Additionally, ongoing innovation advancements are likely to develop better processes which are likely to lower what is TAL/BATNEEC, therefore, prematurely assessing options in detail which may result in abortive investment is not considered to be best use of investment. Through our DWMP analysis we have identified further WwTW which are being closely watched for more in-depth assessment as part of DWMP Cycle 2. From our analysis this indicates by 2050, investment of £1.1bn will be needed to ensure increase pressures can be managed.



6.3 Approach to and appraisal of Best Value Plan

Our customers want us to pursue the best value options within our DWMP. These are not necessarily just the lowest cost options, but questions of value and bill impacts are also particularly important to customers when thinking about solutions that will take several years to implement. While most customers are happy to contribute to the cost of addressing long-term wastewater capacity challenges, they are clear this should be spread out over time, so as not to cause undue financial burden for customers.

A fundamental element of this is going to be determined by the Government’s policy on storm overflows which will be presented to parliament in September 2022. Through the development of our DWMP we have appraised a range of overflow performance spill thresholds, with our minimum emerging preferred plan being based on no more than 10 spills per asset on an average year. Ahead of our Final DWMP publication we will be undertaking further assessments to quantify what additional enhancements will be needed to ensure no environmental harm and customers support for tighter standards. As part of this next phase of assessment, we also need to better understand aligning valuation of wider benefits, such as natural capital and carbon with the same inputs being used in our PR24 business plan. Due to the timing of the publication of the Draft DWMP and the need to align with PR24 research this has restricted our ability to determine a best value plan.

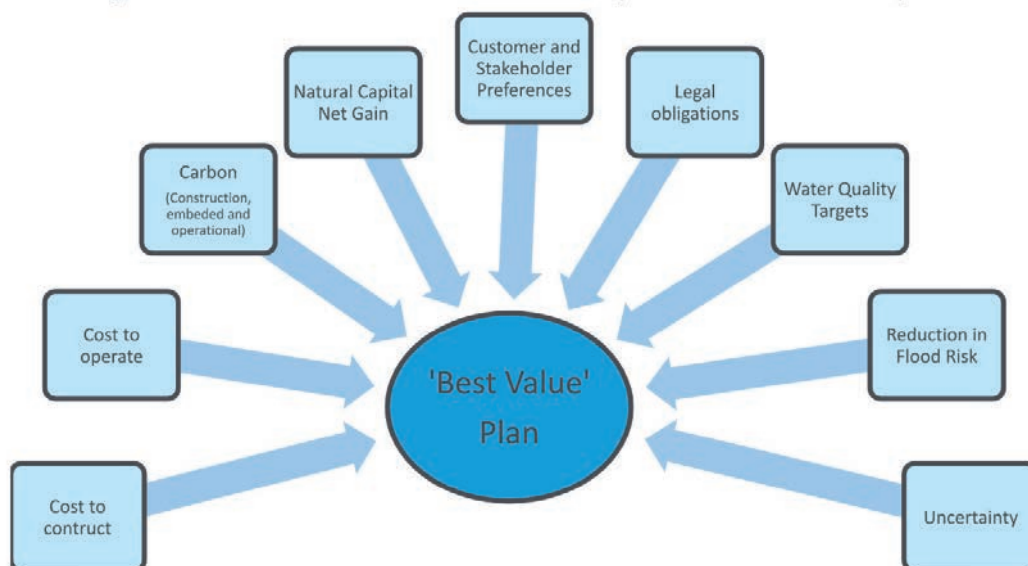


Figure 20. Summary of the elements that make up the development of the ‘best value’ plan

As such, our Draft DWMP sets out a series of intervention scenarios, setting out long term options to alleviate pressures associated with internal sewer flooding and to limit the impact storm overflows have on the environment. This approach aligns with the Framework which recognises that an optimised DWMP is an iterative process that should align with views expressed by customers, regulators, and stakeholders, in addition to the additional planning constraints associated with business plan development. Given that this Draft DWMP is the first time that customers, regulators, and stakeholders will have seen a DWMP output, we feel this approach will add value. We envisage that feedback from the Draft DWMP consultation will enhance the Final DWMP publication and its alignment to PR24.

In terms of an emerging preferred plan, this aligns to our strategic intent to lower the risk of flooding and pollution, achieve net zero carbon, and protect and enhance the environment. Regarding the DWMP capacity focused strategy, our emerging preferred 2050 plan is to reduce the number properties at risk of sewer flooding up to a 1 in 50 year storm event to zero where cost beneficial and that no storm overflow will operate more than 10 times per annum. Although this may have some secondary benefits in terms of pollution incident reduction, the predominate strategy to reduce pollutions, blockages, non-rainfall linked flooding incidents and sewer collapses will be linked to our serviceability led long term strategy.

6.4 Cost Models

Core to our cost estimation process is the Severn Trent Unit Cost Application (STUCA). This is our central cost repository which has and continues to capture outturn project costs for all capital works that we carry out. We use this data to derive programme level average unit costs for the implementation of new assets and intervention activities. The unit costs, adjusted to reflect the future cost efficiency challenges, are used to set target prices as part of our AMP7 procurement strategy. This provides consistency between historic costs, our cost adjustment proposals and projected AMP8 delivery. Our process is well established having been used consistently for over a decade and previously reviewed and assured by third party specialists including Atkins, EC Harris, and Efficio. In addition, our unit costs and cost curves were used for our PR19 Business Plan, and these were validated and benchmarked with proprietary cost information by Jacobs in early 2018.

6.5 Wider benefits assessment Environmental Appraisal

We are passionate about taking care of the environment and ensuring that our plan considers the most sustainable options for addressing current and future risks. Therefore, our DWMP has considered environmental outcomes including habitats, environmental net gain and enhancement when developing and appraising our long-term strategies. To support this, we have applied Natural Capital thinking alongside the alignment of the priorities of DWMP with those identified from Strategic Environmental Assessment (SEA) findings to support Water Resource Management Plan (WRMP). The aligned valuation of environmental benefits is something that is to be incorporated into our Final DWMP which will consider feedback from our Draft DWMP consultation and our PR24 quantitative customer research to feed into the assessment of best value.

The fundamental objectives of DWMP are to improve the environment and the communities we all live in by working together with other others to reduce the risk of flooding and improving river water quality. How these outcomes are achieved offer opportunities to deliver wider environmental benefits, whilst ensuring no deterioration to our current performance. One challenge we have had to overcome is with the level of assessment, whereby the high-level strategic approach to planning has meant it is unfeasible to undertake detailed scheme level assessment. We have therefore taken a pragmatic approach to ensure the environment is appropriately considered as part of the appraisal of our options.



Natural Capital

Natural capital refers to the elements of nature that directly or indirectly provide 'value' to people. It can provide a framework for considering the wider ecosystem services benefits of DWMP options in decision making to prevent environmental deterioration, enable sustainable development and seek out opportunities for environmental enhancement where possible. We have used natural capital thinking to inform identification of 'best value' options. There is, however, no industry accepted methodology for natural capital assessment specific to DWMPs. More detail on the methodology that we have applied is included within the Technical Summaries section.

Our approach enables qualitative natural capital appraisal of DWMP option types using Natural England's Natural Capital Atlas to establish a score-based natural capital baseline for seven ecosystem services for each catchment (Table 8). The Atlas aggregates multiple environmental datasets to produce authoritative natural capital maps which are suitable for regional planning. The DWMP option types were scored to generate three Natural Capital Indicators (NCIs) to identify:

- Potential positive enhancements to ecosystem services
- Potential negative reductions in ecosystem services value
- The resultant 'trade offs' in ecosystem services

Table 8. List of the seven ecosystem services used within the Natural Capital assessment.

Ecosystem service	Explanation
Air quality regulation	Features such as trees and shrubs can remove air pollutants from the atmosphere.
Biodiversity and habitat	The diversity of living things and the environment in which they live is often considered as a supporting service which underlies all other ecosystem services benefits.
Climate regulation	Natural assets remove carbon from the atmosphere and store it in biomass and soils which helps regulate global climate.
Natural hazard regulation (flooding)	Natural capital assets regulate flows of water by intercepting rainfall and slowing flows which helps protect properties from floods.
Recreation and amenity	Natural capital assets including greenspaces in urban areas contribute to the setting for outdoor recreation, tourism and amenity.
Water purification	Natural capital assets such as soils and plant species contribute to removal of water pollutants which improves to water quality.
Water regulation (Usually referred to as water provisioning outside of Water Resources Planning Guidelines, relevant to drought)	Natural capital assets contribute to water supply either directly as water features provide a direct natural capital stock of water, or indirectly through reducing runoff to enhance infiltration and groundwater recharge.

Alignment of DWMP with WRMP Strategic Environmental Assessments

A Strategic Environmental Assessment is a method for evaluating the environmental implications of a plan in a systematic way. Whilst not a statutory obligation to complete a Strategic Environment Assessment (SEA), we recognise that it is ‘best practice’ on the Final optimised plan.

We recognise the benefits of ensuring environmental priorities used to inform DWMP also align with the same priorities used within our Water Resource Management Plans. Just over twelve months ago (April 2021), we undertook a consultation exercise as part of our WRMP to inform SEA priorities. We believe these same priorities should be the same priorities to inform DWMP best value decisions making as both should be aligned to ensure environmental best value costs fully align for both DWMP and WRMP. However, between Draft and Final we will be holding WRMP/DWMP alignment sessions with our stakeholders to ensure the findings from our WRMP to validate these priorities still hold true for DWMP. In addition to aligning DWMP with WRMP to ensure best value assessments align, it is hoped that this approach will also minimise further resources requirements from our stakeholders.

Net Zero Carbon

Assessments to appraise our journey to Net Zero Carbon is being appraised as part of a separate

workstream to support PR24. A key element of this will be to value the impacts of carbon on different DWMP intervention options, as part of construction, embedded and operational. This will be incorporated into our best value plan appraisal ahead of our Final DWMP publication in March 2023.

6.6 Innovation and learning to inform options

Within our wide range of options considered there is a number of new innovative approaches to managing our system. A number of these innovative approaches are currently either in early deployment within Severn Trent (for example our implementation of surface water separation using nature based solutions in Mansfield) or are in innovation trials.

This includes

- **Active System Control** by utilising an AI (Artificial Intelligence) managed active system in our network to proactively manage our available storage in variable storm conditions.
- **Storm Overflow Effluent Treatment** by enhancing our treatment at storm overflows to improve the water quality before release into sensitive environments for example through use of reed beds and Ultra Violet (UV) filters.

- **Domestic Water Consumption management** using rainwater harvesting, greywater or blackwater treatment and re-use on site, smart management of surface water at a property level.
- **Trade Flow demand management** through pre-treatment of trade effluent at source to reduce load at works.
- **Surface Water Inflow Management** through a series of options from de-paving incentivisation, surface water separation and creation of strategic blue / green natural capital SuDS solutions.
- **Operational Performance Management** by enhancing our 'Live' and predictive asset performance monitoring to proactively enhance performance in our system.
- **WwTW performance management** by undertaking intelligent / dynamic process operation or managing our flows into a river reach with a dynamic river catchment permitting approach.

- **Upstream Catchment management** by with utilising SuDS to undertake groundwater recharge to support the WRMP and low flow rivers or though natural flood risk management to provide upstream environmental headroom to accommodate wastewater discharges.

Within our innovation approach we recognise that Artificial Intelligence (AI) is changing the way the world works. It has the potential to transform the way the water sector delivers for our customers, society and the environment. To drive transformative change, and realise the benefits for our stakeholders, we need to share data, best practice and innovative solutions within the sector. We are leading of a cross-sector coalition called 'Artificial Intelligence of Things Enabling Autonomous Waste Catchments' that was awarded £2.8m from the first OFWAT Water Challenge fund to pilot an autonomous waste catchment. This will combine emerging technologies for comprehensive testing, and we will create a shared blueprint that is tested, proven and ready to be scaled across the UK.



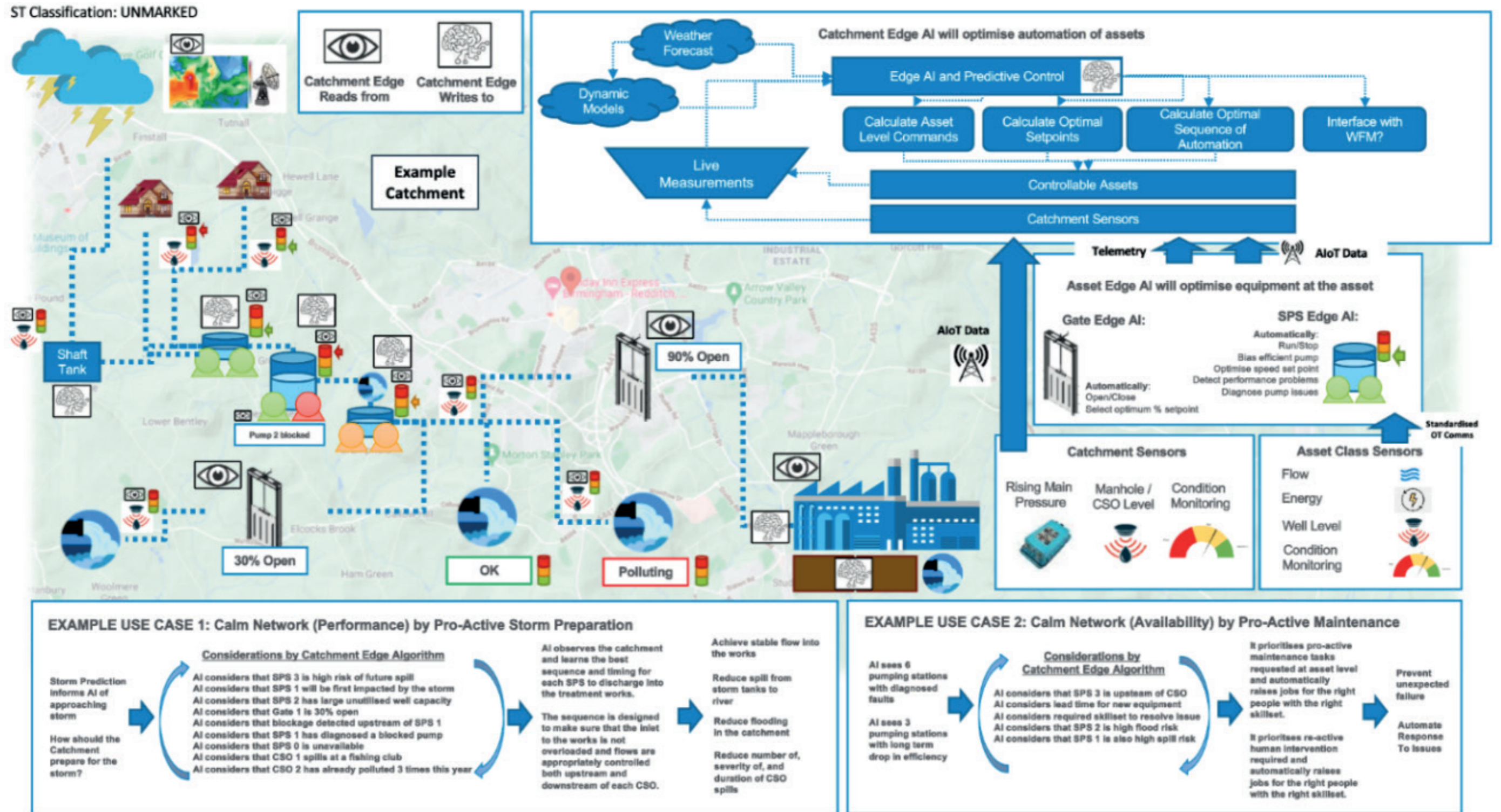


Figure 21. Overview of 'Artificial Intelligence of Things Enabling Autonomous Waste Catchments'

The blueprint will allow water companies to:

- Minimise the risk of flooding and pollutions in real time through intelligent localised autonomous control of the catchment.
- Minimise the risk of asset failure by integrating prescriptive, condition-based maintenance of sewage pumping stations and rising mains.
- Reduce energy consumption and process emissions, and maximise resource recovery, by maintaining steady-state conditions to the sewage treatment works.
- Protect the system from cyber threats and malicious attacks (a key barrier to the adoption of AI solutions) by developing a security wrapper for connected Artificial Intelligence of Things (AIoT) devices.

The potential for fully autonomous waste catchments to exist from this innovative pilot in AMP7 will help inform our catchment management wider in 2025 – 2050.

Emerging preferred plan

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To help us work towards our Strategic Outcomes, we have assessed multiple scenarios and options which are outlined above. These options show a range of choices and the associated investment requirements provide greater value, giving customers and stakeholders the opportunity to comment on which options they most prefer. For our Final DWMP, we will consider the responses

to the consultation and incorporate the additional information available from the Government’s position on storm overflows in addition to customer willingness to pay responses which will inform our PR24 plan, to give a ‘best value’, ‘preferred’ plan. We have translated these priorities into a set of ambitious Strategic Outcomes for our wastewater system.

Table 9. Our Strategic Outcomes

Strategic Outcomes	Lower the risk of flooding and pollution	Protect and enhance the environment	Support a more circular economy (Carbon Net Zero)
By 2030	<ul style="list-style-type: none"> Based on Environment Agency measures (RNAGs) our operations will not be the reason for unhealthy rivers by 2030 We will reduce spills from our storm overflows to an average of 20 per year by 2025 We’ll improve 50km of rivers in Warwickshire and Shropshire, creating 15km of bathing quality rivers by 2025 and have plans to double the amount of bathing quality rivers in the Midlands within 10 years We will deliver 100% monitor coverage at our treatment works and on our storm overflows by the end of 2022 We will work with other sectors to help deliver the Governments 25yr Environment Programme We will aim to reduce process emissions (CO2e) across our assets by 70% 		
By 2045	<ul style="list-style-type: none"> Delivered sewer overflow improvements to remove harm in 100% of Defra outlined priority areas (SACs, SSSIs, etc) within our region. 		
By 2050	<ul style="list-style-type: none"> No storm overflow will operate more than 10 times per year or cause harm as defined by the EA storm overflow guidance Reduced risk of properties flooding up to a 1 in 50-year storm event Zero serious pollutions caused by our assets or operations 		

Due to the scale of risks highlighted from assessing the impact of climate change, growth and urban creep on our system, along with working towards new draft guidance on storm overflows, delivering on these will require a multi-AMP perspective. Although we have undertaken some great steps forward during the current investment cycle, we recognise there is more to do on focusing on innovation, collaboratively working with other drainage authorities and making a collective step change to our management of rainfall.

Our strategic outcomes give us the targets for our common and bespoke planning objectives. CP01 – CP03 all include reviewing our previous 3 years records of reported incidents. In all three cases this, includes incidents not caused by rainfall (capacity) issues but from ‘other causes’, such as incidents caused in dry weather serviceability failures. These are predominately caused by blockages or third-party impact on our assets. While these types of incidents are not specifically covered by our review of rainfall (capacity) issues we still aim to minimise the impact from these issues on our customers and on the environment.

Within DWMP there are three areas where our performance is more at risk due to climate change, growth and urban creep. These are:

- Sewer Flooding (CP04) – Risk of internal sewer flooding in a 1 in 50 storm
- Storm overflow operation (CP05) performance
- Waste water Treatment Works compliance (CP06)

For each of these areas we have made an initial high-level assessment of the potential investment required between now and 2050. These costs are indicative and based on a 2021/2022 price base. Our emerging preferred plan is based on the 30% surface water separation scenario to build on the learning that our Mansfield Green Recovery will give us for co-delivery at a catchment scale. Our emerging preferred plan for storm overflows is to align with the 10 spills per year thresholds as per the Storm Overflows Discharge Reduction Plan, with WwTW investment based on ensuring compliance with permits.

Risk of internal sewer flooding in a 1 in 50 Year Storm	Investment Option	2050 Indicative Cost (£bn)	Properties at Risk
2°C Climate Change Scenario	Maintain Current Risk	£2.1	2.5%
	Basic Investment*	£1.2	3.3%
	Enhanced Investment**	£2.5	2.3%
	Zero Flooding	£8.4	0%

*Cost to ensure no catchments are within the highest flooding risk band

**Cost to ensure no catchments are within the medium flooding risk band

Storm Overflow Performance	Investment Option	Baseline Indicative Cost (£bn)	2050 Indicative Cost (£bn)
4°C Climate Change Scenario	Zero Spills	£4.2	£4.6
	10 Spills	£1.7	£2.0
	20 Spills	£0.7	£0.8
	40 spills	£0.28	£0.32

Wastewater Treatment Works Capacity (Growth)	Investment Option	2050 Indicative Cost (£bn)
2°C Climate Change Scenario	Maintain current environmental performance with increased growth	£1.1

Figure 22. Summary of our emerging preferred options (blue highlight) for internal sewer flooding risk in a 1 in 50 year storm, storm overflow performance and WwTW capacity related to growth.

Our Wastewater Treatment Works (WwTW) investment goes beyond capacity (growth), we have statutory and legal obligations to ensure all of our WwTW remain compliant with their permits and also deliver the improvements set out by the Water Industry National Environment Programme (WINEP) alongside our commitments to enhance the environment and sustainably reduce carbon in the form of emissions from our processes, energy and chemical use. Regarding WwTW, statutory planning guidance and our broader investment programme for the period 2025-2030 remains at an early stage of development and optimisation, as such the detail set out below is an emerging preferred plan as determined by DWMP growth management only.

Our planning outcomes for the investment period 2025-2030 are as follows:

- No deterioration in catchment flood risk level
- Take action in our highest priority catchments to improve their position through a mixture of small-scale localised improvements and larger scale catchment level activity
- Investigate, monitor, and shape solutions for those catchments susceptible to change by 2030 -2040
- Deliver on our River Pledges
- We will focus on Defra priority areas (Sites of Special Scientific Interest (SSSI) and Special Areas of Conservation (SAC)), removing ecological impacts caused by our assets
- Continue to drive down spills from our overflows and increase screening and quality monitoring provision on those that remain in essential use.

We have outlined the programme level plan to reach our 2030 and 2050 emerging preferred plan in Table 10 and Figure 26 below. This shows the main drivers between each programme along with any secondary drivers that can be obtained by creating synergies in our plan. We also recognise the need to continually investigate and monitor our assets. We will do this following industry standards and proactively incorporating new guidance from Defra, OFWAT and the EA. Following our river pledge, we will be open and transparent about our performance and our plans. We are working with NGOs to ensure we provide the river quality information per want and need to see by the end of 2022, we will make this information easily accessible via our website by the end of 2022.

Some of these ambitions are statutory, and others need to be prioritised based on risk and optimised with other drivers to create the best value plan. The feedback we receive through this consultation and wider PR24 engagement will inform the pace and sequence that we work towards these ambitions. This plan will be revised based on feedback from this consultation before publishing our completed DWMP plan in March 2022

Table 10. Indicative AMP8 activity areas

Summary of our Strategic Intent at Draft DWMP	Description of Investment	Indicative AMP8 Activity Summary
No Water Quality Impact from our Storm Overflows	We will continue with our river pledge and ensure that we do not cause any RNAGs within our drainage area (storm overflows and treatment works). We will undertake this by implementing a pragmatic balance of blue / green and grey engineering solutions.	86 river reaches throughout Severn Trent. Approximately 1,133km
No Ecological Impact on SSSI and SACs from our assets	We will focus on the Defra priority areas (Sites of Special Scientific Interest (SSSI) and Special Areas of Conservation (SAC)) for removal of local ecological impact from our assets (storm overflows and treatment works)	All aquatic based SSSI and 3 SAC areas.
DWMP High Priority Storm Overflow Catchments	We will implement large scale catchment improvements in these high priority catchments. This will include large scale surface water separation and implementing nature based solutions. This will be enhanced (where needed) by grey engineering solutions to collectively reduce all storm overflows in these catchments to spill less than 10 times per average year.	199 storm overflows within 17 sewerage catchments
DWMP High Priority Flood Resilience Catchments	We will implement large scale catchment improvements in these high priority catchments. This will include large scale surface water separation and implementing nature based solutions. This will be enhanced (where needed) by grey engineering solutions to collectively reduce flood risk of properties.	14 catchments with strategic amendments to surface water drainage with a further 108 having focused amendments to surface water drainage management
DWMP Growth management at Treatment Works	We will increase our capacity at our works to accommodate the additional population projected to be in each of the treatment work catchments.	39 catchments with strategic amendments required with a further 61 needing additional amendments to current processes

Summary of our Strategic Intent at Draft DWMP		Benefits				Description of Investment	AMP8					AMP9					AMP10					AMP11					AMP12				
		River Water Quality Improvements	Storm Overflow Spill Frequency Reduction	Storm Overflow - Aesthetic Improvements	Flood Resilience Improvements		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
2025-2030	No Water Quality Impact from our Assets	Main Driver	Secondary Benefit	Secondary Benefit		No. Overflows - 380																									
	No Ecological Impact on SSSI and SACs from our permitted discharges	Main Driver	Secondary Benefit	Secondary Benefit		No. Overflows - 80																									
	DWMP High Priority Storm Overflow Catchments		Main Driver	Secondary Benefit	Secondary Benefit		No. Overflows - 199																								
	DWMP High Priority Flood Resilience Catchments			Secondary Benefit	Main Driver	14 Strategic Catchment Amendments + 93 other catchments having localised improvements																									
2030-2035	No Ecological Impact on Eutrophic Sensitive Areas	Main Driver	Secondary Benefit	Secondary Benefit							No. Overflows - 200																				
	DWMP Medium Priority Storm Overflow Catchments		Main Driver	Secondary Benefit	Secondary Benefit							No. Overflows - 323																			
	DWMP Medium Priority Flood Resilience Catchments			Secondary Benefit	Main Driver	5 Strategic Catchment Amendments + 3 other catchments having localised improvements																									
2035-2050	DWMP long term priority Storm Overflow Catchments		Main Driver	Secondary Benefit	Secondary Benefit										No. Overflows - 310																
	DWMP long term priority Flood Resilience Catchments			Secondary Benefit	Main Driver	19 Strategic Catchment Amendments + 21 other catchments having localised improvements																									
	Non DWMP 'triggered' Storm Overflow catchments		Main Driver	Secondary Benefit													No. Overflows - 50														
	Aesthetic Improvements only driver				Main Driver	No. Overflows - 1095																									

Figure 23. Indicative delivery programme

Alignment of DWMP with PR24

Our DWMP is intended to inform our business plan submission to Ofwat, known as PR24. The DWMP and PR24 plans are different and distinct yet align closely to inform the required investment needs to meet the needs and expectations of our customers. The DWMP informs the 25-year strategic investment direction for how the capacity of the wastewater system will be resilient to future pressures of climate change, population growth and increased surface water entering the network from the increase of impermeable area known as urban creep. The DWMP provides one of many inputs into the PR24 plan which sets out the investment needs for the whole business including clean water and wastewater for the period between 2025-2030. The PR24 plan is a best value plan which sets out the investment needs to meet performance targets across water and wastewater service provision and treatment, including day to day operation and capital maintenance of our assets. It takes into consideration what our customers tell us are the most important issues they want us to address and invest in, including how this can be done

whilst ensuring bills are no higher than absolutely necessary. This Draft DWMP is a key step in the journey to publishing our Final DWMP which sets out the future capacity related wastewater investment strategy. The Final plan will benefit from additional information which is being prepared for the PR24 plan, including customer priorities and clarity on the Government's direction on Storm Overflows.

We see the development of the DWMP to be a critical part of the PR24 business planning process. It gives us the opportunity to develop the important evidence base to ensure that the business plan considers the current and future needs of the wastewater system. The two plans will be aligned with the overall goal of ensuring we improve customer outcomes and that our plan provides value for money as well as societal and environmental benefits. Careful alignment of the plans is imperative to ensure the selection process for developing investment options is carefully balanced between cost and benefits.

Adaptive planning

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It is prudent to recognise that there is uncertainty in our modelling of the future, as unexpected changes may occur and our assumptions for example around climate change or population growth could be different to what we expect. We have therefore looked to consider adaptive pathway thinking as part of our DWMP, particularly as part of our Option Development and Appraisal (ODA). Adaptive pathway thinking is a planning approach that considers how future uncertainty and change could be accommodated by adaptable intervention strategies.

It is often visualised as being like a London Underground map whereby intervention strategies can jump to a different pathway depending on when predetermined triggers are realised. The key objective being to avoid strategic cul-de-sacs and ensuring decisions are future proof to reduce the risk of abortive investment associated with recently built assets having to be replaced because they turn out to be too small.

The intention of the DWMP is to provide a high-level catchment assessment to inform the best direction of travel to meet its expected needs. We also need to balance proportionate optioneering to ensure the level of detail and complexity associated with the ODA process is proportionate to the levels of risk identified, the timing of the risk materialisation and the confidence in the information being used to define the inputs.

For our Draft DWMP we have kept things relatively simple, in our modelling of climate change, growth and urban creep we undertook sensitivity analysis to gain an understanding of the extent to which each variable is responsible for the increase in risk that we are predicting. This identified that climate change is the primary variable which needs to be considered as part of adaptive pathway thinking. This is one aspect which is well understood and supported by sound research. Our modelling of 2°C (RCP6.0) and 4°C (RCP8.5) scenarios have allowed us to plan for the likely 2°C scenario but prepare options which consider an increased warming scenario.

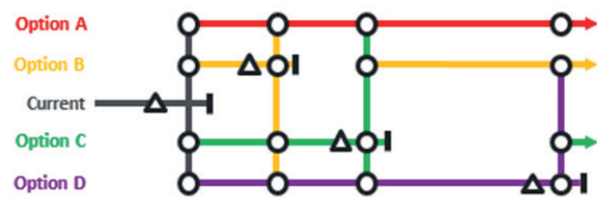


Figure 24. Visualisation of adaptive thinking pathways

As the name suggests, adaptive pathways should also consider how adaptable interventions are to changes in the future. This will depend on catchment characteristics as well as the needs of a catchment. In narrowing down the long list of generic options for each catchment, the ODA screening processes considered how adaptable an intervention would be to future uncertainties. These considered:

- Technical feasibility and buildability – to understand how established a technology or methodology behind a particular intervention is. For example, upsizing a sewer is a well-established process, but remediation of infiltration has been historically difficult to find and fix.
- Longevity and robustness – to understand how robust an intervention is to maintenance liabilities and how long it is likely to be valid for before the desired level of performance is unable to be met. For example, a well-designed sewer would require minimal maintenance and solely within the remit of a sewerage company, whereas as SuDS based solution would require annual maintenance which might rely on other organisations to support and if not appropriate could impact on its ability to perform.
- Adaptability to future uncertainties – some interventions are more adaptable than others. For example, surface water separation is more adaptable than building bigger traditional 'grey' infrastructure as it reduces the inflow and is easier to undertake more surface water separation in the future should climate change projections increase by 10%, but it will be more difficult to retrospectively add 10% more capacity to a traditional storage tank.

Through the ODA screening process, we developed a short list of options per catchment which best address current and future needs, incorporating adaptive pathway thinking when identifying which options are most appropriate for each catchment. From our DWMP analysis we have a good understanding which catchments are of a greater priority and an indication of the best strategic direction to meet is long term needs. However, the scope of DWMP does not go down to scheme specific level where the real benefits of adaptive pathway thinking can be applied across a catchment.

Whilst the DWMP may indicate that the best long-term strategy is to separate out surface water to meet the 2050 needs of a catchment, we will also need to consider that in the interim there may be priority areas which cannot wait for a surface water management strategy to be developed and implemented. In such cases we may need to install traditional interventions, but the benefit we will have from DWMP is that we can ensure this aligns to the long-term strategy and consider catchment uncertainty.

For the catchments which have been identified as a priority for PR24 investment, we are undertaking more detailed catchment level optioneering ahead of the Final DWMP. This will benefit from use of optimisation software where it is intended to

appraise critical adaptive pathway uncertainties.

More detail on the adaptive pathway planning approach is found within the Adaptive Pathway Thinking Technical Summary.

8.1 Common Reference Scenarios

To support PR24, Ofwat have published their 'PR24 and beyond: Long-term delivery strategies and common reference scenarios'¹⁹, setting out their expectations for strategic planning frameworks at PR24, including DWMP. Part of this sets out common reference scenarios (which differ from the common planning objectives within a DWMP).

The document refers to assessing eight common reference scenarios

- 2 x Climate Change: using an RCP2.6 and RCP8.5 scenarios
- 2 x Technology: by assessing a future world in a high and low technology scenarios
- 2 x Demand: whereby future growth scenarios are informed by latest local planning authority (high scenario) and forecasts derived from the Office of National Statistics (low scenario),
- 2 x Environmental ambition: based on a high 'enhanced' scenario and a low scenario based on 'business as usual' ambition.

Our DWMP has focused on assessing uncertainty regarding future upward pressures associated with climate change as our catchment analysis was undertaken in 2020 prior to this document being published.

As stated above we have appraised future catchment risk from climate change scenarios to align with the 'Independent Assessment of UK Climate Risk' report recommendations to 'plan for 2°C, prepare for 4°C'. This equates to RCP6.0 and RCP8.5 with the use of an RCP8.5 being in line with what is suggested in the DWMP Framework. The use of an RCP2.6 scenario is aligned to current baseline global temperature, with RCP6.0 being in line with the 2016 Paris Agreement.

In terms of demand, we have used both local planning authority and ONS forecasts. The latter is more applicable for us with WwTW planning as this is principally reliant on population projections, whereas sewer modelling is very sensitive to where development will occur within a catchment, its size, potential connection points and occupancy profiles. Given that it is the role of a local planning authority

to determine where to build and the role of a sewerage company to accommodate the additional flows, we believe using the latest planning authority data is appropriate and pragmatic. Due to the number of individual development allocations indicated across our catchments by 2050, running scenarios for a multitude of different combinations of sites supplied by the local planning authority may or may not happen is beyond what is achievable through DWMP due to the nature of catchment modelling. Further information on how we have modelled demand is included within our Accounting for Growth Technical Summary.

Our environmental ambition is to align with the Government's storm overflow policy as a minimum. However, as part of our PR24 customer research we will also be appraising support to go beyond this minimum to deliver enhanced scenarios.

In relation to technology, we aim to have all our storm overflows fitted with event duration monitors by December 2022, in addition to currently having over 9,000 of our AMP8 planned 40,000 sewer sensors installed across our catchments to give early warning of blockages building up.

¹⁹ <https://www.ofwat.gov.uk/publication/pr24-and-beyond-long-term-delivery-strategies-and-common-reference-scenarios/>



Customer and stakeholder engagement

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The views of our customers and stakeholders are important to us in developing our DWMP as it is essential for keeping everyone informed around the DWMP and for identifying opportunities with our stakeholders for working together to develop solutions which have multiple benefits to our customers and the environment.

Our customer engagement is aligned to meet the requirements of the Customer Engagement Policy^[20] building on its key objectives of being Useful and contextualised, Neutral, Fit for Purpose, Inclusive, Continual, Shared in Full, Independently Assured, Ethical.

9.1 Engagement with customers

Our customers are at the heart of our DWMP – we have conducted an extensive and in-depth programme of research to understand customer views on the long term challenges we face to ensure the sustainability of drainage and how we make decisions on the future of the service we provide to them and the environment.

Our customers tell us they are increasingly concerned about climate change and how changes in the weather, and the increasing extremes, will affect both water resources and their wastewater service. They recognise that the challenges of climate change and urban creep will lead to an increased risk of flooding and environmental impact, and they strongly support investment to reduce the risk of disruption to their service and meet the challenges of the future.

Throughout our research, concern for the environment emerges strongly, and this carries through to drainage and wastewater planning – customers seek environmentally driven solutions and there is strong support for implementing sustainable solutions in all new building and housing developments. They recognise SuDS solutions as being beneficial for the environment, with the potential to be attractive spaces which promote wildlife, biodiversity, and social cohesion. Whilst they also raise some concerns, such as the safety and maintenance, there is still strong support for these options. Even when sustainable solutions are more expensive, and might lead to higher bills, customers demonstrate a strong preference for these options.

Storm overflows have become an increasingly contentious issue in the media. Customers find it unacceptable that untreated sewage enters rivers, no matter how dilute. Whilst customers understand the reasons why companies have overflows and feel that preventing flooding is a high priority, they want to see overflows eradicated as soon as possible.

Whilst customers tell us they trust us to make decisions about future drainage solutions, they welcome consultation at a local level on the right options for the communities they live in. Educating and consulting customers on our plans increases the confidence they have in Severn Trent meeting future drainage challenges. Customers also strongly support Severn Trent working in partnership with other organisations to address future challenges and delivering wider benefits.

A fuller description of the customer research we have carried out and how it is shaping our plan is set out in Appendix 5.

²⁰ <https://www.ofwat.gov.uk/wp-content/uploads/2022/02/PR24-customer-engagement-policy.pdf>

9.2 Engagement with stakeholders

Across our wastewater service area, we have engaged with over 100 organisations including Local Planning Authorities (LPA), Lead Local Flood Authorities (LLFA), the Environment Agency (EA), Natural England, Canals & Rivers Trust, and several wildlife trusts. The feedback received from these organisations offered the insight and knowledge necessary to shape our understanding of the future and in turn are influential in how we approach long-term planning. We undertook the following engagement and consultations with our stakeholders:

- One of our first tasks in September 2018 was to raise awareness of what DWMPs are across our stakeholder community. This entailed regular attendance at the quarterly EA/LLFA Network Meetings as well as the English Severn & Wye and Trent Regional Flood and Coastal Committees (RFCCs).
- In October to November 2019, we undertook a Strategic Context Consultation which raised awareness of the DWMP and allowed us to consult on the potential planning objectives.
- Between August - October 2020, we undertook a Baseline Risk Stakeholder Consultation. Our planned approach was amended due to the COVID-19 pandemic, meaning a move to virtual engagement. To support this, we developed a GIS web platform where stakeholders could 'self-serve' at a time that was convenient to them. This was supported by a series of virtual workshops with over 100 organisations consulted and resulted in us being awarded the winner of the ESRI UK "Customer Success Award for Excellence 2021 – Community Engagement".
- Finally, we provided progress updates to stakeholders over 2021, including a newsletter update in October 2021.

9.3 Wider engagement

In addition to formal consultations, we are actively involved in multiple stakeholder working groups which provides a solid basis for working together in collaboration.

- We have regular meetings and discussions with the EA regional and local teams covering flood and water quality, 28 Lead Local Flood Authorities, 80 Local Planning Authorities, 13 CaBA Partnerships, 2 local rivers trusts and 10 wildlife trusts.
- We have actively reviewed and fed into the EA Flood Risk Management Plan^[21] during its refresh (cycle 2) over the last number of years.
- We have a multi-source flooding programme running since 2015 which includes working with other Risk Management Authorities (RMA) responsible for drainage to collectively understand and alleviate flood risk.
- We actively attend the English Severn and Wye and Trent Regional Flood and Coastal Committees (RFCC) which act to help the EA and partners to understand local issues better and to balance local and national priorities.
- We have cooperated and collaborated with the EA and LLFA on schemes within the Flood and Coastal Erosion Risk Management (FCERM) six-year investment programme.
- We are active members of the EA and Severn Trent regional strategic flood risk working group.
- We are active members of the 3 Environment Agency/LLFA network meetings that are within our region.
- We have fed into the National Infrastructure Commission call on information for the 'reducing the risk of surface water flooding'^[22].
- We have provided active leadership on industry wide DWMP Steering and Implementation Groups and numerous Task & Finish Groups. Many of these group sessions have involved input from stakeholders to help influence implementation and development of the Framework.

²¹ Environment Agency, 2021. Draft Flood Risk Management Plans

²² National Infrastructure Commission, 2021. Reducing the risks of surface water flooding

9.4 Working with Partners

We have a good track history with working with partners in the co-creation and funding on partnership solutions. One of the fundamental principles of DWMP is working together and so through sharing the findings of our analysis with others we anticipate we will see a significant acceleration in activity level.

A key aim of DWMP is for it to compliment and integrate with existing strategies and plans, as this will help promote working together to improve drainage and environmental water quality. Through the development of our DWMP we consulted with our flood risk and environmental stakeholders to understand the wider needs of a catchment. This is essential to ensure DWMP catchment thinking maximises opportunities to work together to improve drainage and environmental water quality. During the development of the DWMP we have used the surface water and fluvial flood risk mapping to inform our catchment modelling, this has then allowed us to overlay the results of our sewer flooding risk modelling with the intention of identifying opportunities for the development of potential co-created partnership solutions and catchment thinking.

We have confidence that we can convert the findings of the DWMP into actual deliverable outcomes, building on experiences delivering partnership co-funded schemes during AMP5, AMP6 and AMP7. We are active members on the Regional Flood and Coastal Committees (RFCC) covering our region; Trent RFCC and English Severn and Wye RFCC. We engage with the RFCCs and associated sub-committees to help increase coordination and collaboration. We already do this using the information from our Sewerage Management Planning and will continue to do this with DWMP.

As part of our involvement supporting the “Flood and coastal erosion risk management: an investment plan for 2021 to 2027”^[23] to better protect 336,000 properties from surface and fluvial flooding, we engage with this programme to identify risk and opportunities for in AMP7 and in-programme (2021 to 2027) collaboration with EA, LLFAs and IDBs. This programme also influences

our own programmes of schemes to alleviate sewer flooding to help develop multi-source flooding solutions. This same approach is being used to influence our AMP8 plans.

Regarding Flood Risk Management Plans, we have contributed to and responded to the draft FRMPs. From this we are working with partners to alleviate risks within specific ‘flood risk areas’ which have been identified as high-risk area prioritised for investigation and investment. Again, the pre-DWMP information from our Sewerage Management Plan programme already seeks to align plans and assess opportunities for collaboration in these areas and post 2027 we see DWMP reinforcing this alignment.

When it comes to specific initiatives, we are involved with several catchment groups:

- River Severn Partnership
- Trent Catchment Partnership
- CaBA Groups (which are aligned to River Basin Management areas)
- Flood Risk Catchment Groups
- Rea Catchment Partners
- River Leen Strategy
- River Cole Strategy
- Isle of Axholme Strategy
- Matlock and Upper Derwent catchment partnership

In addition, we are involved with supporting specific LLFA plans and strategies, such as Local Flood Risk Management Strategies and Surface Water Management Plans and engage with Community Groups (e.g. Flood Action Groups).

The conclusion from the above is that we have a proven track record when it comes to supporting development of co-created and co-funded options for the DWMP, as we have been doing so for many years using the Sewerage Management Plan principles, we have adapted for DWMP.

The downside to DWMP is that the current FCERM funding period only extends to 2027, whereas DWMP covers from 2025 to 2050. This makes it challenging to determine schemes and funding beyond 2027, but what DWMP does do, is provide evidence base to compliment and integrate with existing strategies and plans.

²³ <https://www.gov.uk/government/publications/flood-and-coastal-erosion-risk-management-an-investment-plan-for-2021-to-2027>

Board Statement

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A separate document accompanies our Draft DWMP which sets of our approach to assurance and provides a signed Board assurance statement as required in the joint Defra/Environment Agency/Ofwat letter dated 18th February 2022.

Next steps

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The publication of our Draft DWMP is only part of an ongoing journey to which will culminate in the publication of our Final DWMP by 31st March 2023. This will ultimately support our PR24 business plan covering the period from 2025-30 to ensure short term investment needs align with the longer-term needs of our catchments out to 2050 and beyond.

11.1 Have Your Say

We want to give you the opportunity to have your say on our Draft DWMP. To enable us to take on board your comments for the publication of our Final DWMP by 31st March 2023 we would encourage you to take part in our consultation. Our consultation will run over 12 weeks from 30 June to 30 September 2022. We request that you complete our online response form which will give you the opportunity to provide comments on specific questions and any additional comments you may have. Should you have any further comments or questions we encourage you to email us at DWMP@severntrent.co.uk.

During that time, we will be taking on board your comments and the responses will be collated and analysed. We will also be taking in to account the outcome of the Government's Storm Overflows Discharge Reduction Plan which will be presented to Parliament on the 1st September 2022.

To recap, we would appreciate your feedback on the following questions:

Questions

1. Do you agree Severn Trent Cycle 1 DWMP represents a fair interpretation of the DWMP framework?
2. Do you agree with the strategic priorities and pace set out by Severn Trent?
3. Do you agree the planning scenarios used represent a fair assessment of likely future?
4. Do you support the ambition of zero properties being at risk of being flooded internally with sewage, which would cost all households £2.12 per year, with the bill being £53 higher by 2050?
5. Would you prefer less ambition on flooding risk, with around 145,000 properties remaining at risk of internal sewer flooding, costing £0.63 per year, with the bill being £16 higher by 2050?
6. Do you support the ambition of each Storm Overflows only discharging into the environment a maximum of 10 times per year, which would cost all households £0.51 per year, with the bill being £13 higher by 2050?
7. Would you prefer less ambition, with each Storm Overflows discharging into the environment a maximum of 20 times per year, which would cost all households £0.2 per year, with the bill being £5 higher by 2050?
8. Do you agree with outperformance of statutory minimum requirements particularly for the benefit of environmental quality?
9. Do you agree that Severn Trent should place a greater emphasis on Blue/Green (nature based solutions) and the use of partnership activities to solve future challenges over more traditional increases in asset capacity?
10. Please rank these areas of investment in order of priority for you, Water quality, Flood risk reduction, Habitat creation, Carbon, Source separation.
11. Do you support the draft plan proposed by Severn Trent?
12. How would you prefer us to engage with you in the future?

11.2 Finding Out More

The aim of this document is to set out the company level DWMP for our customers and stakeholders. Alongside this document there are multiple additional documents at different levels of detail. If you are interested in finding out more about our plan including the detail of how we have developed the plan, undertaken detailed hydraulic modelling and what this means for specific regions and catchments you can find a wealth of information on our website.

Our published Draft DWMP also includes:

- Customer Summary
- Level 1 Non-Technical Summary (this document)
- 14 x Level 2 Strategic Planning Area Summaries
- 957 x Level 3 Catchment Summaries
- 22 x Technical Summaries
- Glossary of Terms
- Data tables

The series of technical summaries are intended to provide more substantive explanations as to how we have gone about certain element of developing our DWMP, links to these documents can be found in Appendix 1.

11.3 What are the timescales?

As the DWMP is intended to support the PR24 price review, our Final DWMP will be published by 31st March 2023 to support the PR24 business plan submission due to be submitted to Ofwat in Autumn 2023. Following publication of this Draft plan there is a 3 month consultation period to give our stakeholders and customers the opportunity to have their say on our plan to enable us to take on board your comments for the publication of our Final DWMP.

Appendices

Appendix 1 – List and explanation of supporting Technical Summaries

Table 11. List and explanation of supporting Technical Summaries

Technical Summary Title	Description
What is a DWMP?	A summary of what a DWMP is, why we have developed it and how it is structured.
How we have developed our DWMP	A summary of the key process steps, timetable for delivery, links to other Strategic Plans and who we have been working with.
Roles and Responsibilities of Risk Management Authorities (RMAs)	Outlines the role and responsibilities of the Water and Sewerage Company, identifies the key risk management authorities we work with and their responsibilities. Addresses the limitation of surface water inlet capacity restrictions and how the theory has been applied in our modelling.
Planning Objectives	A summary of the trends and challenges facing DWMPs, development and description of the Common Planning Objectives and Opportunity Indicators.
How we have selected catchments (RBCS)	Explains the methodology used to undertake Risk Based Catchment Screening to select which catchments progress to further detailed assessment.
Our Approach to Modelling BRAVA	Explains the methodology used to undertake the Baseline Risk and Vulnerability Assessment (BRAVA) modelling.
Accounting for Growth	Explains the methodology for determining population increase over the DWMP period of 2025-2050, including Local Planning Authority and Office for National Statistics data sources.
Assessing Climate Change	Explains the methodology used to assess the impact of climate change. Including how guidance has been utilised, the impact on rainfall and how this was incorporated into long-term assessments.
Modelling of Urban Creep	Explains the methodology used to incorporate an increase in impermeable area creep into 2050 model scenarios.
Option Development and Appraisal Screening	Explains the methodology for undertaking catchment problem characterisation and Option Development and Appraisal screening from a long list to a short list of options.
Assessing Risk of Sewer Flooding in a Storm	Description of the methodology for assessing the risk of internal sewer flooding in a storm and how we have estimated costs of options.
Assessing Surface Water Separation	Description of the methodology for assessing surface water separation options. Includes how we identified catchments which provide the best opportunity for separation.
Modelling Storm Overflow Performance	Explains the methodology used to develop the strategic options for Storm Overflows.
Assessing WwTW Capacity	Outlines the methodology used to assess future impacts on Wastewater Treatment Works and their performance. In particular, it looks at future needs and constraints.
Resilience Assessment	Outlines how we have undertaken the Resilience Assessment. Considering the resilience of Wastewater Treatment Works and Sewage Pumping Stations to flooding, power failures and telemetry outages.
Assessing sustainable accommodation of future growth	Outlines the process for calculating catchment level assessment of the impact of growth to support the Opportunity Indicator assessment.
Assessing wider flood risks in a catchment	Summarises the approach taken to assess surface flood risk as part of Opportunity Indicator 1 – ‘Reduction in risk from surface water, groundwater and river flooding.’
WRMP Alignment	Summarises how we have aligned DWMP with Water Resource Management Plan (WRMP), particularly with regards to water consumption, occupancy rates, population projections and climate change.
Utilisation of Stakeholder Data	Outlines the Stakeholder engagement process and how we have utilised the data and comments received.
Catchment Optimisation Software	Description of an approach we trialled to utilise Optimisation Software to assess and narrow down options to address internal flood risk.
Adaptive Pathway Thinking	Outlines the approach we have taken to accommodate adaptive pathway thinking in the DWMP.
Natural Capital	Overview of how we have assessed Natural Capital and used it to influence DWMP strategic thinking.
Glossary of Terms	A useful reference document including simple explanations of technical terms and acronyms used throughout the DWMP.

Appendix 2 - River positive pledges

We're passionate about making a positive impact on the communities and the environment where we work, therefore in addition to our performance commitments we have signed up to 5 new Get River Positive pledges²⁴ (see Figure 28). River health is essential to the communities we serve and our ability to provide vital water on tap. As such, it makes sense that we take a leading role in protecting and enhancing our rivers



Ensure storm overflows and sewage treatment works do not harm rivers

- Based on Environment Agency measures (RNAGS), our operations will not be the reason for unhealthy rivers by 2030.
- We will reduce spills from storm overflows to an average of 20 per year by 2025.
- Using better data we will find and fix problems quicker than ever before at no extra cost to customers.



Create more opportunities for everyone to enjoy our regions' rivers

- We will ensure that 90 percent of people in our regions live within an hour's drive of a bathing site.
- We'll improve 50km of rivers in Warwickshire and Shropshire, creating 15km of bathing quality rivers by 2025 and have plans to double the amount of bathing quality rivers in the Midlands within 10 years.
- We will work with local clubs to increase opportunities for water-based activities at our reservoir sites, starting this year.



Support others to improve and care for rivers

- On 1st May this year, we will collectively launch a new deal for farmers, that includes incentivising regenerative farming practices in our region and providing access to green financing (through partnership working).
- We will campaign for the removal of the automatic right to connect for new development, i.e. building new homes.
- We will champion the Bill to ban wet wipes that contain plastic and will lobby for a ban on all wet wipes that are not 'Fine to Flush'.
- We will launch regional River Forums bringing all contributors to river health together.
- Later this year we'll launch a Get River Positive Community Fund to support community groups and charities wanting to/helping improve our region's rivers.
- We'll use our convening powers to help others address their contribution to river health* including hosting a Midlands River forum to bring all contributors to river health together.

**Currently, 86% of rivers don't achieve good ecological status, with other sectors accounting for 76% of reasons for rivers not achieving good ecological status.*



Enhance our rivers and create new habitats so wildlife can thrive

- By 2030 we will have established new habitats for native species of wildlife, such as great crested newts, beavers, otters and cuckoos, in the Midlands - so our natural communities can thrive.
- Our River Rangers will work with community groups and organisations such as Warwickshire Wildlife Trust to care for rivers and address issues across our region.
- Our Get River Positive Community Champion volunteers will work with Waterside Care and the Canal and River Trust to clean and restore rivers and river banks across our region.
- We'll plant over a million trees across our region by 2025, and 1.3 million by 2027.



Open and transparent about our performance and our plans

- We will work with NGOs to ensure we provide the river quality information people want and need to see by the end of 2022.
- We will make this information easily accessible via our websites by end of 2022.
- As well as 100% monitor coverage at our treatment works and on our storm overflows, later this year we will start monitoring wider river quality and share the results on our websites.

Figure 25. Get River Positive Pledges: our commitments

²⁴ Severn Trent, 2022. Get River Positive Pledges

Appendix 3 - Planning Objectives

To measure how current and future performance is assessed by the DWMP we have developed a number of planning objectives with associated performance metrics against which constraints are assessed and interventions developed. These planning objectives fall into two main categories: Common Planning Objectives and Opportunity Indicators.

Common Planning Objectives

During the implementation of the DWMP process, all companies were required to report against six common planning objectives. The intention was to provide stakeholders with an informed overview of the 2020 baseline performance, and the long-term risk for three of the planning objectives under a 'do nothing' scenario. The planning objectives considered the impact of future challenges including climate change, urban creep and growth and are summarised in Table 13.

Table 13. Summary of the Common Planning Objectives

Ref	Common Planning Objective	2020	2050	Comments
CP01	Internal sewer flooding risk	✓	n/a	Based on the average number of internal sewer flooding incidents reported over the 3 year period from 1st April 2018 to 31st March 2020.
CP02	Pollution risk	✓	n/a	Based on the average number of pollution incidents reported over the 3 year period from 1st April 2018 to 31st March 2020.
CP03	Sewer collapse risk	✓	n/a	Based on the average number of sewer collapses reported over the 3 year period from 1st April 2018 to 31st March 2020.
CP04	Risk of internal sewer flooding in a 1 in 50-year storm	✓	✓	Based on the Ofwat guidance for Risk of Sewer Flooding in a Storm Methodology and incorporating enhancements to align with the assessment of surface water and fluvial flood risks assessments used by Environment Agency/LLFAs.
CP05	Storm overflow performance	✓	✓	Based on the Water UK 21st Century Drainage Capacity Assessment Framework to assess storm overflow performance.
CP06	Risk of wastewater treatment works quality compliance failure	✓	✓	This considers pressures on flow and quality permit compliance at Wastewater Treatment Works, plus any technological limitations or physical site conditions which could limit available solutions.

The first three of these common planning objectives are only required to be assessed for the 2020 Baseline and this is justified in the DWMP Framework "because a method for forecasting future events in such a large asset stock, which are typically caused by random or unpredictable incidents, is not presently available". The methodologies for assessing CP01: Internal sewer flooding risk, CP02: Pollution risk and CP03: Sewer collapse risk, are based on using regulatory reported incident data over a 3-year period (1st April 2017 to 31st March 2020). This highlights catchments which have a retrospective higher average risk than other catchments. The root cause of these three levels of service failure is principally associated with operational issues which are outside the underlying ethos of working in partnership with external delivery partners to address rainfall driven capacity challenges. Due to the nature of these risks, interventions can be implemented as part of our normal operational activities and as such retrospective problems informing the 2020 baseline risks will have been mitigated well before the start of the 2025 planning period.

As a result, we have reported against these three operational intervention driven common planning objectives, but interventions have not been included within the scope of our DWMP which focussed on rainfall induced capacity.

For the other three common planning objectives (CP04: Risk of internal sewer flooding in a 1 in 50-year storm, CP05: Storm overflow performance and CP06: Risk of wastewater treatment works quality compliance failure), we have used our comprehensive hydraulic sewer model coverage to assess current 2020 Baseline and future 2050 risk. The 2050 assessments are intended to inform the potential consequence under a 'do nothing' situation, which allows us to understand how performance is likely to be impacted by future challenges. This doesn't mean we plan to do nothing, instead that a suite of DWMP intervention scenarios can then be appraised to determine the best value strategy to offset these risks.

Planning Objective consultation

We wanted to ensure that our DWMP addresses the issues that are most important to our customers and stakeholders. Prior to the development of the industry wide common planning objectives, we developed seven 'Strategic' planning objectives as the basis of our DWMP plan. These were included within our Strategic Context stakeholder consultation in October-November 2019, which was sent out to 128 organisations, including Local Planning Authorities, County Councils, Lead Local Flood Authorities, Environment Agency, Internal Drainage Boards, Rivers Trusts, Canal & Rivers Trust, Wildlife Trusts, Natural England, and others.

The consultation indicated support for these seven Strategic planning objectives. As the consultation was followed by the development of the industrywide common planning objectives there was a degree of duplication and overlap, this is summarised in Table 13.

Table 12. List of planning objectives indicating the crossovers between Common and Bespoke planning objectives

Ref	Planning Objective	Common	Strategic
CP01	Internal sewer flooding risk	Yes	
CP02	Pollution risk	Yes	
CP03	Sewer collapses risk	Yes	
CP04	Risk of sewer flooding in a 1 in 50-year storm	Yes	Yes
CP05	Storm overflow performance	Yes	Yes
CP06	Risk of wastewater treatment works quality compliance failure	Yes	Yes
O11	Supporting others with reduction of surface water, fluvial & groundwater flood risk		Yes
O12	Sustainable accommodation of future growth		Yes
O13	Ensuring our critical wastewater assets remain resilient		Yes
O14	Supporting Water Resource Water Planning		Yes

Opportunity Indicators

There were four of our Bespoke planning objectives which were not common, these have subsequently been rebadged as "Opportunity Indicators". The reasoning being that these four are not so much objectives, but more indicators to inform the wider

opportunities of working with others which could be supported by DWMP strategies. We wanted to include these as each one provides the ability to provide wider benefits to our customers and stakeholders by impacting on drivers that are wider than just a wastewater focus.

Table 14. Summary of the Opportunity Indicators

Ref	Opportunity Indicator	2020	2050	Comments
O11	Risk of surface, fluvial and groundwater flooding		n/a	This indicator uses the Environment Agency surface water flood risk maps to identify properties at risk of surface water flooding which could potentially benefit from co-created drainage and wastewater solutions.
O12	Sustainable accommodation of future growth		n/a	This indicator looks at how likely it is that new development would connect to a foul/combined sewer as no suitable surface water sewers are available or the ground conditions limit use of Sustainable Drainage Systems (SuDS).
O13	Effective wastewater asset resilience		n/a	High level assessment of WwTW and major pumping station resilience against fluvial (river) flooding, electricity supply failures and communication outages.
O14	Supporting Water Resource Management Plan strategies		n/a	This indicator assesses potential opportunities to integrate DWMP surface water management strategies to offset groundwater and river abstraction constraint within WRMP.

O11: Risk of surface, fluvial and groundwater flooding

This indicator informs the wider drainage benefits DWMP could support. Whilst it is not our responsibility to alleviate flooding risk not associated with the public sewer network, through the DWMP there is the opportunity to work alongside other Risk Management Authorities to develop co-creation opportunities to better manage surface water and deliver multiple benefits. To a lesser extent, the DWMP may be able to support alleviation of fluvial flooding by helping to manage surface water in the upstream catchment, whilst groundwater is not considered to be something which the DWMP could benefit. Whilst modelling of sewer capacity is within the remit of a water and sewerage company, undertaking overland surface water and river modelling to understand non-sewer flood risk is not. Hence, this indicator is intended to identify potential opportunities of surface water management strategies to meet both wastewater planning objectives and wider benefits. The opportunities gleaned from this information can be used as part of the best value appraisal to ensure DWMP strategies maximise opportunities for co-creation. This mirrors how we currently work with other Risk Management Authorities but ensures long term investment supports and expands these opportunities.

For further details on how we have assessed this indicator and to understand the roles and responsibilities of different risk management

authorities in managing flood risk, please refer to the technical summary section.

O12: Sustainable accommodation of future growth

Under current legislation new development has a right to connect to the existing public sewerage system, with the sewerage company required to provide additional capacity if needed and with the costs being recovered from developer connection charges. Where separate foul and surface water public sewers are not available, current legislation also allows a new development to connect surface water flows into a combined sewer (which takes foul and surface water flows). Through the planning process, Local Planning Authorities (supported by Lead Local Flood Authorities) are required to ensure surface water on new development can be discharged sustainably, where possible following the connection drainage hierarchy^[25] in H3 of the Building Regulations. However, where this is not possible, there is a current right to connect surface water to a public surface water sewer, and as a last resort to a combined sewer.

To recognise the risk of surface water from new development being connected to a public foul sewer, we developed this Opportunity Indicator to inform where there is a greater risk that new development could exercise their right to connect surface water to a foul sewer. The intention being to give an indicative identification of where new surface water separation strategies to support capacity constraints may also support sustainable

²⁵ Planning Practice Guidance Paragraph 80 (Reference ID: 7-080-20150323)

accommodation of future growth. The underlying methodology uses a combination of how much public surface water sewer network is available across a catchment and the suitability of the soil strata to facilitate infiltration and negate the need for a sewer connection.

O13: Ensuring our critical wastewater assets remain resilient

Using the Framework guidance on assessing resilience, we have developed an approach to undertake a high-level evaluation of asset resilience. This assesses our WwTW and sewage pumping stations against the risk of surface water and fluvial (river) flooding, potential impact of power outages, and remote communication outages which could impact on remote control of WwTW and real-time operation of network assets (such as pumping stations and flow balancing attenuation facilities).

Due to the critical nature of this infrastructure, we are not intending to share details relating to these assets and instead we have used this Opportunity Indicator to inform where DWMP strategies may be able to support resilience opportunities.

O14: Supporting Water Resource Management Plan strategies

Whilst the scope of DWMP is on drainage and wastewater provision, this Opportunity Indicator recognises the interaction within the wider water cycle. This is a high-level assessment with the principal purpose to identify wider benefits of DWMP intervention options where a focus on surface water management may also benefit groundwater recharge or low flow rivers which are potentially water sensitive for WRMP.



Appendix 4 - Evolution of our drainage plans and risk assessment

We first started our long-term wastewater planning back in 1984 with Drainage Area Studies. This included 331 study areas, refreshed on a 10 year cycle, focusing on assessing hydraulic, operational, structural, and environmental challenges across our WwTW catchments with the findings used to support business investment decisions. Underpinning our approach was the development and use of hydraulic sewer modelling and over the past decades we have seen advances in computational capabilities enabling development in our abilities to better understand catchment performance, both now and in the future.

This process was further developed in 2010 when we moved to undertaking Sewerage Management Plans (SMPs). The 10 yearly refresh cycle was replaced with a 'live' planning approach, enabling models to be maintained and refreshed as appropriate, meaning that by 2020 100% of our connected population was covered by a 'live' model. Our Sewerage Management Plans also introduced time horizon assessments, allowing assessment of future risks up to a 25-year period. All catchments are now reviewed and maintained as part of our standard modelling process and aligning with CIWEM Urban Drainage Group modelling guidance^[26].

When developing our PR19 business plan, which outlined our investment plan for 2020-2025, DWMP thinking was in the early stages of development, yet we took the opportunity to produce a DWMP Lite^[27] which allowed us to identify future pressures, the trusted risk assessment tools we would be building on and the key considerations of our Strategic Planning Areas which would be considered within our plan.

Therefore, whilst this is our first Drainage and Wastewater Management Plan, we do have extensive experience of drainage planning, giving us an excellent starting point for developing our DWMP. As part of developing our DWMP, we have made a conscious effort not to reinvent the wheel, learning from established processes in the Water Resource Management Plan (WRMP) and building on our existing wastewater planning and hydraulic modelling outputs. We have an excellent collection of maintained hydraulic sewer models in addition to catchment technical knowledge and experience and which underpin much of the assessment of current and future risk explained in our DWMP. Our technical processes and outputs have undergone rigorous internal and external assurance to ensure that our customers and stakeholders can trust the outputs. This assists the intention of the DWMP representing a valuable evidence base for supporting the PR24 business planning process.

²⁶ CIWEM UDG, 2017. Code of Practice for the Hydraulic Modelling of Urban Drainage Systems, Version 01

²⁷ https://www.stwater.co.uk/content/dam/stw/about_us/pr19-documents/sve_appendix_a9_drainage_and_wastewater_management_plan.pdf



Appendix 5 - Customer engagement

Since PR14 we, and the rest of the water industry, have significantly improved the maturity of our customer insights and how we use them in business planning. Our PR19 plan drew on an extensive and in-depth insight programme, and we have continued since then to refine our understanding of what is important to our customers and build a plan based on those needs. Our approach for both PR24 and the DWMP takes into account:

- Ofwat and Consumer Council for Water (CCW) expectations, including the standards for high quality research published in Feb 2022.
- The scope for customer insights to shape the plan.
- Our legacy – we aren’t starting from scratch, we are building on an extensive programme of research over the last 5 years, both for the price review, our green recovery business cases and our significant programme of continual research.

We have reflected on the approach to customer engagement we developed for PR19 and concluded that the strategic research framework we developed at the time, alongside our Customer Challenge Group (CCG), the Water Forum, remains valid. Engaging with customers about drainage issues isn’t straightforward. Many have no personal experience of service failure and lack detailed knowledge of the service they receive and who is responsible for what aspects. The decisions we need to make also run across decades and affect future generations. We have used deliberative research to build awareness and use active participation to get informed opinions and probe the consumer verses citizen mindset. We have risen to the challenge of working through the Covid-19 pandemic by adapting our tools and techniques to include more online deliberative research, as well as telephone research with those who are digitally disenfranchised.

There are five key elements to our PR24 and DWMP insight strategy, as described in Figure 28.

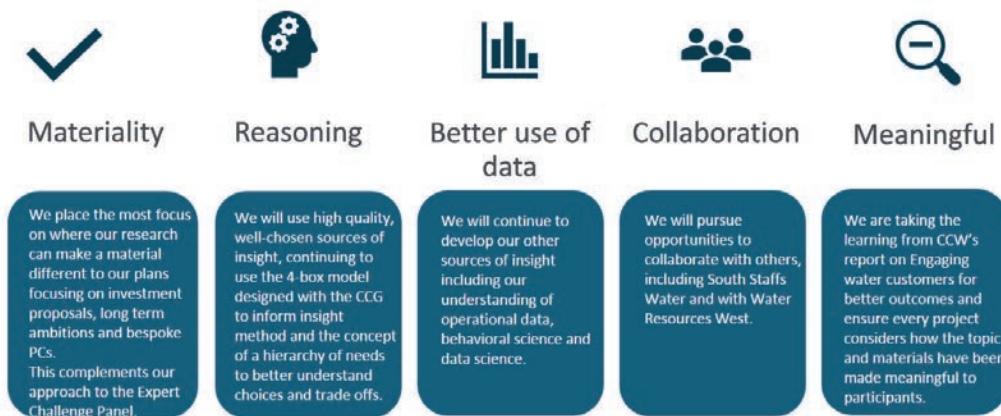


Figure 26. Key elements of the PR24 and DWMP insight strategy

Throughout the plan we have engaged with CCW to get challenge on our approach, alongside the launch of our Expert Challenge Panel in May 2022. We have conducted an extensive research programme with over 5,000 current and future customers to understand their views on the long-term challenges affecting their water and wastewater service, as well as the solutions we could adopt. The customer research activities we have undertaken that are most relevant to the

development of the DWMP are listed in Table 16. These range from bespoke projects to research with members of our online community, Tap Chat, as well as wider contextual research we have conducted to inform our PR24 plan and long-term strategic direction. As well as understanding the views of current bill paying customers, we typically include a sample of future customers in our research.

Research	Date	Customers Engaged
Priorities for the next 30 years – Tap Chat discussion	June 2020	450 Tap Chat members
Green recovery sustainable drainage – focus groups to understand the support for SuDS and community involvement in their design, with customers living near SuDS and those who had experienced flooding	November 2020	11 customers as part of a programme of 10 focus groups on all green recovery investment areas
DWMP research – reconvened focus groups and in-depth interviews with customers about the DWMP options	April 2021	19 billpayers (HH)
Social barometer tracker – survey on a range of topics including wider customer priorities, the environment, climate change and investment priorities	Sept 2021 Dec 2021 April 2022	Representative sample of HH customers (500 per wave)
Strategic priorities 3-week online community to explore a multiple of future priorities including customers' role in responding to future challenges	November 2021	30 billpayers (HH), 10 future customers, 10 small businesses (NHH) and 5 vulnerable customer depths
Climate change adaptation – Tap Chat discussion	November 2021	163 Tap Chat members
Storm overflow tracker boost – quantitative research exploring perceptions and awareness of storm overflows	December 2021	500 HH customers
Pros and cons of drainage solutions – quantitative research on our online community Tap Chat on sustainable and traditional drainage solutions	March 2022	1089 Tap Chat members
River water quality research – qualitative and quantitative research on river water quality, storm overflows and drainage solutions	Jan – March 2022	41 customers through an online community and focus groups, and a survey of 2052 HH customers

We have also triangulated the findings from our Severn Trent research with any relevant research conducted by CCW and Ofwat at the national level.

The reports we have referenced include:

- CCW – Public views on the water environment^[28]
- CCW – Awareness and perceptions of river water quality^[29]
- CCW and Ofwat – Customer spotlight: People's views and experiences of water^[30]
- CCW and Ofwat – Preferences research^[31]

²⁸ CCW, 2021. Public views on the water environment report

²⁹ CCW, 2022. Awareness and perceptions of river water quality

³⁰ CCW and Ofwat, 2022. Customer Spotlight: People's views and experiences of water

³¹ CCW and Ofwat, 2022. Understanding customer' preferences for performance commitments at PR24

What we have learnt

Climate change

Throughout all our research, and that undertaken by third parties, a consistent theme emerges in terms of the growing concern amongst customers about climate change. Even though this isn't the most pressing issue at the wider societal level; pollution, conservation and the impacts of extreme weather feature strongly in customer's concerns^[32].

71% of customers believe climate change is already having an impact in the UK, and 61% are more concerned about climate change than they were 2 years ago^[33]. Extreme weather, higher temperatures and flooding are the key indicators for customers in their local area.

Spontaneous recall of environmental topics in the news shows the cut through of climate change and plastic pollution, but extreme weather flooding and storms also emerge.



Figure 27. Key topics emerging from our research

Priorities for the future and investment

Clean, safe, good quality drinking water and an affordable service are top of mind unprompted priorities for our customers, but a reliable service, education and the environment are also spontaneously identified^[34]. When prompted with a list of focus area, national research conducted by CCW and Ofwat^[35] finds the top four priorities for water companies to be 1) provide clean, safe drinking water; 2) prevent sewage entering people's home; 3) prevent sewage entering rivers, streams and the sea; and 4) fix leaks.

There is a clear consensus when discussing climate change^[36] that investment is needed to avoid the disruption caused by climate change. The environment and climate change feature strongly when asking customers about their priorities for investment going forwards, across multiple pieces of research. In our Social barometer survey the top four future investment priorities are related to these themes:

1. Prevent the sewage network from causing environmental pollution.
2. Meeting the challenges of climate change and drought, to ensure there is always enough water for everybody.
3. Ensure the sewer network can cope with external challenges (climate change, population growth).
4. Ensure the water pipe network can cope with external challenges (such as ageing assets, natural disasters and customer needs).

77% of customers agree a lot more investment is needed in the drainage system right now, and 83% agree it is needed in the future^[37]. Despite this most customers have confidence that Severn Trent is planning to meet future drainage challenges, with 63% feeling confident at the start of the research, increasing to 81% when they find out more information about our plans.

³² Social barometer, wave 1

³³ Social barometer, wave 1

Future drainage challenges

Alongside the challenge of climate change and the increased risk of flooding, new housing developments are also considered problematic as they create urban creep and increase flood risk (as well as the impact on water resources). Customers express concern about sewer pipes not coping with the extra rainfall.

“Severn Trent will need to deal with extremes of weather. Nobody can rely on traditional seasons anymore” Tap Chat, climate change discussion

“I think renewing the infrastructure in our village is necessary as we have sewage coming up through manholes when we have heavy rain.” Tap Chat, climate change discussion

“They are building new housing estates everywhere, which stops natural drainage and causes flooding.” Tap Chat, climate change discussion

When discussing the potential problems that might arise as a result of these challenges, the most concerning are river pollution and external and internal flooding. In our green recovery research, we talked to customers who had experienced flooding in the past and we found that these customers were worried about future floods, with some taking steps themselves to protect their homes. CCW and Ofwat research at the national level^[38] finds that both internal and external flooding are of high importance to customers. Both are seldom experienced but are easily imagined to be

impactful on homes and businesses, inconvenient and unpleasant. Internal flooding in particular is regarded as highly important due to the impact on health and people’s lives and a high priority to resolve as quickly as possible. River pollution is also considered extremely important although it has less impact on day to day lives, due to the damage to the environment and because it is perceived to result from company malpractice.

Knowledge and awareness

Customers have some understanding of the issues surrounding surface water and drainage, but there is the potential to improve knowledge in some areas. For example, 21% don’t know (and 19% neither agree or disagree) that managing surface water reduces the impact Severn Trent have on river water quality. This is not surprising when, at a more general level, 58% of customers tell us they know little to nothing about how Severn Trent deals with sewage. In national research, CCW and Ofwat^[39] find that customers often do not understand water company’s responsibility, with only 36% of customer thinking water company provide drainage for rainwater which falls on a property.

Across multiple research pieces we find that customers are willing to invest more now to prevent larger problems occurring in the future, and particularly if this enables Severn Trent to deliver wider environmental and long-term benefits.

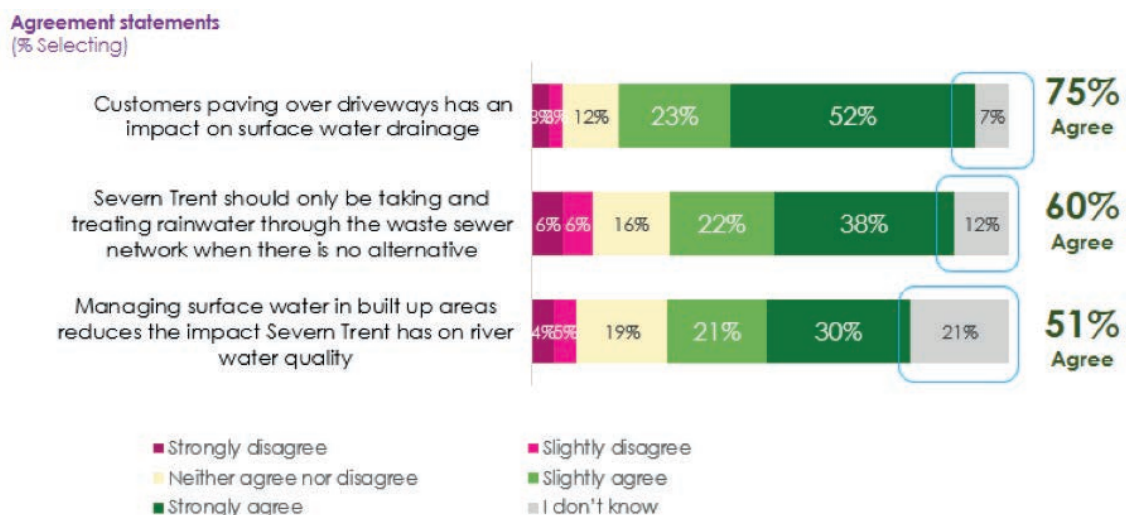


Figure 28. Identification of how much customers agree with statements relating to surface water management.

³⁴ Strategic Priorities research
³⁵ Customer spotlight research, CCW and Ofwat
³⁶ Tap Chat discussion on climate change adaptation

³⁷ Pros and cons of drainage solutions, Tap Chat survey
³⁸ Ofwat and CCW, Customer preferences research
³⁹ Ofwat and CCW, Customer Spotlight

Responsibility and working together

Customers feel that everyone has a responsibility to act in the short term to prevent longer term implications of climate change and other environmental challenges. They also perceive businesses as having a responsibility to work in environmentally friendly ways and to manufacture environmentally friendly goods. The Government is expected to have a leadership role and change the law to ensure everyone is held accountable.

Customers feel strongly that others have a part to play in managing these challenges – 92% agree that housing developers have a responsibility to manage surface water, and 89% agree public sector organisation such as councils have a responsibility not to build on green spaces and to manage surface water^[40].

The role of water companies is perceived to extend further than purely drainage. Customers feel that, as experts, water companies are in a position of power to educate and influence the Government, businesses and customers, to change behaviours and promote environmentally friendly activities related to drainage and wastewater. Lobbying for change and working with others is an unprompted suggestion to address future challenges.

“They have a significant power to do something. They cover wide areas...they can lobby Government, educate customers” Current HH customer, DWMP research.

“Wet wipe companies should all be addressing this themselves. They should say they can’t be flushed and make it clearer to consumers” Current HH customers, DWMP research.

When it comes to flooding there is a feeling that no one is taking responsibility for flooding, with so many agencies and organisations involved in flood protection and prevention. This view is especially strong in those who have experienced flooding themselves, and who perceived they had been passed around organisations without getting much help. For those who have not experienced flooding awareness of responsibility can be low [41].

“We always have problems with flooding in the winter. No one agency is responsible, and it is a worry for sure” Green recovery research, HH customer with experience of flooding.

“I was surprised that there were so many different bodies responsible for different kinds of flooding” Green recovery research, HH customer living near a SuDS.

Across our research we have found that customers are largely positive about working in partnership to solve flooding and consider it essential in areas which are at higher risk. They feel there are benefits of sharing expertise, resources and costs and therefore it’s seen as a common sense approach. Some identify potential downsides as well, such as slower processes, the question of who regulates partnerships and who takes a leadership role.

Prioritising drainage solutions

We have discussed potential drainage solutions with customers across two different pieces of research [42], presenting them with summary information on options including the relative cost, the carbon impact and the disruption impact. In Table 16 we have summarised the views for each of the solution options.

To address drainage challenges customers gravitate towards the options that have the least impact in terms of cost, carbon and disruption – with natural sustainable options typically emerging as a higher priority.

Solutions should also be long term and address the underlying issues. Short term solutions (such as sewer jetting or property level flood resilience) might be required in urgent situations, but overall customers indicate a preference across multiple research projects for long-term solutions as well as early investment to reduce risks to prevent higher costs in the future when problems become larger.

“Longer term solutions that could result in a better system... if there was a clear strategy I would be happy to pay more” HH customer, DWMP research.

⁴⁰ Pros and cons of drainage solutions, Tap Chat survey

⁴¹ Green recovery SuDS research

⁴² DWMP research, and river water quality research

Where possible, they expect Severn Trent to work with others to “build better in the first place”, for example working with developers, and encourage customer behaviour change. These solutions have the most appeal, although there are still some concerns.

A range of solutions have high to medium appeal for customers, including using sustainable solutions, providing they will be effective. Separating sewer pipes is also a popular solution despite the cost, carbon and disruption impact because it’s seen to have a permanent impact.

We found differing views across our two pieces of research on increasing the capacity of combined pipes. In our river pollution research, we find that this has the least appeal because it has a high

carbon and financial cost and is seen as disruptive. However, in our deep dive into DWMP solutions it emerges as high priority due to participants recognising that this might be the best solution in certain geographic locations.

Installing ways of collecting and storing rainwater has limited appeal – it’s seen as an option only for those with financial means and space and impractical in urban areas.

Garden de-paving attracts quite contentious views across our research. Most customers feel it is unrealistic and that uptake will be low, and there are concerns about parking and the cost for customers. When discussing actions customers can take to reduce wastewater and other problems there is least willingness to take action in this area for both HH and NHH customers^[43].

Table 16. Understanding customer priorities relating to wastewater solution types

Solution	DWMP research	River water quality research
Change planning laws to create sustainable drainage and permeable surfaces for rainwater	This wasn't included as an option however lobbying for change emerges spontaneously as an option	✓ ✓ ✓
Encouraging customers to change behaviours	High priority	✓ ✓ ✓
Install small scale treatment or natural treatment at the end of overflows		✓ ✓
Creating natural drainage solutions to store rainwater and keep it out of sewers	High priority	✓ ✓
Separating sewer pipes so foul and rainwater can be carried in separate pipes	High priority	✓ ✓
Install ways of collecting and storing rainwater		✓
Replacing sewer pipes with larger diameter pipes	High priority	✓
Sewer repairs	High priority	
Garden de-paving	Low priority	
Property resilience	Low priority	
Sewer jetting	Low priority	
Groundwater infiltration	Low priority	
Pumped storage	Low priority	

⁴³ Strategic priorities customer forum

Sustainable drainage solutions

Across our own, and third-party research, the environment is consistently very important to customers. The concern we see for the environment throughout our general research carries through to drainage and wastewater planning. This leads customers to seek environmentally driven solutions, and there is strong support for implementing sustainable solutions in all new building and housing developments.

We have discussed SuDS solutions with customers in multiple research projects and have typically found that, compared to more traditional solutions, customers view sustainable options more positively. Whilst supportive of SuDS, customers do have some concerns and would welcome consultation from Severn Trent to get customer buy in for their local areas. Customers also recognises that other solutions may still be required, particularly in some, e.g. if there is a lack of space.

SuDS are seen as having the potential to reduce flooding, which is a major concern, and to benefit the local environment. In our green recovery research customers spontaneously identified multiple benefits of SuDS, which closely matched those subsequently presented by Severn Trent.

Customers spontaneously also perceived some disadvantages and concerns over the effectiveness, cost, upkeep and space availability for SuDS.

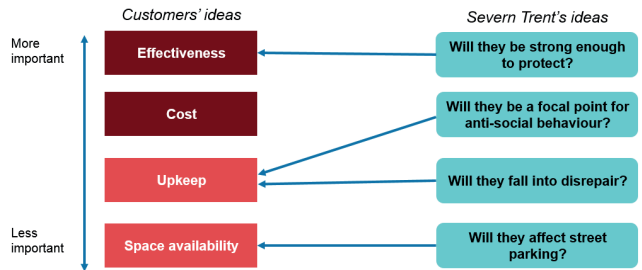


Figure 29. Summary of customer concerns and perceived disadvantages of SuDS

These are echoed in our more recent survey on Tap Chat [44]. When shown some of the advantages and disadvantages customers like that fact that sustainable solutions are:

- Good for the environment and for the future.
- They look attractive, and natural, spaces.
- They encourage wildlife and biodiversity.
- They are adaptable and more sustainable.
- Less polluting than traditional options.

“I love the idea of sustainable options. This is more environmentally friendly and also more appealing to the public. More adaptable to future climate change” Tap Chat member, Pros and Cons of drainage solutions.

“Attractive solution to create a great environmental impact and appearance” Tap Chat member, Pros and Cons of drainage solutions.

“Habitats for wildlife have been reduced so much already and anything that can increase them again is valuable” Tap Chat member, Pros and Cons of drainage solutions.

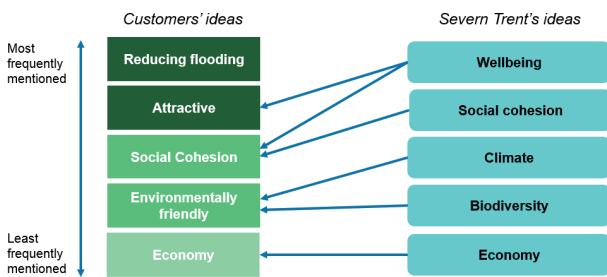


Figure 30. Assessment of how customers ideas and Severn Trent's ideas align regarding SuDS.

⁴⁴ Pros and cons of drainage solutions

However, some customers also feel concerned about:

- The safety of ponds for young children, and whether adequate safety measures will be put in place.
- Maintenance, so areas don't become overgrown, messy and clogged up.
- reating potential problems, for example with parking.

"Important they are managed and maintained to continue working" Tap Chat member, Pros and Cons of drainage solutions.

"I have small children and would worry about the risk of drowning" Tap Chat member, Pros and Cons of drainage solutions.

"I wouldn't reduce parking for the sake of a different type of drainage, especially since it's more expensive to implement. I think human needs such as parking is more important than luxuries such as green space" Tap Chat member, Pros and Cons of drainage solutions.

Overall, customers have a sense that different solutions will work better in different locations, or that a combination of solutions is most appropriate.

Traditional solutions

Traditional solutions evoke a sense of trust in Severn Trent to be experienced and know what they are doing (which might outweigh it not being the most sustainable option). There are some mixed views on the disruption during construction, with some feeling this is disadvantage, whereas others think the long term gains are worth it. Some also feel that traditional solutions are easier to fix and maintain.

"Experience counts a great deal in situations like this" Tap Chat member, Pros and Cons of drainage solutions.

"Yes you're good at this but is it sustainable with every growing housing areas? Just because you've always done things this way doesn't mean you shouldn't look for better ways too" Tap Chat member, Pros and Cons of drainage solutions.

"The disadvantages say it all, more pollution, disruption and digging" Tap Chat member, Pros and Cons of drainage solutions.

76% of customers would prefer Severn Trent to adopt sustainable solutions to manage the drainage of surface water, and 17% don't mind with a feeling that Severn Trent are the expert and should make the decision^[45]. The preference for sustainable solutions is higher in higher socio-economic groups and with those who say they act in an environmentally friendly way, even if it's more expensive.

In our green recovery research, we talked to some customers who live near current SuDS. We found that awareness of these was low, with little information and engagement with the local community about them installation and impact. Trade-off between sustainability and cost – considerations for investment

In general, we see a preference from customers for environmentally friendly solutions, although the potential bill impact gives rise to mixed views. Around half of customers in the first wave of the social barometer (Sept 2021) told us they would prefer environmentally friendly options even if it means higher bills, but this has declined slightly in the third wave (March 2022), potentially due to concerns over the cost of living crisis. In our deliberative research prioritising environmentally friendly options, even if they cost more, receives less consensus, although by the end of the community forum some customers shift their views away from keeping bills as low as possible.

When talking more specifically about drainage solutions, customers would prefer Severn Trent to adopt sustainable solutions, even if it's more expensive, although this does decline as the cost increases.

⁴⁵ Pros and cons of drainage solutions, Tap Chat survey

Which solution would you prefer Severn Trent to adopt?
(% Selecting)

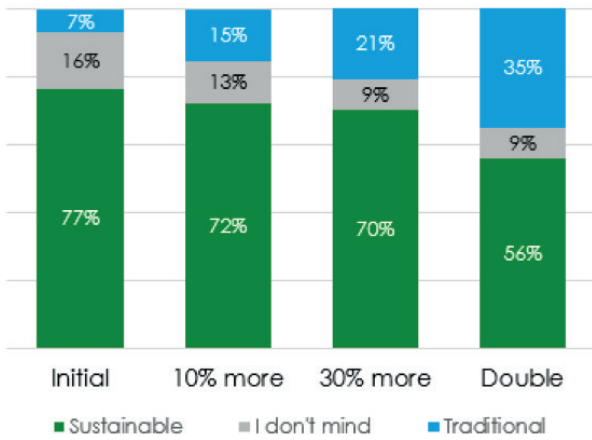


Figure 31. Summary of customer’s preferred type of solution

When choosing solutions, overall the majority of customers agree they are happy for Severn Trent’s drainage experts to decide on the most appropriate solution or neither agree nor disagree (79%). On a local level we have seen on both Tap Chat and in our green recovery research that consultation with local residents before building solutions will be valued.

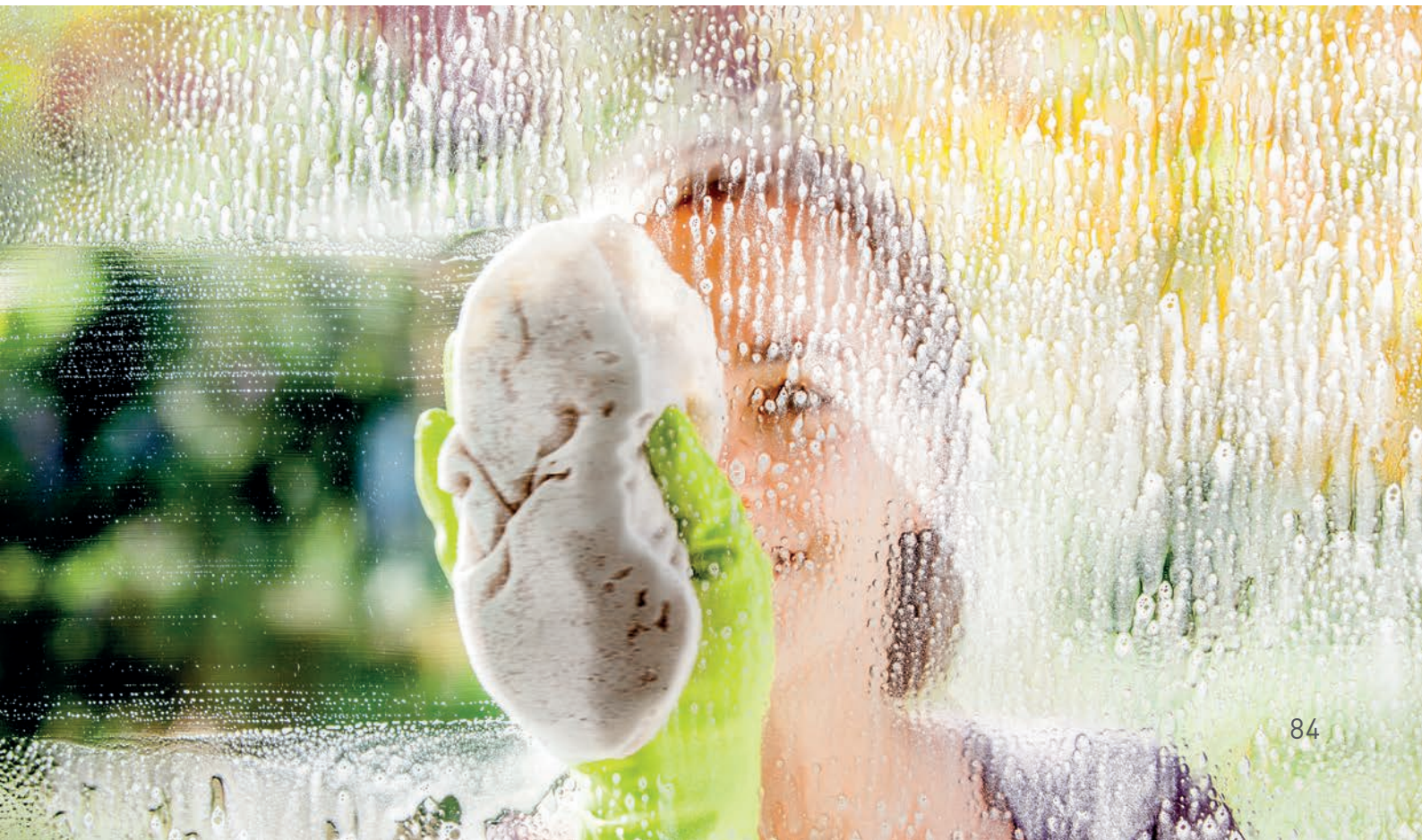
Storm overflows

The operation of storm overflows has become increasingly prominent recently in the media in recent months. In our research in November 2021, we found that 47% recalled seeing or hearing about sewage being released into rivers in the news (when prompted), although climate change and plastic pollution dominated the recall. In our river pollution research in 2022 42% said they had heard of storm overflows before, with awareness slightly higher amongst river swimmers, those who are environmentally conscious and older, higher socio-economic groups.

CCW research^[46] also finds that river pollution from sewage ranks fourth when showing customers a list of environmental issues that affect the UK, with most concerned about microplastics, air pollution and flooding from rivers and sea. The same research finds that 41% definitely or may recall seeing media coverage about river or stream quality.

Across multiple pieces of research, we find that the majority of customers feel it is an unacceptable practice.

⁴⁶ CCW, Awareness and perceptions of river water quality



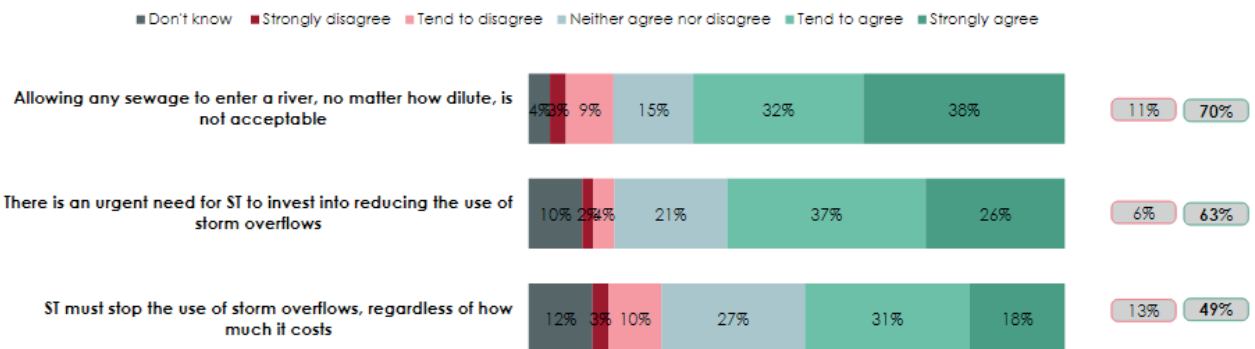


Figure 32. Customer views regarding storm overflow operation

Almost half of customers correctly identify that storm overflows are used to prevent sewage flooding homes and businesses, but they also feel there are other reasons why this happens, including

“When outdated parts of the sewer network can't cope” and “when there is a problem at the wastewater treatment works”.

When provided with information about the process and why overflows are used those who find it unacceptable reduce from 94% to 48% and a further 19% aren't sure, mainly due to the alternative of flooding properties (Storm overflow tracker boost).

“I appreciate excess water has to go somewhere. Preventing people's homes being flooded has to be a priority” HH customer, Storm overflow tracker boost

“Because there are so many houses more than the structure would have originally catered for” HH customer, Storm overflow tracker boost

Those who still find the practice unacceptable feel that the system should have been updated to prevent overflows operating, and there is concern over the environmental impacts, especially as some customers feel that extreme weather events are becoming more frequent.

“Lack of investment over a long time has caused the issue” HH customer, Storm overflow tracker boost

“Because it may be happening far too often, rather than every now and then. The systems aren't being re-designed for the impact of climate change” HH customer, Storm overflow tracker boost

Despite the information, some customers remain sceptical that overflows don't typically cause harm.

Overall, our research shows strong support for the urgent reduction and elimination of overflows. Customers want Severn Trent to eradicate storm overflows as quickly as possible, and are willing to pay more on their water bill for river water quality improvements. However, customers still look for reassurance that existing funds have been spent wisely and want detail about where the money is going and what it will achieve. CCW's research^[47] also shows that in principle most (58%) would pay more on their water bill to reduce the need to use storm overflows, but subject to detail and cost.

⁴⁷ CCW, Awareness and perceptions of river water quality



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