Our final plan

Our Drainage and Wastewater Management Plan 2025-2050

Technical Appendices
Appendix C - Baseline Risk and Vulnerability Assessment and Problem Characterisation (BRAVA)

May 2023

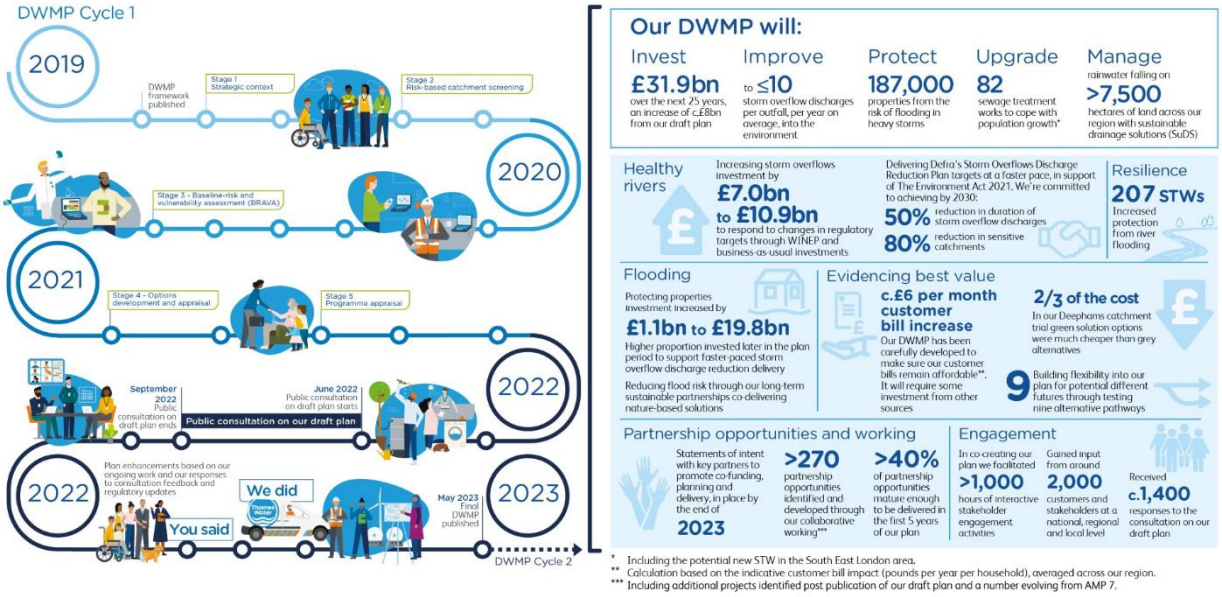
Contents

Figures

Tables

Preface

We're proud to present our first Drainage and Wastewater Management Plan (DWMP) and encouraged by the level of positive feedback we've received. Over the last four years, we've engaged and worked collaboratively with around 2,000 of our customers and stakeholders, to deepen our shared understanding and develop new ways to manage drainage and wastewater across our region. We illustrate our DWMP Cycle 1 and its headlines below.



We've progressed and enhanced our DWMP since we published it for public consultation in June 2022. We were pleased to receive lots of positive comments and support on the quality and ambition of our draft plan as well as useful ideas for making our final DWMP even stronger.

We've updated our draft plan based on our ongoing DWMP work, regulatory updates and our responses to the consultation feedback wherever possible*. Our updates include providing more detail where you felt it was needed and creating new appendices to answer technical queries. For more details on how we've progressed our final plan and responded to the consultation feedback, please see our Non-technical summary and You said, We did Technical appendix.

* Some public consultation feedback didn't require further action or wasn't relevant to the DWMP process. Other feedback was relevant to future DWMP planning cycles and will be used to inform this work.

Progress signposts

We want to make it easy for you to see what's changed. You can spot all the places we've updated our draft plan with our 'progress signposts' which we've used across our final DWMP documents.

Here's where they'll be:

- Preface summaries – we've put a summary table in each document's preface (excluding Summary documents and CSPs)
- Relevant chapters – we've placed the appropriate signposts next to each relevant chapter (including Summary document and CSPs)

To help you find our progress signposts, here are examples of what to look out for:

Progress summary table

The progress signposts summary table for the chapters in this document is outlined below. We've used orange cells to indicate where our draft plan has been updated with progress.

Progress signposts summary: Appendix C Baseline Risk and Vulnerability Assessment	Progress updated	More detail or new content	Number(s) updated	Delivery timeframe updated	Informing DWMP cycle 2
1 Our DWMP					
2 Baseline Risk and Vulnerability Assessment (BRAVA)					
3 Our approach					
4 Partnership approach					
5 Summary outputs					
6 Wider resilience					
7 Problem characterisation					

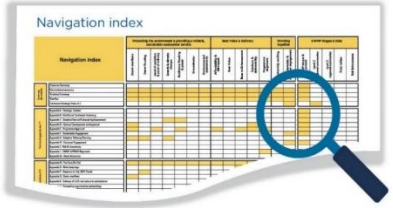
Key DWMP content

This document specifically includes the following key DWMP content:

- DWMP stages and data:
  - DWMP stages & process
  - Level 2 regional summaries
  - Level 3 regional summaries

Navigating our documents

To help you navigate around our final DWMP document suite and find where key DWMP content features, we've placed a Navigation index at the back of this document.



Executive Summary

The objective of our Baseline Risk And Vulnerability Assessment (BRAVA) is to assess infrastructure risks now and to provide a view of how these change in the future due to growth and climate change across our region.

Industry guidance[1] uses a reference to the existing mature planning process used in Water Resources Management Planning to confirm the context of BRAVA:

> *"Much like the supply-demand-balance concept of Water Resource Management Plans, the outputs of the BRAVA provide a strategic view of the level of risk facing drainage and wastewater services now and in the longer term. It helps inform whether interventions are required to ensure a robust and resilient service can be provided now and into the future."*

Our review of risk is built up at three geographical levels: Sewage Treatment Works (STW) catchment (L3), Thames Regional Flood and Coastal Committee (TFRCC) sub-committee (L2) and overall region wide (L1). Our assessment includes how current drainage and wastewater systems perform against our strategic DWMP planning objectives, how risks will change in the future under each time period being considered, and the principal drivers for change in risk.

Our earlier Strategic Context[2] stage set 12 planning objectives against which risk assessments would be undertaken. Six of these were reported nationally by all Water Companies, six reflected our local stakeholder needs (e.g., external flooding and STW Dry Weather Flow (DWF)) with four being assessed at a later stage in the process. The protocols for the six national objectives were devised and agreed by water companies in consultation with national stakeholders via the Water UK DWMP steering group. Protocols for external flooding and DWF assessments use established industry methodologies.

We reported our BRAVA results nationally in December 2020 to provide stakeholders (Ofwat, Defra, EA (Environment Agency), NIC (National Infrastructure Commission), ADEPT (Association of Directors of Environment, Economy, Planning & Transport), CCW (Consumer Council for Water)) with a strategic view of the level of risk facing water company drainage and wastewater services across the country and to inform progress towards final DWMPs. This high-level strategic understanding assists in the identification of opportunities for collaboration within other strategies and plans.

Analysis of our results clearly identifies the size of our current problem, or extent of our baseline risk. 83% of all L3 catchments are at risk of failing at least one planning objective, in Figure 0-1 we show how this relates to Population Equivalent with the greater risk being in the more densely populated urban areas. 99.76% of our customers are currently served by a wastewater catchment at risk.

[1] https://www.water.org.uk/wp-content/uploads/2020/07/BRAVA-planning-objectives-for-the-first-cycle-of-DWMPs.pdf
[2] https://www.water.org.uk/wp-content/uploads/2020/01/Water_UK_DWMP_Framework_Report_Main_September-2019.pdf

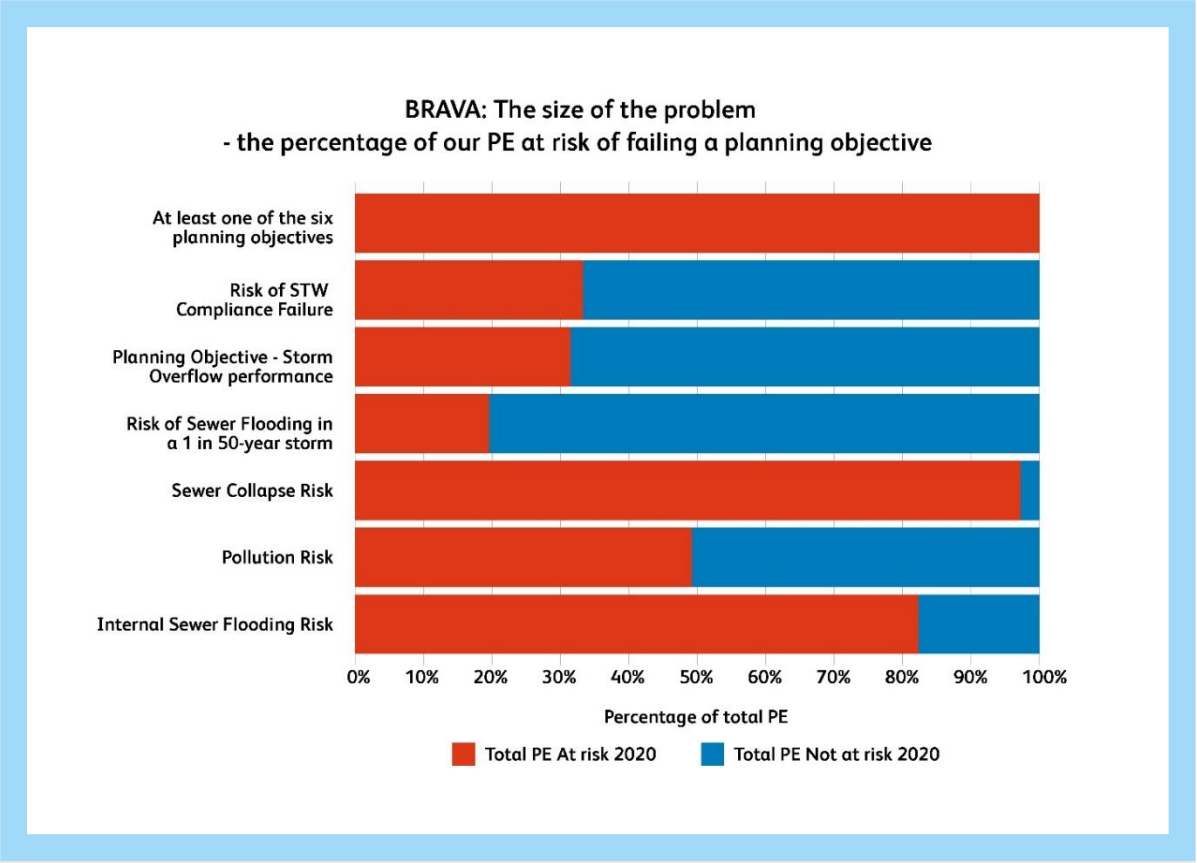


Figure 0-1 BRAVA – The size of the problem

Overall, this risk assessment showed that both growth and climate change, if left unmitigated, will have a significant impact on the performance of our wastewater service over the next 25 years.

The key insights from this risk assessment were:

Risk of flooding in a 1 in 50-year storm (2% probability)

Our modelling predicts that much of our region is resilient to extreme storms when considered against the threshold of required performance at the end of AMP7 (2025) in our performance commitments. The results identify that only a limited number of our catchments are at risk in the baseline, with very limited increase in 2050. The problem areas are concentrated in west London with few catchments outside of the M25 at significant risk. It is important to highlight that this metric is focused on risk from 1 in 50-year storms (2% probability), noting that in July 2021 more than a month's worth of rain fell in an hour in parts of London, representing a storm return period of 1 in 179 years (0.6% probability) which exposed additional vulnerabilities to storms of this scale.

Storm overflow performance

The results demonstrate a wide-spread challenge that will continue to worsen without intervention. The Thames Tideway Tunnel will ensure long-term resilience to storm overflow discharges impacting the Tideway region of London. However, elsewhere, without continued investment, the number of storm overflow discharges across our region will increase.

STW quality compliance

The baseline distribution of risks is linked to the performance of individual STWs. The 2050 results clearly display a company-wide trend of significant risk that is a result of population growth. This growth will erode our STW quality compliance headroom and without continued investment, we will have significant compliance issues at STWs across our region in the future.

Internal (hydraulic) sewer flooding risk

Our baseline assessment shows that for much of the region, we need to continue to invest to ensure we are achieving industry upper quartile performance on internal hydraulic flooding risk. The location of the significant problems is dominated by London and towns on the periphery of greater London, with the notable exceptions of Banbury, Oxford, Reading, Basingstoke and Guildford, which also fall into this category.

Risk of pollution incidents

Our baseline data shows that outside London, many of our regions are experiencing pollution incidents at a rate that is higher than the industry upper quartile performance we aim to deliver for our customers. We need to continue to invest to bring these rates down.

Sewer collapses

Our baseline data shows that as an overall region, we have a collapse rate that is amongst the lowest in the industry. But particularly in Thames Valley we have collapses associated with legacy material (pitch fibre pipes); which indicate further investment in asset health is required.

1 Our Drainage and Wastewater Management Plan (DWMP)

Our DWMP vision

1.1 Working in partnership to co-create a 25-year plan for drainage and wastewater that sustainably benefits communities and the natural environment in our region.

Our DWMP aim

1.2 To identify future catchment risks to our drainage and wastewater treatment systems and develop sustainable, efficient solutions to address them.

What we're trying to achieve

1.3 Protection of our environment, looking after the health of our rivers (aiming for zero harm from storm overflow discharges), being resilient to the risks of flooding and generating wider benefits to the communities we serve. DWMP contains outcomes for:

- Customers and communities – fair charges, improved health and wellbeing, increased amenity, and a resilient service
- Drainage and wastewater services – reduce hydraulic sewer flooding and achieve 100% Sewage Treatment Works (STW) compliance
- The environment – increase biodiversity, zero harm from storm overflow discharges, environmental net gain

Description of the plan

1.4 A DWMP is a long-term costed plan that is focused on partnership working, which sets out the future risks and pressures for our drainage and wastewater systems. It identifies the actions that are required to make sure we can continue delivering our services reliably and sustainably, while also achieving positive outcomes for our customers, communities and environment.

1.5 Our long-term, collaborative plan aims to ensure a resilient and sustainable wastewater service for the next 25 years and beyond.

Framework

1.6 This is the first time we've produced a long-term plan for our wastewater business. Based on the national DWMP framework[3] that was developed jointly by regulators and industry bodies including Ofwat, Defra, the Environment Agency, Water UK, Welsh Government, Natural Resources Wales, Consumer Council for Water, Association of Directors of Environment, Economy, Planning and Transport and Blueprint for Water, the DWMP creates a roadmap for how we adapt our wastewater service to cope with future challenges.

[3] https://www.water.org.uk/wp-content/uploads/2019/09/Working-together-to-improve-drainage-and-environmental-water-quality-an-overview-of-Drainage-and-Wastewater-Management-Plans.pdf

2 Baseline Risk and Vulnerability Assessment (BRAVA)

Progress

Purpose

2.1 The Baseline Risk and Vulnerability Assessment (BRAVA[4]) is a key stage in the DWMP journey as it assesses how current drainage and wastewater systems perform, how risks will change in the future under each time period being considered and identifies the principal drivers for changes in risk. The focus for BRAVA is those L3 catchments (293 out of 382), identified at the Risk Based Catchment Screening stage, which have risks and vulnerabilities now and going forward.

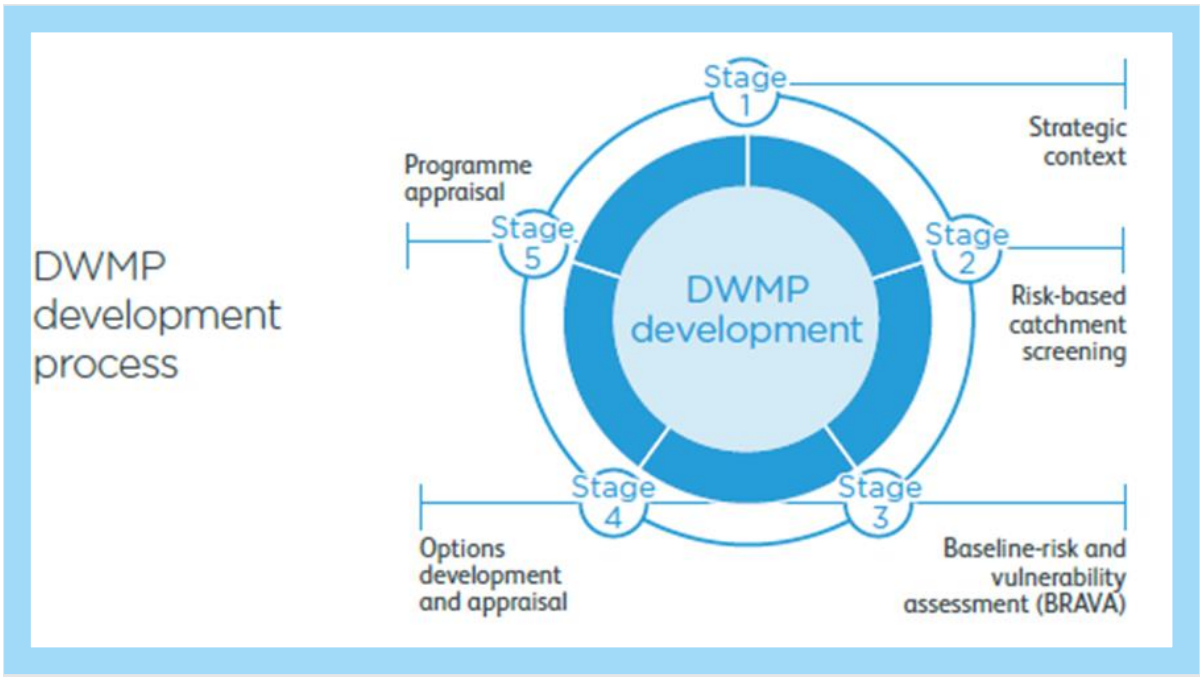


Figure 2-1 Position of the BRAVA stage within the DWMP development process

2.2 The objective of BRAVA is to assess the baseline risk and future risks against the DWMP planning objectives for these 293 L3 catchments. This catchment level data is also amalgamated at a sub-regional (L2) and regional level (L1) to facilitate stakeholder reporting. Much like the supply-demand-balance concept of Water Resource Management Plans, the outputs of BRAVA provide a strategic view of the level of risk facing our wastewater services now and in the long-term. It helps inform if interventions are required to ensure we provide a robust and resilient service now and into the future. If interventions are required, these will be developed through the Options Development and Appraisal (ODA), and Programme Appraisal stages, and incorporated in the final DWMP.

[4] https://www.water.org.uk/wp-content/uploads/2020/01/Water_UK_DWMP_Framework_Appendices_September-2019-C.pdf

Planning objectives set at a strategic context stage

2.3 The 12 planning objectives shown in Table 2-1 were agreed with stakeholders at the strategic context stage. Eight were assessed at the BRAVA stage of the framework, with all 12 planning objectives assessed during the ODA stage.

Inclusion in DWMP assessment	Planning Objective
Stage 3: BRAVA (Common (national) planning objectives)	STW quality compliance
	Risk of pollution incidents
	Storm overflow performance
	Internal sewer flooding risk (Hydraulic)
	Risk of flooding in a 1 in 50 storm
	Sewer collapses
Stage 3: BRAVA (Bespoke (regional) planning objectives)	Sewage treatment works (STW) dry weather flow (DWF) compliance
	External sewer flooding risk (Hydraulic)
Stage 4: Options Development and Appraisal (Planning) Bespoke	Carbon neutrality
	Wellbeing
	Reduce surface water runoff
	Reducing misconnections

Table 2-1 The 12 DWMP planning objectives set by stakeholders as part of the Strategic Context stage

2.4 Six of the DWMP planning objectives applied to our region are common planning objectives and are reported nationally to facilitate national risk assessments carried out by the National Infrastructure Commission.

2.5 Six bespoke BRAVA planning objectives were developed with local stakeholders to reflect our regional priorities and local issues.

2.6 Four of the bespoke additional objectives are plan output measures and are assessed later in the process during the Options Development and Appraisal, and Programme Appraisal stages.

3 Our approach

Progress 

Climate change

3.1 We used climate change projections published by the United Kingdom Climate Impacts Programme (UKCIP) as our base data source for all climate change assessments.

3.2 Pre-release UKCP2018 revised projections have been incorporated into our sewer network modelling.

3.3 The 2017 UK Water Industry Research CL1053 Rainfall Intensity for Sewer Design – Stage 2[5] and EA methodologies were then used to apply the climate change variables to the rainfall used in our network model runs, with a central estimate[6] uplift to account for climate change of +10% for 2035 and +15% for 2050 which aligns with the Representative Concentration Pathway (RCP) 6.0. RCP 6.0 is the central estimate in regard to global CO2 emissions, see below.

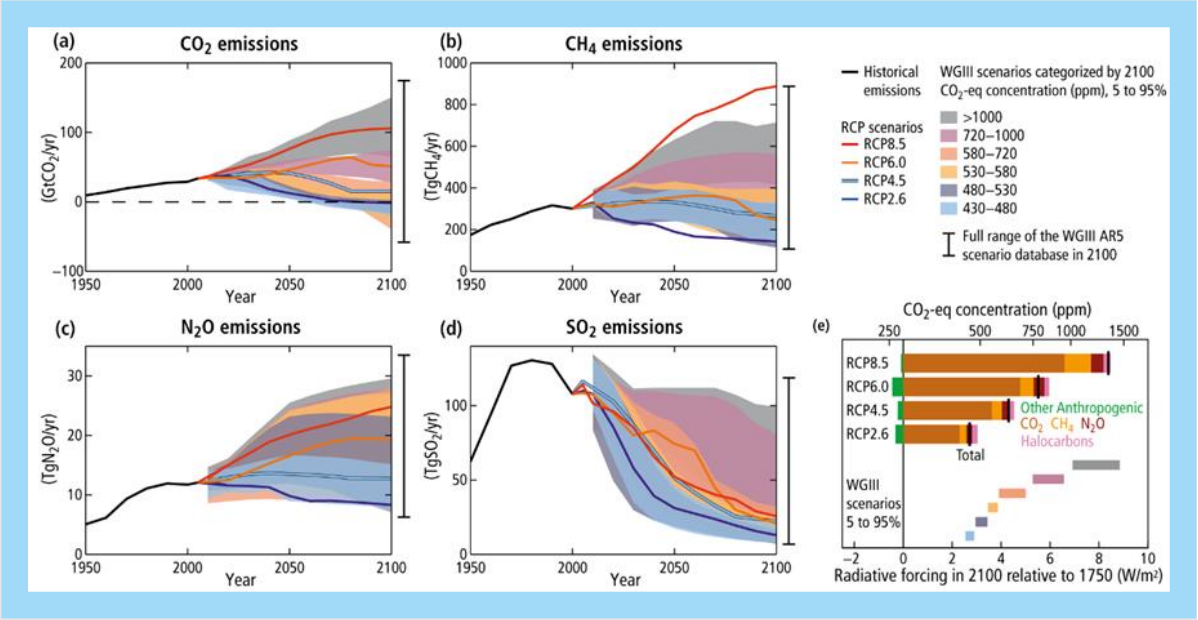


Figure 3-1 IPCC Climate change RCP overview[7]

3.4 In November 2021 Ofwat published the "PR24 and beyond: Long-term delivery strategies and common reference scenarios".[8] The discussion paper laid out common reference scenarios that Water Companies are expected to use to inform long term delivery strategies, utilising adaptive planning. In the document Ofwat sets out four material drivers

[5] https://ukwir.org/rainfall-intensity-for-sewer-design-stage-2-0
[6] https://artefacts.ceda.ac.uk/badc_datadocs/future-drainage/FUTURE_DRAINAGE_Guidance_for_applying_rainfall_uplifts.pdf
[7] https://ar5-syr.ipcc.ch/topic_futurechanges.php
[8] https://www.ofwat.gov.uk/publication/pr24-and-beyond-long-term-delivery-strategies-and-common-reference-scenarios/

that create uncertainty around long term enhancement spending: climate change, technology, demand, and environmental ambition. They were split into 'high' and 'low' scenarios. Climate change low and high scenario projections were specified: (1) low scenario based on UKCP18 RCP 2.6, (2) high scenario based on UKCP18 RCP8.5.

3.5 We have undertaken sensitivity testing using these the low and high scenarios on a suite of representative catchments. Flood Estimation Handbook (FEH) 139 Design rainfall profiles received a percentage uplift and Time Series Rainfall (TSR) was perturbed with an updated industry tool called RedUp v3 (Rainfall Event Duration uplift) (Table 3-1). The tool redistributes rainfall from a continuous time series of rainfall data to represent changed rainfall patterns such as drier summers and wetter winters as well as the intensification of rainfall events.

3.6 Version 3 of the RedUp tool has been released by UKWIR (UK Water Industry Research) in 2022 and includes the UKCP18 RCP 8.5 scenario only. To produce outputs for the Low scenario for the Storm overflow performance objective we have used the RedUp predictions for 2030 (RCP8.5) as a proxy of the likely rainfall distribution for 2050.

Planning Objectives	Modelled Rainfall Type	Scenarios	2035 uplift	2050 uplift
(1) Risk of flooding in a 1 in 50 storm (2) External hydraulic sewer flooding risk	FEH 13 Design Rainfall	**High:** RCP 8.5 Common Reference Scenarios-Sensitivity Analysis UKCP18, 50th percentile	10%	20%
		Central estimate - BRAVA – RCP 6.0	**10%**	**15%**
		Low: RCP 2.6 Common Reference Scenarios-Sensitivity Analysis UKCP18, 50th percentile	4%	10%
Storm overflow performance	Time Series Rainfall	**High:** RedUp v3; RCP 8.5; 2050	Not modelled	Perturbed based on information in
		Central estimate - BRAVA: RCP 6.0, RedUp v2		
		Low: RedUp v3 2030 RCP8.5(assumed to be a proxy for 2050 Low RCP2.6)		

Table 3-1 Climate change application on rainfall scenarios

Growth

3.7 Thames Water closely tracks growth to enable us to provide additional capacity before the demand is realised. We use Local Authority Plans as well as ONS (Office for National Statistics) data to plan for the future.

[9] Find more about design rainfall here: https://www.ceh.ac.uk/services/flood-estimation-handbook

3.8 Local Authority and ONS forecasts for each STW catchment are internally captured in SOLAR forms. Our records in SOLAR were updated before we commenced modelling the impact of growth.

3.9 Network models for catchments of equal or more than 10,000 population equivalent were updated based on the following approach: (1) Inclusion of larger developments spatially; (2) remaining uplift included globally. Generally Local Authority Plans at the time of modelling only covered a time horizon up to 2036, therefore the remainder of the period up to 2050 was based on ONS (as assessed in 2018) predictions. ONS predictions do not have the same granularity, however present the best available information.

3.10 Network models for catchments of less than 10,000 population equivalent were updated with Edge data projections, by adding additional population in individual subcatchments.

Urban Creep

3.11 Urban creep has been represented in the hydraulic models by increasing the connected impermeable areas and reducing permeable area by the equivalent (increase in impermeable area) amount in subcatchments to replicate the replacing of green/permeable areas with hardstanding, buildings etc. Annual creep rates were based on assessments made for individual SDACs (Sewerage Drainage Area Catchments), which represent hydraulically distinct areas within a STW catchment. For combined sewerage catchments 100% of the calculated creep was included in the adjustment of the areas in the subcatchments. For separately sewered areas this was reduced to 30% of the calculated creep areas as an adjustment to the subcatchments. For Baseline (2020) analysis models, not subject to recent reverification (less than 5 years) were updated with creep to account for any possible change that may have arisen up to 2020.

3.12 Thames Water's Sewerage systems, by length, is predominately separate by design, with the intention that foul and surface water flows are conveyed in separate systems (pipes). Combined sewers, where a single pipe exists to capture both surface and foul water will mostly be found in London. In this first iteration of our DWMP we have taken a conservative approach to the inclusion of Urban Creep in separately sewered systems, which we will look to refine in the next iteration (cycle 2) of our BRAVA analysis to improve our forecast of how risk may change in the future.

Risk assessment protocols for common (national) planning objectives

3.13 For each of the six common planning objectives we followed the Water UK guidelines[10] on risk protocols that are summarised in Table 3-2.

Planning Objective	How we measure this objective
Risk of flooding in a 1 in 50 storm: To define the risk of residential properties experiencing flooding in a storm that might be experienced once in every 50 years on average, equating to a 2% probability of the rainfall event occurring in any given year.	Percentage of population at risk of flooding in a 1 in 50-year rainfall event in 2020 (baseline) and 2050.
Storm overflow performance: To define the ability of the sewerage system (including STW) to operate in storm conditions with an acceptable frequency of overflow to the environment.	Modelled annual average frequency of discharge (number of events) from storm overflows using forecast rainfall data in 2020 (baseline) and 2050.
Sewage treatment works (STW) quality compliance: To define the ability of STW to treat and dispose of sewage in line with current discharge permit quality conditions.	Modelled sewage treatment works compliance against current permit quality conditions in 2020 (baseline) and 2050.
Internal hydraulic sewer flooding risk: To define the risk of properties flooding internally from our sewers.	Risk assessed based on average of the last three years' performance data; and Modelled risk based on internal escape locations in a 1 in 30-year event in 2020.
Risk of pollution incidents: To define the risk of polluting discharges to the environment (classed as Category 1 to 3 by the Environment Agency) arising from either network or treatment sites.	An average of the last three years of annual performance for Category 1 to 3 pollution incidents as set out in the Environmental Performance Assessment (EPA) in 2020.
Sewer collapses: To define the risk of a sewer collapsing so that its ability to convey wastewater is compromised, specifically defined as the number of sewer collapses.	An average of the last three years of annual performance in 2020.

Table 3-2 Six Common (national) planning objectives and how we measure them

Risk assessment protocols for bespoke (regional) planning objectives

3.14 For both of the bespoke (regional) objectives amenable to long-term forecasting and modelling, described in Section 2.5, we followed similar principles to the Water UK guidelines that are summarised in Table 3-3.

Planning Objective	How we measure this objective
Sewage treatment works (STW) dry weather flow (DWF) compliance:	Modelled compliance against daily DWF permit limit.

[10] https://www.water.org.uk/wp-content/uploads/2020/07/BRAVA-planning-objectives-for-the-first-cycle-of-DWMPs.pdf

Planning Objective	How we measure this objective
To define the ability of STW to treat and dispose of sewage in line with current dry weather flow (DWF) discharge permit conditions.	
External hydraulic sewer flooding risk: To define the risk to outside areas within a boundary curtilage flooding from our sewers.	Modelled risk based on external escape locations in a 1 in 30-year rainfall event.

Table 3-3 Bespoke (local) planning objectives and how we measure them

Thresholds

3.15 We have assessed risks against performance thresholds that are aligned with our end of AMP7 (2025) performance targets set in our company performance commitments.[11] As some companies will have similar targets, this approach maximises the opportunity for consistent reporting of national data. Also, performance commitment targets are agreed with stakeholders at price reviews and therefore have wider stakeholder advocacy, adhering to the DWMP framework.

3.16 Risks have been assessed against the performance thresholds at a STW catchment level (L3) and are reported against the following three risk category groupings to provide an indication as to whether future pressures are likely to significantly impact system performance:

- 0: Not Significant
- 1: Moderately Significant
- 2: Very Significant

3.17 The risk assessments performed, and the performance thresholds applied, are summarised in Table 3-4 and Table 3-5.

Planning Objective	Threshold
Risk of flooding in a 1 in 50 storm	Existing hydraulic models used FEH 13 rainfall to assess the percentage of population at risk of flooding in a 1 in 50-year return period storm. A statistical correlation function from modelled catchment results was applied to non-modelled catchments. Threshold levels have been set as a percentage of population at risk: • 0 (Not Significant): <7.6% • 1 (Moderately Significant): 7.6% – 14.3% • 2 (Very Significant): >14.3% The thresholds were developed by forecasting performance quartiles for the resilience assessment for all relevant wastewater companies in England and Wales, based on population growth and various best to worst case scenarios affecting future performance.
Storm overflow performance	The risk of the spill frequency of all non-temporary permitted overflows, from foul or combined networks or from STW storm tank overflows, was assessed against the following national threshold levels:

[11] https://www.ofwat.gov.uk/wp-content/uploads/2019/12/PR19-final-determinations-Thames-Water-%E2%80%93-Outcomes-performance-commitment-appendix.pdf

Planning Objective	Threshold
	• 0 (Not Significant): <20 storm overflow discharges per year • 1 (Moderately Significant): 21 – 40 storm overflow discharges per year • 2 (Very Significant): >40 storm overflow discharges per year
Sewage treatment works (STW) quality compliance	The risk of a compliance failure aligns to the current Environmental Performance Assessment (EPA) definition. We have used four methods for determining risk of non-compliance at STWs: Capacity – this is based on theoretical Population Equivalent (PE) capacity. Model – the output of the process model for an individual site is used to assess predicted effluent performance over time. Performance – based on the average Biochemical Oxygen Demand (BOD) and ammonia performance over the last three years against the permit. Other – where no capacity, modelled or performance data is available, expert judgment has been used. Thresholds were based on Water UK guidelines as a percentage of the permit limit: • 0 (Not Significant): <80% • 1 (Moderately Significant): 80% – 94.9% • 2 (Very Significant): ≥95%
Internal hydraulic sewer flooding risk	Internal flooding is recorded in the Sewer Flooding History Database and the numbers of internal flooding properties were normalised to a 'per 10,000 connected properties' measure. The normalised values were averaged for the last three years to determine the threshold band. Threshold levels have been based on AMP6 upper quartile and end of AMP7 targets, to ensure consistency across metrics and to use values which are based on common planning commitments across the industry: • 0 (Not Significant): <1.34 (end of AMP7) • 1 (Moderately Significant): 1.34 - 1.68 (AMP6 Upper Quartile) • 2 (Very Significant): >1.68
Risk of pollution incidents	The risk of pollution incidents was extracted from the Environment Agency National Incident Reporting System database and normalised per 1,000km sewer length. Threshold levels have been based on AMP6 upper quartile and end of AMP7 targets. This is to ensure consistency across metrics and to use values which are based on common planning commitments across the industry: • 0 (Not Significant): <19.5 (end of AMP7) • 1 (Moderately Significant): 19.5 – 24.5 (AMP6 upper quartile) • 2 (Very Significant): >24.5
Sewer collapses	Verified collapse data was normalised per 1,000km sewer length. Threshold levels have been based on AMP6 upper quartile and end of AMP7 targets. This is to ensure consistency across metrics and to use values which are based on common planning commitments across the industry.

Planning Objective	Threshold
	• 0 (Not Significant): No collapses • 1 (Moderately Significant): ≤ 4 (AMP6 upper quartile) • 2 (Very Significant): > 4

Table 3-4 Summary table of the performance thresholds used for each common planning objective

Planning Objective	Threshold
Sewage treatment works (STW) dry weather flow (DWF) compliance	This planning objective relates to compliance with the Dry Weather Flow (DWF) permit at our STWs. The forecasted DWF is calculated using measured flow data and forecasted changes in water use, and population growth. This forecast is compared with the existing permit value. Threshold limits have been set based on the percentage of permit value: • 0 (not significant): <90% of permit • 1 (moderately significant): 90% – 100% • 2 (very significant): ≥100%
External hydraulic sewer flooding risk:	The external sewer flooding planning objective is an internal metric, for which we applied a different approach: rather than banding the data into categories of 0, 1 and 2 as per above objectives, we banded the data into performance quartiles derived from the results for all L3 catchments to identify those that are the worst and best performing. • Quartile 1 = < 0.49% of properties at risk • Quartile 2 = between 0.49% and 1.09% of properties at risk • Quartile 3 = between 1.09% and 2.19% of properties at risk • Quartile 4 = >2.19% of properties at risk

Table 3-5 Summary table of the performance thresholds used for each bespoke planning objective

Sensitivity analysis

3.18 For this first cycle DWMP, the thresholds described in Table 3-4 were aligned to our performance commitments. We looked to see how using different thresholds could impact on the final results and found that for most parameters, the risk categories were sensitive to thresholds set. Setting thresholds aligned to performance commitment targets is a reasonable starting point for cycle 1 as it promoted consistency nationally.

3.19 Threshold setting will require more development work ahead of cycle 2 to ensure we continue to promote consistency for national reporting whilst retaining a representation of local risk issues. This is part of the cycle 1 to cycle 2 development programme underway via Water UK DWMP Task and Finish Groups.

Reporting and assurance

3.20 The BRAVA return was produced in-house by experienced system planners and modellers and the results are integrated with our planning team's system reviews and thinking. In the run up to the submission of BRAVA outputs to DWMP Steering Group submission, we held weekly internal data surgeries to challenge and to identify any anomalies.

3.21 We also discussed BRAVA results at regular sub-regional stakeholder forums to ensure local stakeholders were aware of the outcome of the data return. This also provided stakeholders with an opportunity to input further risk data where it was considered that initial BRAVA findings did not sufficiently capture the risks present in a catchment.

3.22 The BRAVA results have been assured as part of our corporate External Information Risk Assessment run by our Strategy and Regulation team. Prior to external publication, the BRAVA data was subject to the following assurance activities:

- production of methodology statements
- four level management sign off
- comparison to other water company data which was a final check to spot outliers due to data errors

4 Partnership working

Progress 

Our approach / protocol development

4.1 Partnership working is a key part of the DWMP development. Throughout BRAVA it was important to us that the information and modelling results were made available to our stakeholders and opportunities were created for detailed conversations on the results and potential additional areas of risk or opportunity.

4.2 The BRAVA stage coincided with the 2020 coronavirus pandemic. Associated lockdowns and restrictions could have reduced effective engagement as we had to perform the majority of our engagement virtually. To mitigate the impact of changes in ways of working, we accelerated the development of our online data sharing platform (DWMP GIS portal) which was launched in summer 2020 and we changed our interactions from face-to-face group discussions to more bespoke virtual stakeholder sessions to account for the differing IT constraints of some of our stakeholder groups.

4.3 70 data-sharing sessions were delivered between September and December 2020 across our company area to share our BRAVA results and learn more about additional stakeholder risks. For more detail see the Stakeholder Engagement Technical Appendix.

4.4 Members of the relevant Lead Local Flood Authority, Local Authority, EA, Local Catchment Partnership, Thames Flood Advisors and our experts attended the sessions to discuss opportunities and key areas of concern that should be prioritised through the plan.

4.5 To maximise feedback, we provided each stakeholder with an online questionnaire during the workshops.

4.6 We also shared interactive pdf maps showing the key BRAVA results for each catchment prior to these sessions. The maps were then uploaded to our on-line Practitioner Portal, which all our partners were given access to, allowing detailed review of all L2 and L3 spatial data. An example of the quality and of the comprehensive data available is shown in Figure 4-1.

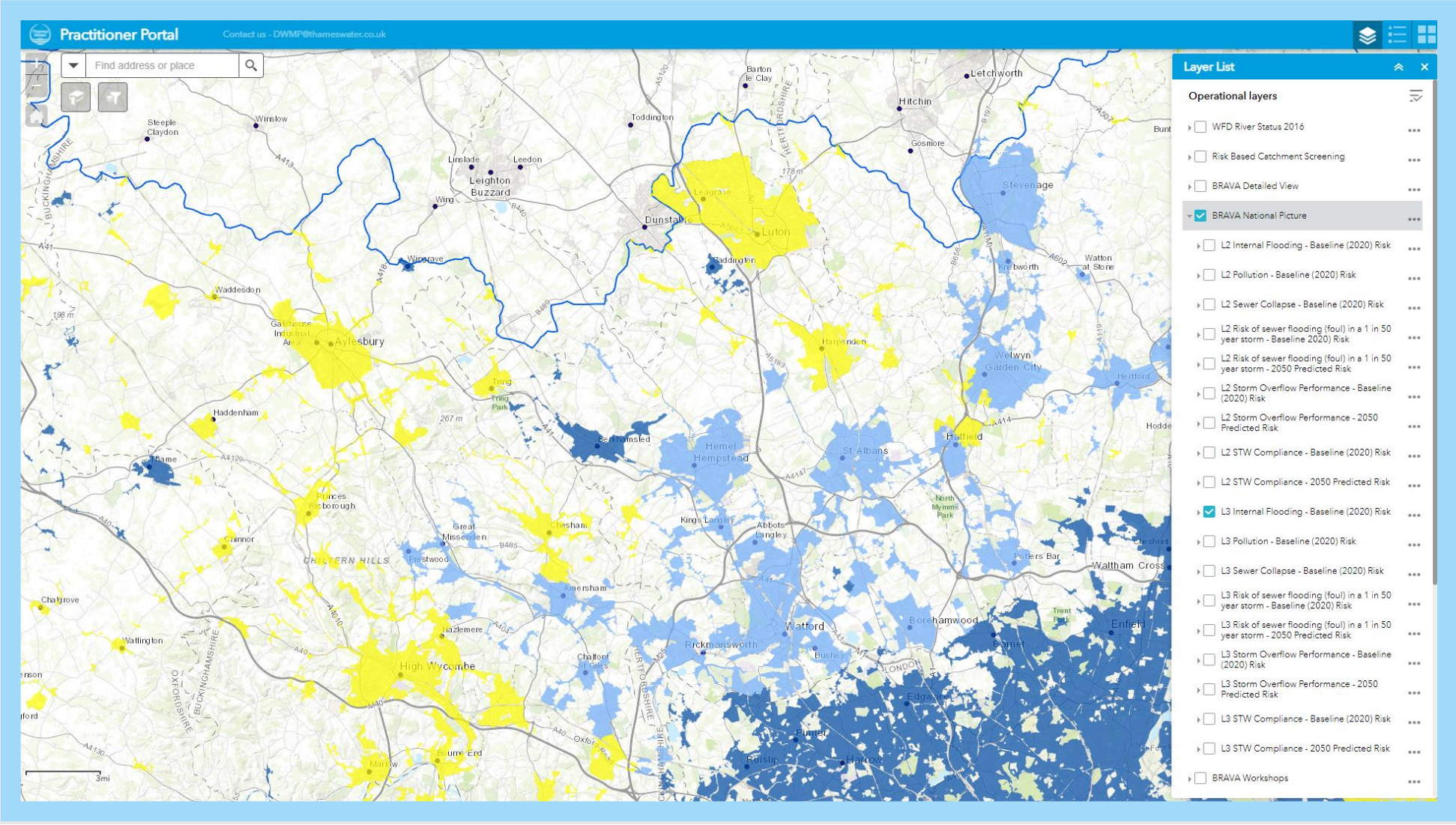


Figure 4-1 Screenshot from the Practitioner Portal showing the quality of the comprehensive data available

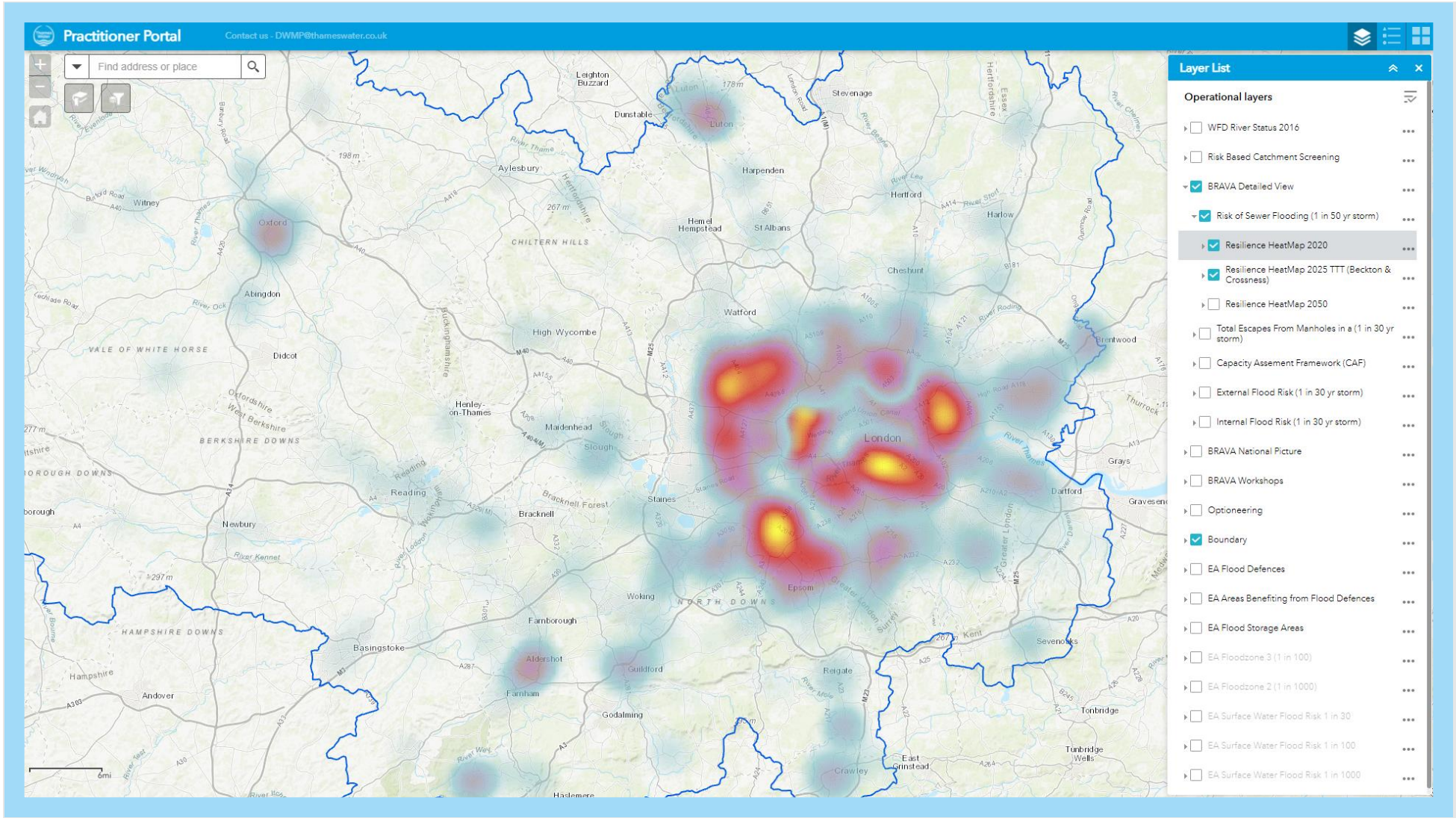


Figure 4-2 BRAVA results presented in the stakeholder workshops as hotspots of risk to illicit commentary on the accuracy of the data and possible opportunities

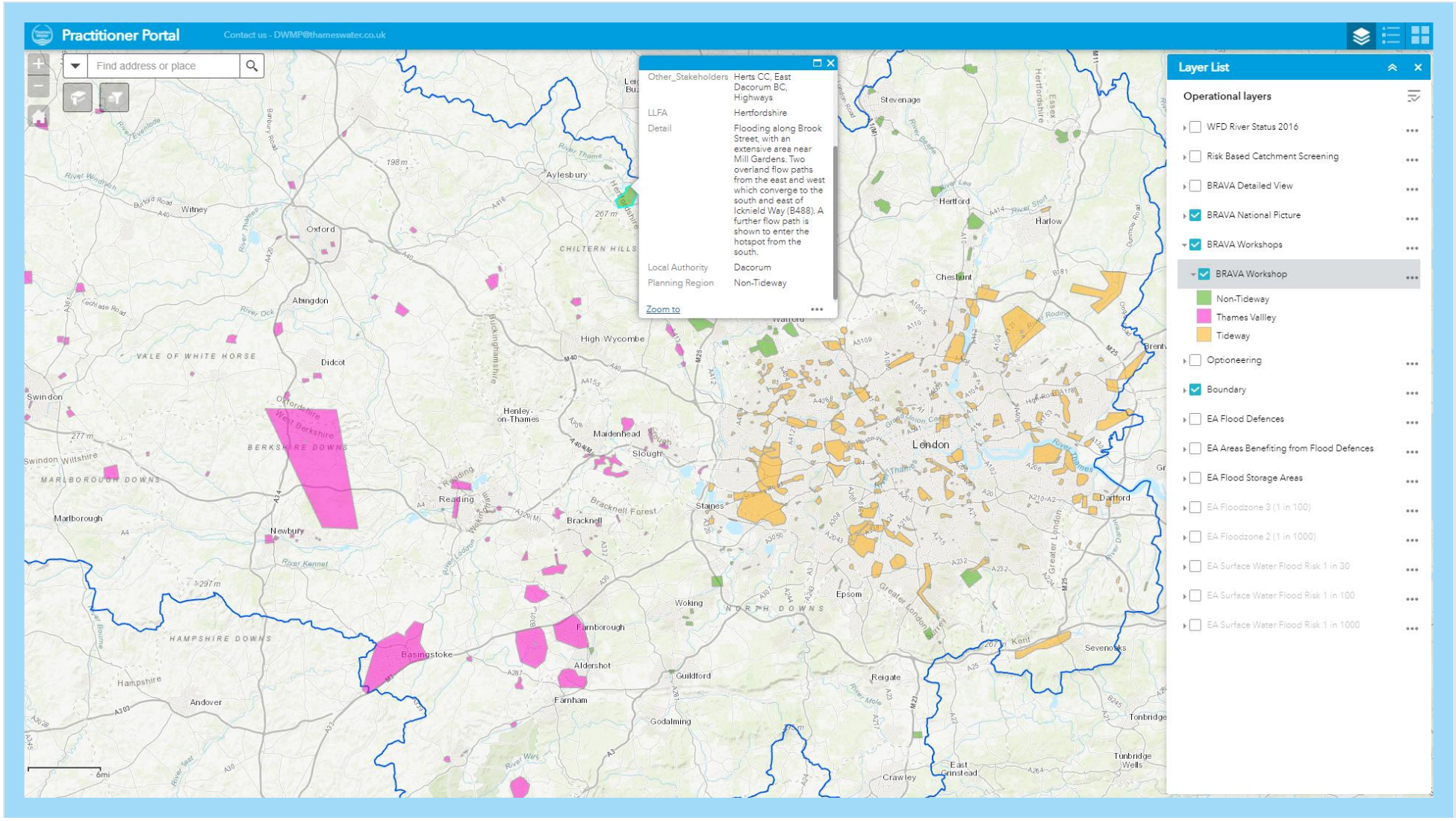


Figure 4-3 Example of the areas of risk / opportunity added by stakeholders at the BRAVA workshops

Response from stakeholders

4.7 At each workshop, we presented the results of the BRAVA modelling on the Practitioner Portal through additional layers to show hotspot areas of risk, as shown in Figure 4-2. Approximately 120 stakeholders were engaged in the BRAVA process directly through workshops and a further 50+ were provided with access to the Practitioner Portal to view the data.

4.8 Partner comments and key areas of concern were collated and plotted on to the maps, as shown in Figure 4-3. Some aligned with BRAVA results, although at least 3 additional risk areas per workshop were added to our catchment maps based on stakeholder feedback.

4.9 We recorded details of the issues and potential solution (if known) and used the additional information to support problem characterisation and create an early-view list of potential partnership projects to be added to the DWMP. In total, we gathered information on over 500 risk areas at the close of BRAVA discussions.

4.10 Results from our stakeholder feedback forms were positive, with an average score of 4 out of 5 for the effectiveness of the reference material and quality of the workshop material and space for discussion.

5 Summary outputs

Progress 

5.1 The full suite of results for the six common planning objectives was reported to Water UK and the DWMP Steering Group in December 2020 in the form of data tables and a series of spatial representations.

5.2 These outputs identified size, type and location of the current problem and how risks would become worse without intervention. The results also demonstrated the progress that we and all the other wastewater companies have made towards producing DWMPs and helped to inform and advance the preparation of DWMPs nationally.

5.3 The results of the BRAVA assessments undertaken at L3 have been normalised by population equivalent (PE) or per km as appropriate and aggregated to L2 Thames Regional Flood and Coastal Committee (TRFCC) sub-committee areas and then to an overarching regional level (company-wide L1).

5.4 The presentation of aggregated results for L1 and L2 does introduce the risk of an aggregated 'low' score, averaging out pockets of significant risk, and vice versa. For example, there may be a high score at L2 due to a handful of outlier catchments, when there is little risk in the vast majority. To address this risk, we have provided a discussion of the risks in the following section and have presented the full L3 results and spatial representations in the Appendices.

L1 outputs

5.5 The L1 results presented in Table 5-1 demonstrate that at a company level, we have key challenges that we need to address in our long-term planning. Our analysis shows that, if left unchecked, growth and climate change could significantly impact on the natural environment, with increased frequency of storm overflow discharges and non-compliant STW discharges.

5.6 It is important to note Thames Water has invested continuously in its modelling stock, evolving these important Decision Support Tools. In recent years we have moved to make the models simulate in real time 24/365 meaning that we are able to continuously assess and review their capability to replicate hydraulic sewer flooding. An area we will pay particular attention to further evolve the models from cycle 1 to 2 is in their capability to replicate extreme weather events i.e. those above what we normally design schemes to (1 in 30 year). These events by their very nature are rare, and vary spatially i.e. the geographical area they impact at any one time, but through capturing data when they occur e.g., London July 2021 event, we are able to observe how our models performed and target improvements where appropriate such as how we model overland flooding in combined systems or how flow is routing into surface water systems such as road gullies. We believe these enhancements will help build valuable insight into flood risk and afford greater opportunity for partnership working with other Risk Management Authorities.

Planning Objective	Threshold Description	Planning Objective Impact
	Total Population Equivalent	15,878,382
	Baseline (2020) sewer length (km)	109,500
Risk of flooding in a 1 in 50 storm	Baseline (2020) score	0
	2050 score	0
Storm overflow performance	Baseline (2020) score	1
	2050 score	1
Sewage treatment works (STW) quality compliance	Baseline (2020) score	0
	2050 score	2
Internal sewer flooding risk	Baseline (2020) score	2
Risk of pollution incidents	Baseline (2020) score	2
Sewer collapses	Baseline (2020) score	1

0= Not Significant, 1= Moderately Significant, 2= Very significant

Table 5-1 Level 1 BRAVA results

L2 outputs

5.7 The L2 results presented in Table 5-2 demonstrate our current and future concerns in our thirteen L2 Strategic Planning Areas, as assessed across the six common planning objectives. They show:

- Growth and climate change will create more flooding.
- The risk of flooding in a 1 in 50-year storm worsens across northwest and southwest London, although we believe that the risk of flooding in London is more widespread than these results suggest. For example, the apparent greater modelled flood risk in northwest London, is likely to be because of higher hydraulic model coverage of its surface water system, in part due to its complexity and interaction with the historic rivers in the area, which were culverted as London grew.
- Some L2 communities will suffer unacceptable storm overflow performance. This could impact the environment that we know these communities' treasure and could have a negative effect on designated areas such as conservation areas and SSSIs.
- Growth will have a universal impact on quality compliance at all of our STWs if not mitigated through appropriate investment.
- Sewer collapses will increase as the assets age, and some parts of our region have a collapse rate that is worse than our current target.

Strategic Planning Area	Risk of flooding in a 1 in 50 storm		Storm overflow performance		Sewage treatment works (STW) quality compliance		Internal sewer flooding risk	Risk of pollution incidents	Sewer collapses
	2020	2050	2020	2050	2020	2050	2020	2020	2020
Central Bedfordshire, Buckinghamshire, Slough, Luton	0	0	1	1	1	2	0	1	1
Central North London	0	0	0	0	1	2	2	0	2
Central South London	1	1	0	0	0	2	2	0	1
Essex and Thurrock	0	0	0	1	0	1	0	2	2
Hertfordshire	0	0	0	1	0	2	1	2	1
Lee Valley	0	0	0	0	1	2	2	0	1
North East London	0	0	1	2	0	2	2	0	1
North West London	1	2	2	2	0	2	2	2	2
Oxfordshire, Swindon, Wiltshire, Gloucestershire, Warwickshire	0	0	1	1	1	2	2	2	2
South East London	0	0	0	0	0	2	1	0	1
South West London	1	1	0	0	0	2	2	0	1
Surrey	0	1	1	1	1	2	1	2	1
West Berkshire, Reading, Wokingham, Bracknell Forest, Windsor and Maidenhead, Hampshire, West Sussex	0	0	0	1	1	2	1	2	1

Table 5-2 Level 2 BRAVA results

5.8 Figure 5-1 to Figure 5-6 show the L2:

- Baseline 2020 position for all six objectives
- Predicted 2050 position for the three planning objectives where this has been possible to model future predictions

5.9 The following key presented in Table 5-3 is used for the risk thresholds categories, defined in Section 3.5, and shown on the figures below:

	Risk Threshold
	0 : Not Significant
	1 : Moderately Significant
	2 : Very Significant

Table 5-3 Risk threshold key

Risk of flooding in a 1 in 50-year return period storm

- Our modelling predicts that most of our region is resilient to extreme storms when considered against the threshold of our annual performance commitments, although this metric needs further development to fully account for modelling uncertainty.

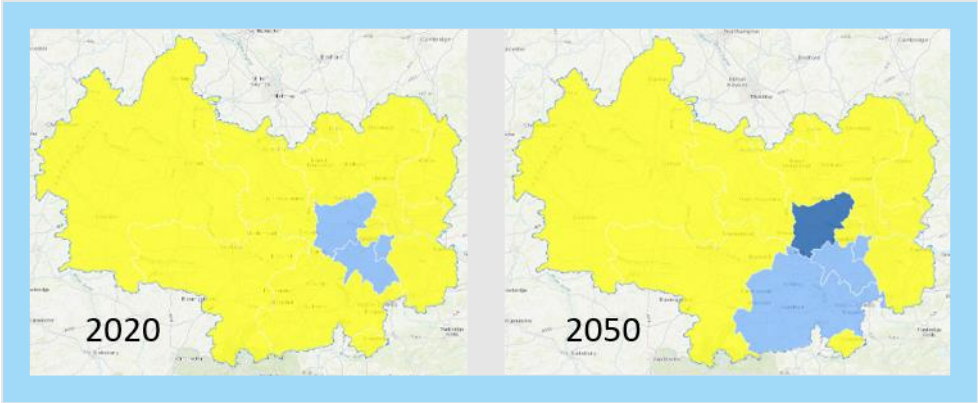


Figure 5-1 L2 risk of flooding in a 1 in 50-year return period storm

Storm overflow performance

- The Thames Tideway Tunnel will ensure resilience to storm overflow discharges in inner London over the next 25 years. However, without continued investment, the number of storm overflow discharges across our region will increase.

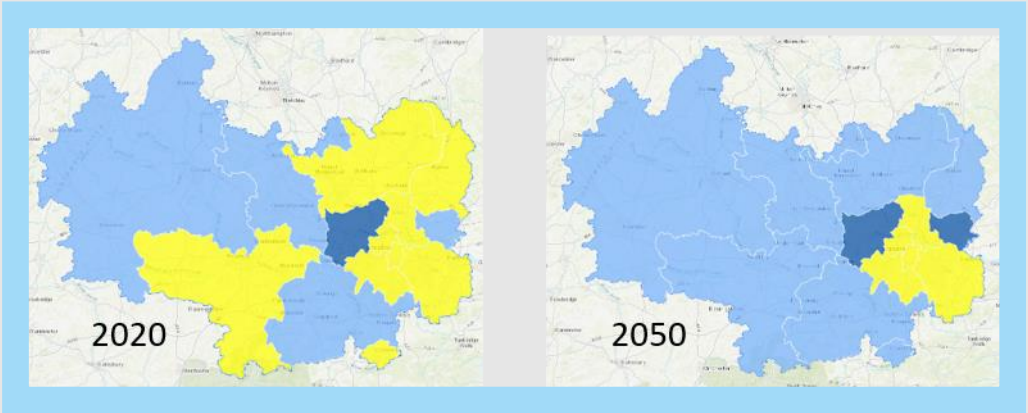


Figure 5-2 L2 Storm overflow performance

Sewage treatment works (STW) quality compliance

- Without continued investment, growth will erode our STW headroom, and we will have significant quality compliance issues at STWs across our region in 2050. The baseline position in London deteriorates towards the end of AMP7 (2025), requiring earlier near-term investment.

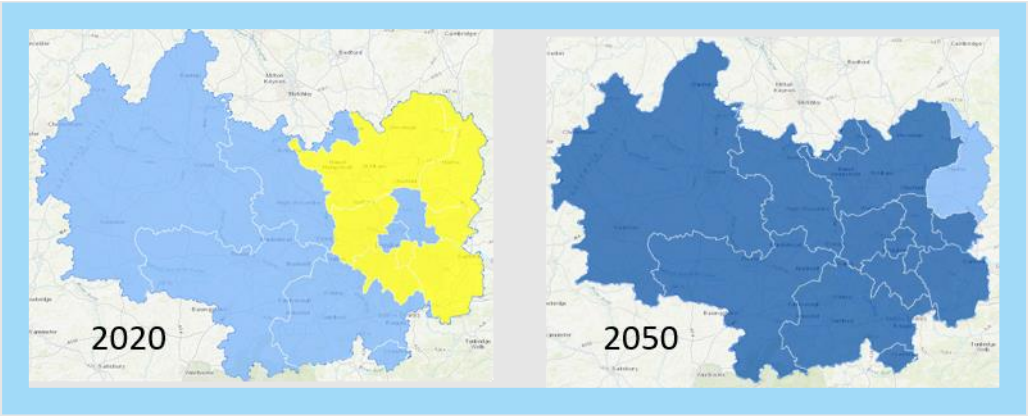


Figure 5-3 L2 STW quality compliance

Internal hydraulic sewer flooding risk

- The modelled risk of experiencing internal flooding based on measured data is higher than the industry upper quartile performance levels that we aim to deliver for our customers. We need to continue to invest to reduce flood risk to achieve this.

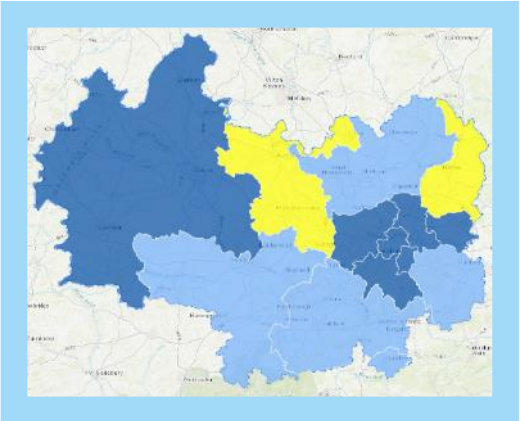


Figure 5-4 Internal sewer flooding (2020)

Risk of pollution incidents

- Outside of London, many of our regions are experiencing pollution incidents at a rate that is higher than the industry upper quartile performance, we aim to deliver for our customers. We need to continue to invest to bring these rates down.

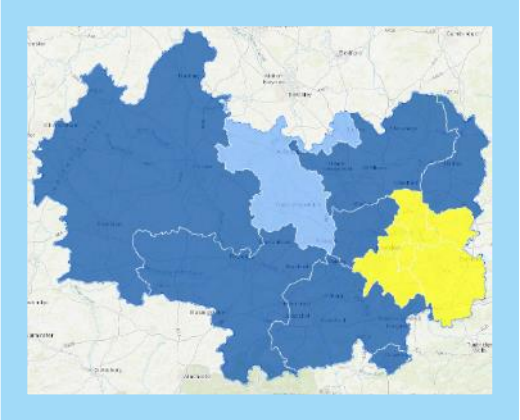


Figure 5-5 L2 risk of pollution incidents (2020)

Sewer collapses

- As a company, we have a sewer collapse rate which is amongst the lowest in the industry, although we have presented a conservative set of results where any problem is deemed to be a moderately significant risk. However, some parts of our region have a collapse rate above our current AMP7 performance commitment rate of 4 per 1,000km.

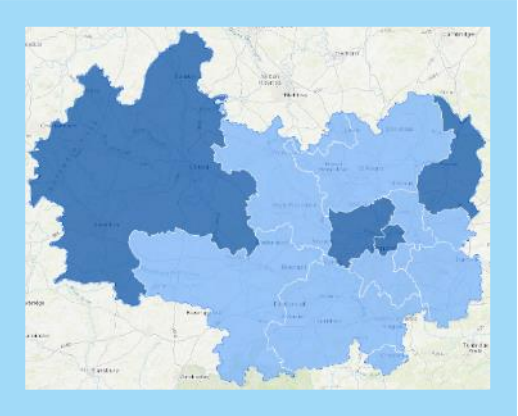


Figure 5-6 L2 risk of sewer collapse (2020)

L3 outputs

5.10 The L3 BRAVA outputs have provided us with the information to determine the severity, location and type of problem we currently have with regards to meeting our agreed planning objectives.

5.11 The full results and detailed geospatial representations that show the risk levels of individual catchments are presented in Appendix A.

5.12 At L3, as expected, flood risk, storm overflow performance and pollution events reflect highly localised factors, including property density and local relief coupled with proximity to local watercourses.

5.13 Risk of sewer flooding in a 1 in 50-year storm: The modelled results identify that only 22 or 8% of our catchments are at 'moderate' or 'very significant' risk in 2020, which increases to 27 catchments or 9% in 2050. The problem areas are concentrated in west London, with few catchments outside of the M25 at significant risk. We commonly see problems with surface water flooding entering foul sewer manholes, and in the Thames Valley region the naturally high groundwater levels affect our network with seasonal widespread infiltration.

5.14 Storm overflow performance: The L3 results, and their aggregation to L2 demonstrate a wide-spread problem in some of our region's larger towns and much of Greater London that are not protected by the Thames Tideway Tunnel, as well as correspondingly large areas where risks are not significant. Where there are problems, these issues will continue to worsen without intervention.

5.15 STW quality compliance: The 2020 distribution of 'moderate' or 'very significant' risk is linked to the performance of individual STWs. However, the 2050 results clearly display a company-wide trend of 'very significant risk' as growth is predicted not only in London, but across all of the southeast of England. Without intervention, this would mean that the STWs serving 89% of our customers would be at risk of breaching their effluent quality permits.

5.16 Internal hydraulic sewer flooding: The location of the 'very significant' risks is dominated by London and towns on the periphery of greater London, with the notable exceptions of Banbury, Oxford, Reading, Basingstoke and Guildford that also fall into this category. The

population density of these urban conurbations leads to 69% of PE being at 'very significant' risk.

5.17 Pollution: The results demonstrate stark differences in risk across our region, with the majority of the catchments (98%) categorised as either not significantly at risk, or very significantly at risk.

5.18 Sewer collapse: As explained in Section 5.9, we have a sewer collapse rate which is amongst the lowest in the industry, although we have presented a conservative set of results where any problem is deemed to be a moderately significant risk. Even with the conservative thresholds used, the L3 results show that risks are typically 'moderate' across the region. The poorer performances in Oxford and Banbury skew the categorisation of the Oxfordshire, Swindon, Wiltshire, Gloucestershire and Warwickshire L2 TRFCC to 'very significant', whilst the majority of the catchments have much lower risks.

5.19 Analysis of this data clearly identifies the size of the current problem, or extent of the baseline risk. 83% of all L3 catchments are at risk of failing at least one planning objective but owing to the greater risk in the more densely populated urban areas, this means that 99.76% of PE are currently at risk, as demonstrated in Figure 5 7.

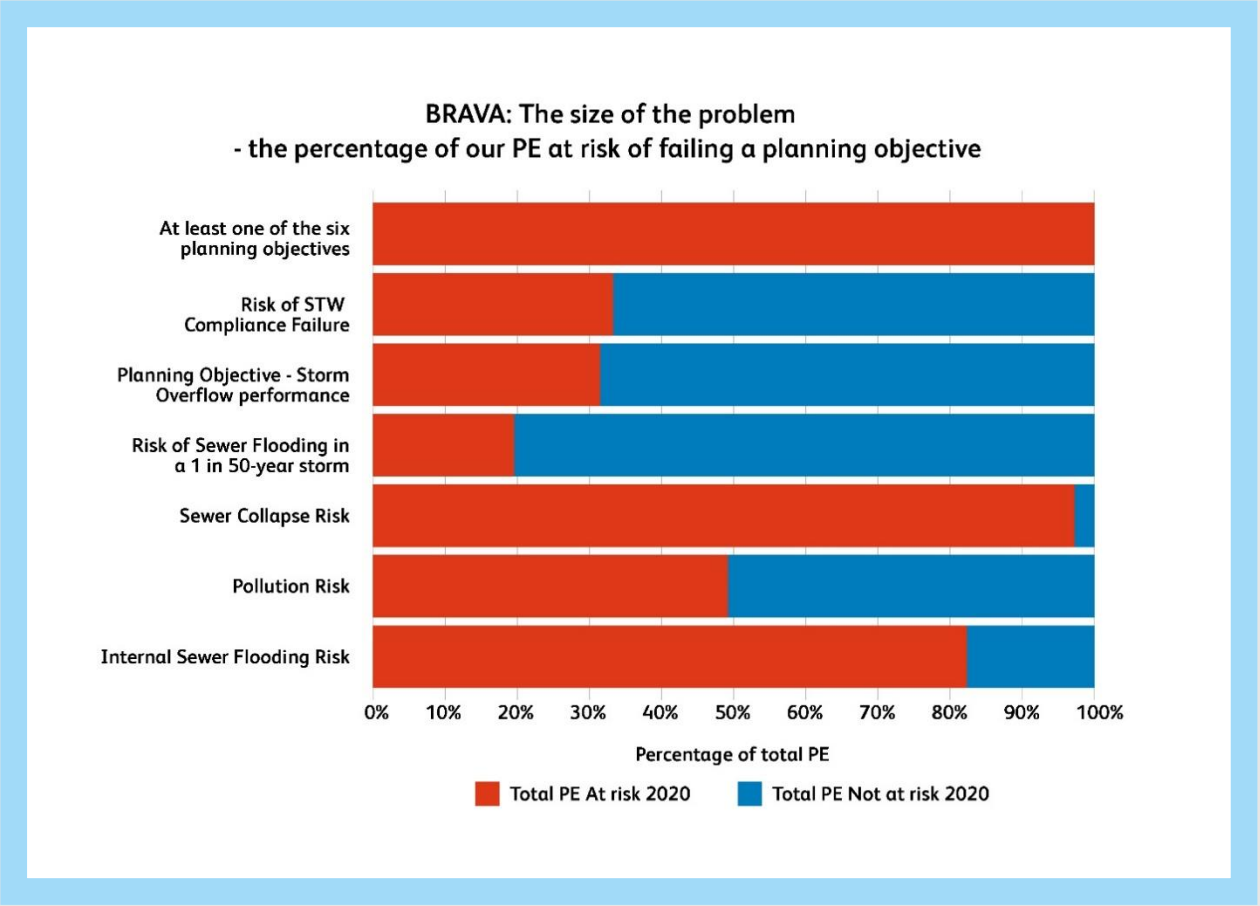


Figure 5-7 The percentage of Population Equivalent (PE) at risk of failing a planning objective in the 2020 baseline

5.21 The three modelled planning objectives that allow the risks to be calculated for both the 2020 baseline and in 2050 are shown in Figure 5-8 and Figure 5-9. These future predictions have identified:

- that risks will increase in the future as a direct result of climate change, and population growth, and urban creep
- where further investigations are required to understand and determine the investment required to address and reverse this trend
- that the most significant deterioration is in STW compliance and is driven by growth
- that whilst the analysis shows a minimal increase in the number of systems impacted by storms beyond 1 in 50 between 2020 and 2050, this does not reflect areas such as West London where events such as that of July 2021 are happening with increasing frequency and severity meaning we need to have a particular focus on such areas as part of cycle 2 and how we make such areas resilient to major events, working in partnership with key stakeholders.

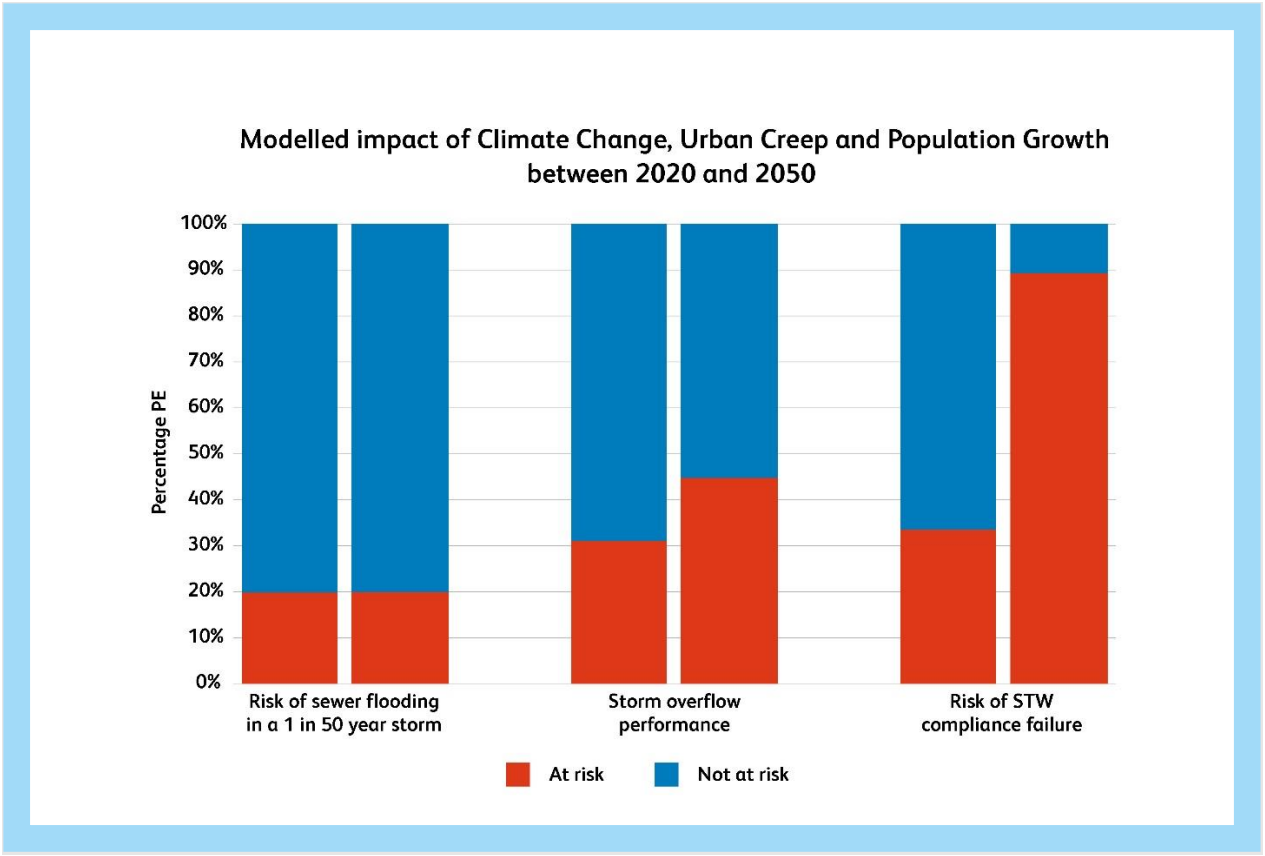


Figure 5-8 Increasing percentage of customers, presented as PE, at risk of failing planning objectives in 2050 as a result of climate change, population growth and urban creep

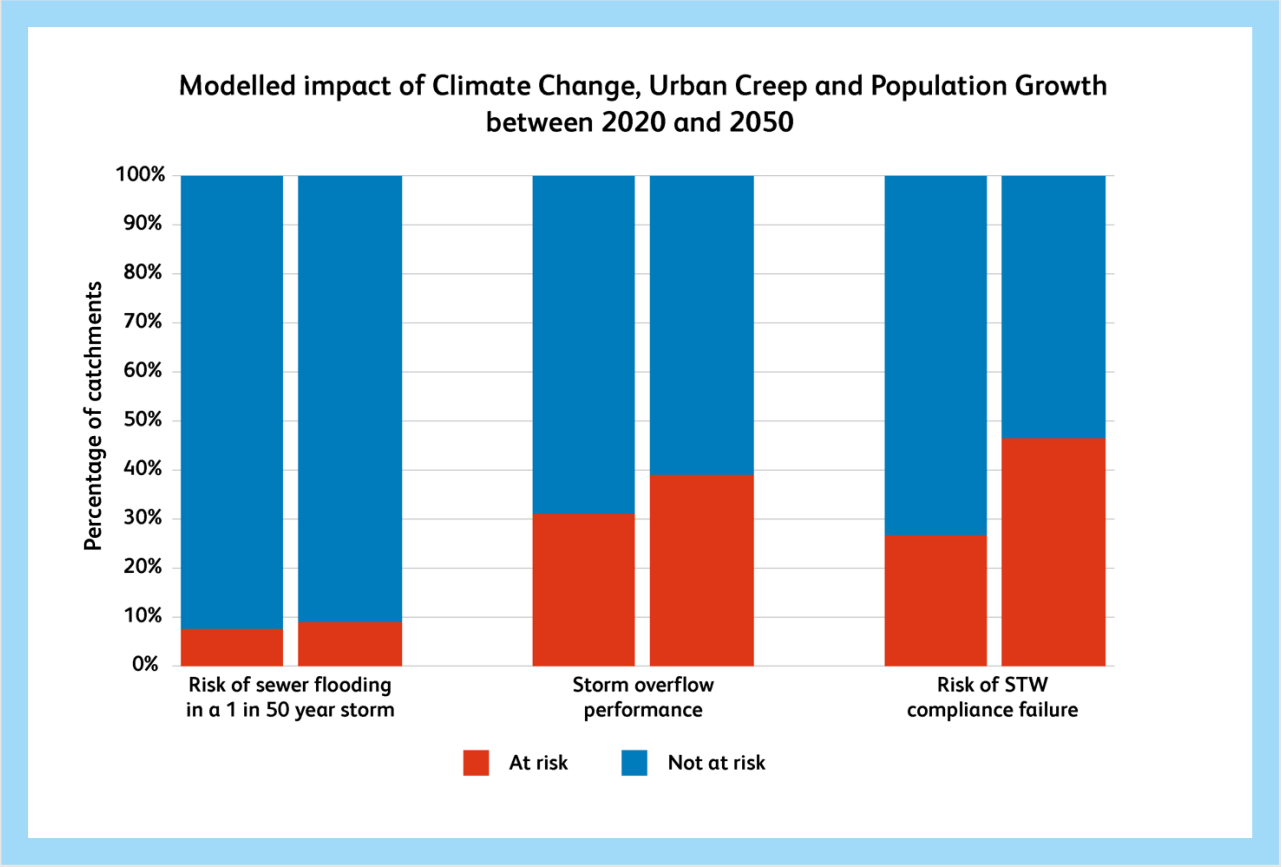


Figure 5-9 Increasing percentage of catchments at risk of failing planning objectives in 2050 as a result of climate change, population growth and urban creep

Summary of the BRAVA outputs

5.22 Overall, the assessment has shown that we have significant risks to investigate and address in order for us to meet our planning objectives. Growth and climate change, as well as urban creep in areas with surface water and/or combined sewer systems, if left unmitigated, will have a significant impact on our wastewater service over the next 25 years.

5.23 Table 5-4 provides a summary of the BRAVA results for each of the six planning objectives and identifies the need for future investigations and future investments that will be required to address these risks.

BRAVA Planning Objective and planning period	Summary	Further investigations and future investments to address risk
Risk of flooding in a 1 in 50-year storm 2020, 2050	The modelled results do not identify a significant or widespread flooding risk in the future when considered against our performance commitments, although there are localised risk areas concentrated in areas such as West London and Surrey. Model representation of extreme weather events will further improve for cycle 2.	Baseline and 2050 projections do not fully encompass the risk of basement flooding and requires further protocol development for cycle two of the DWMP process.

BRAVA Planning Objective and planning period	Summary	Further investigations and future investments to address risk
Storm overflow performance 2020, 2050	The Thames Tideway Tunnel will ensure resilience to storm overflow discharges into the tidal River Thames over the long-term. However, without continued investment, the number of storm overflow discharges across our region will increase. The protocol that we have, followed EA guidance and assigns the risk to spill frequency and not volume.	AMP8 and 2050: We have areas of significant risk and need to continue to invest. We also need to enhance our protocol to better target the harm caused by storm overflow discharges.
Sewage Treatment Works quality compliance 2020, 2050	We are seeing most risks in the future due to growth (15% increase) and the widespread nature of growth. The 2020 position in London does not show a significant issue, but this does not take into account growth towards the end of AMP7 and the need to invest ahead of that growth.	AMP8 and 2050: Growth towards the end of AMP7 and onwards means that we need to continue to invest to ensure our STWs continue to protect the local environment.
Internal hydraulic sewer flooding risk 2020	There is widespread risk that is generally associated with urban areas.	We have areas of significant risk and need to continue to invest.
Risk of pollution incidents 2020	Outside of London many of our regions are experiencing pollution incidents at a rate that is higher than the industry upper quartile performance we aim to deliver for our customers. We need to continue to invest to bring these rates down.	We have areas of significant risk, particularly outside of London and need to continue to invest.
Sewer collapses 2020	The risk is generally associated with urban areas.	We need to continue to invest in parts of our region to maintain sewer condition.

Table 5-4 Summary of the BRAVA results, further investigations and future investments to address the worsening risk position

6 Wider resilience

Progress 

Our asset resilience strategy

6.1 The DWMP framework[12] requires an assessment of our assets to 'understand wider resilience issues within each catchment that could impact on maintaining compliance with planning objectives'. This is not a new requirement as we have been including site resilience assessments as part of medium-term planning for price reviews.

6.2 For PR19 price review we performed an assessment of the broader vulnerabilities within our wastewater processes to allow the planning and prioritisation of investments to improve resilience. This assessment followed a structured and methodological approach to ensure that the resilience of all relevant elements of the system were identified and assessed in terms of vulnerability and potential impacts. This included site hazard assessments at ten "case study" sites, which were selected to cover the range of characteristics found throughout our operation area, allowing extrapolation of potential vulnerabilities across our wider wastewater system.

6.3 The list of vulnerabilities was prioritised by assigning an impact score to each item, which was derived from the desktop assessment, but then moderated through the workshops and a comparison with the impact assigned to similar risks in Community Risk Registers.

6.4 Options to improve the resilience of the system were identified for all vulnerabilities rated as medium or higher. To ensure a wide range of options was explored, we used industry knowledge and professional judgement to suggest a measure for each of the Cabinet Office's Resilience 4Rs: resistance, reliability, redundancy, and response and recovery.

Pluvial and fluvial risk sites

6.5 In order to ensure that within our optioneering we have fully accounted for the resilience risk from the different types of flooding, we have assessed the predicted flood depths at our sites, the provision of flood defences, and the corresponding level of service disruption and consequence.

6.6 These results fed into the ODA stage to allow identification of appropriate resilience options for all sites that require DWMP options. Typical examples of this would be the identification of STW outfalls becoming locked due to high water levels in receiving waters and where the predicted flooding depth is greater than 100mm.

6.7 There is more information on in our Technical Appendix on Resilience[13].

[12] https://www.water.org.uk/wp-content/uploads/2020/01/Water_UK_DWMP_Framework_Appendices_September-2019-C.pdf
[13] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-u-resilience.pdf

7 Problem characterisation

Progress 

Protocol

7.1 This stage is part of the risk assessment of the DWMP process and ensures that the approach to the Options Development and Programme Appraisal stage is proportionate to the nature of any problems identified.

7.2 Problem characterisation defines the nature and complexity of the system to determine whether different growth scenarios are required (a type of sensitivity testing).

7.3 We used a risk assessment matrix shown in Table 7-1 to assign a level of concern to catchment risks and therefore the optioneering complexity required with the results presented in Figure 7-1. The optioneering complexity is described in Table 7-2.

STW				Strategic needs score ("How big is the problem")			
				Negligible	Small	Medium	Large
				1-2	3-4	5-6	7-8
Complexity factors score	("How difficult is it to solve")	High	(8+)				
		Medium	(5-7)			X	
		Low	(<4)				

Table 7-1 Summary problem characterisation matrix

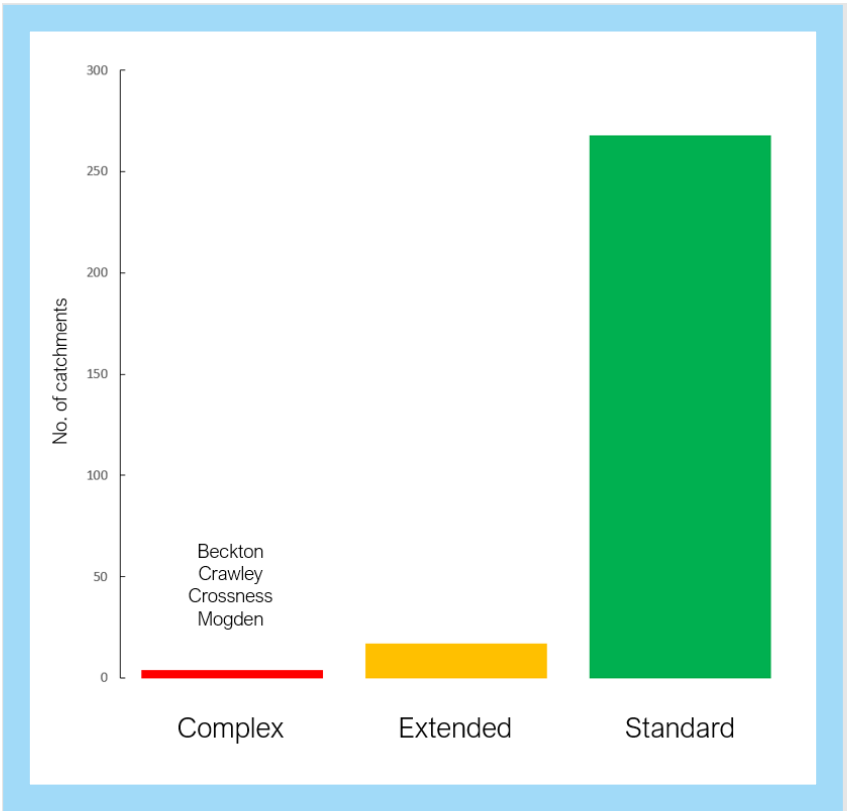


Figure 7-1 Results of the problem characterisation stage in terms of the number of catchments requiring the three different levels of optioneering complexity

Level of concern	Optioneering and decision-making approach	
Low	Standard	Generally, 'current' approaches should be adequate to determine and justify interventions and resultant investment proposals to ensure planning objectives are met (noting earlier guidance on the usage of additional future scenarios, as defined within the Capacity Assessment Framework (CAF)[14].
Medium	Extended	'Extended' approaches to optioneering may add considerably to a company's understanding. 'Extended' refers to methods not previously widely used in drainage and wastewater planning, but which have been utilised previously on specific catchment investigations that are deemed to be at the 'leading edge' of current planning approaches or tested to at least the 'proof of concept' stage for actual UK drainage and wastewater systems and have outputs that can be readily understood by planners
High	Complex	Consider whether it would be useful to go beyond the 'extended' approaches to decision making (referred to a 'complex'), as this could add considerably to the company's understanding. Here, 'complex' approaches refer to more advanced, conceptually complex methods not yet applied to the UK drainage and wastewater planning context, although these may be under current investigation in academia/currently developed by companies

Table 7-2 Required complexity of optioneering and decision-making approaches[15]

7.4 Outside of London, small non-complex dendritic systems (where smaller sewers merge to form larger ones, like the branches and trunk of a tree) were assigned a standard optioneering approach. London and large catchments outside of London looked at wider options and therefore followed an extended optioneering framework, with the two largest London catchments classed as complex (Beckton and Mogden), where we trialled adaptive pathway modelling.

7.5 It is important to note that standard optioneering involved a full assessment of wider benefits under a best value framework. Standard optioneering also involved use of hydraulic modelling data to assess costs and benefits. In reality, the optioneering in most catchments used both standard and extended techniques. This is in keeping with the framework which states that "It is acknowledged that optioneering complexity is a continuum that, for simplicity, has been represented as three distinct categories for decision. The intention is not to dwell on a precise score, but to identify a justifiable course of action for commencement of option development."

[14] Capacity Assessment Framework Project Report (water.org.uk)
[15] https://www.water.org.uk/wp-content/uploads/2020/01/Water_UK_DWMP_Framework_Appendices_September-2019-C.pdf

Appendix A BRAVA National Outputs

A.1 December 2020 BRAVA data tables

Level 3 Tactical Planning Unit				Planning Objective - Internal Sewer Flooding Risk		Planning Objective - Pollution Risk		Planning Objective - Sewer Collapse Risk		Planning Objective - Risk of Sewer Flooding in a 1 in 50-year storm			Planning Objective - Storm Overflow performance			Planning Objective - Risk of WwTW Compliance Failure		
Ref	Name	Total Population Equivalent (Per APR Table 4S Line 16)	Baseline (2020) sewer length (km)	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment
ABBES1ZZ	ABBESS RODING STW	675	10.3	0		0		2		0	0		0	0		0	0	
ABINS1ZZ	ABINGDON STW	38,888	315.9	0		0		1		0	0		0	2		0	2	
ALDES2ZZ	ALDERSHOT STW	40,407	313.3	2		2		1		2	2		2	2		0	2	
ALTOS1ZZ	ALTON STW	25,253	226.1	2		0		2		0	0		0	0		0	1	
AMPNS1ZZ	AMPNEY ST PETER STW	2,531	27.6	0		0		2		0	0		2	2		1	2	WINEP Upgrade not included in model
ANDOS1ZZ	ANDOVERSFORD STW	691	5.2	0		2		0		0	0		2	2		0	0	
APPLS1ZZ	APPLETON STW	6,127	70.6	2		2		0		0	0		2	2		1	2	WINEP Upgrade not included in model
ARBOS1ZZ	ARBORFIELD STW	19,330	177.8	2		2		2		0	0		0	2		0	1	
ASCOS1ZZ	ASCOT STW	33,734	237.8	2		2		2		0	0		1	1		0	0	WINEP Upgrade not included in model
ASHRS1ZZ	ASH RIDGE (WOKINGHAM) STW	13,295	109.6	2		1		1		1	1		0	0		0	2	
ASHVS1ZZ	ASH VALE STW	16,960	121.7	0		1		2		0	0		0	2		0	2	
STUBS1ZZ	ASHAMPSTEAD STW	161	2.5	0		0		0		0	0		0	0		0	0	
ASHFS1ZZ	ASHFORD HILL STW	41	0.5	0		0		0		0	0		0	0		2	2	
ASHTS1ZZ	ASHTON KEYNES STW	1,294	15.6	2		0		0		0	0		0	0		2	2	
ASTOS1ZZ	ASTON LE WALLS STW	274	2.9	0		0		0		0	0		0	0		0	0	
AYLES1ZZ	AYLESBURY STW	114,721	879.4	0		2		1		0	0		0	0		0	2	
BAMPS1ZZ	BAMPTON STW	4,713	32.9	2		2		0		0	0		2	2		0	0	WINEP Upgrade not included in model
BANBS1ZZ	BANBURY STW	75,788	510.8	2		1		2		0	0		0	0		0	2	WINEP Upgrade not included in model
BARFS1ZZ	BARFORD STW	790	8.7	0		0		0		0	0		0	0		0	0	
BARKS1ZZ	BARKWAY STW	672	8.1	0		0		0		0	0		0	0		0	0	
BASIS2ZZ	BASILDON PARK STW	11	0.4	0		0		0		0	0		0	0		Not assessed	Not assessed	Discharges covered by Groundwater Regs rather than permit conditions
BASIS1ZZ	BASINGSTOKE STW	132,919	807.5	2		2		1		0	0		0	0		0	2	
BAYDS1ZZ	BAYDON STW	727	5.9	0		0		0		0	0		0	0		0	0	
BECKS2ZZ	BECKLEY STW	326	0.6	0		0		0		0	0	Manually assessed	1	1	No model data, assessed based on EDM data	0	0	
BECKS1ZZ	BECKTON STW	3,327,040	18,334.3	2		0		2		0	0		0	0		1	2	2020 risk position deteriorates in AMP7 with upgrades to address
BEDDS1ZZ	BEDDINGTON STW	420,873	3,008.9	2		0		1		0	0		0	0		0	2	
BENSS1ZZ	BENSON STW	6,711	48.9	0		2		0		0	0		2	2		2	2	WINEP Upgrade not included in model
BENTS1ZZ	BENTLEY STW	2,289	33.4	2		2		2		0	0		0	0		0	2	
BERKS1ZZ	BERKHAMSTED STW	25,820	214.0	2		0		1		0	0		0	0		0	1	WINEP Upgrade not included in model
BIBUS1ZZ	BIBURY STW	617	6.6	2		0		0		0	0		0	0		0	0	
BICES1ZZ	BICESTER STW	50,865	368.5	0		2		1		0	0		0	0		2	2	AMP7 Upgrade not included in model.
BISHS1ZZ	BISHOPS STORTFORD STW	70,598	348.1	1		2		2		0	0		0	0		0	2	
BLACS1ZZ	BLACKBIRDS STW	95,575	13.7	2		0		0		0	0	Manually assessed	Not assessed	Not assessed	See Maple Lodge	0	0	
BLEDS1ZZ	BLEDINGTON STW	602	10.0	0		0		0		0	0		2	2		0	0	
BLETS1ZZ	BLETCHINGDON STW	1,439	11.7	0		2		0		0	0		0	0		1	1	
BLOXS1ZZ	BLOXHAM STW	4,797	46.7	1		2		2		0	0		0	0		0	1	WINEP Upgrade not included in model
BLUNS1ZZ	BLUNSDON STW	2,038	16.7	0		2		0		0	0		0	0		0	0	
BODDS1ZZ	BODDINGTON STW	494	9.9	0		0		0		0	0		2	2		0	0	
BORDS1ZZ	BORDON STW	37,796	352.2	0		2		1		2	2		2	2		0	2	AMP7 Upgrade not included in model.
BOURS2ZZ	BOURTON-ON-THE-WATER STW	4,699	58.5	2		2		2		0	0		2	2		2	2	WINEP Upgrade not included in model
BOXFS1ZZ	BOXFORD STW	288	3.8	2		0		0		0	0		0	0		0	0	
BRACS1ZZ	BRACKNELL STW	80,197	777.2	0		0		1		0	0		0	0		2	2	AMP7 Upgrade not included in model.
BRAMS1ZZ	BRAMFIELD STW	208	2.5	0		0		0		0	0		0	0		0	0	
BRAUS1ZZ	BRAUGHING STW	1,610	16.7	2		2		0		0	0		0	0		0	0	
BRICS1ZZ	BRICKENDON STW	232	2.1	0		2		2		0	0		0	0		0	0	
BROAS2ZZ	BROADWELL STW	3,042	41.2	2		2		2		0	0		2	2		0	0	
BROUS1ZZ	BROUGHTON STW	1,812	25.6	0		2		2		0	0		0	0		0	0	
BUNTS1ZZ	BUNTINGFORD STW	6,578	52.8	2		2		2		0	0	Manually assessed	0	0	No model data, assessed based on EDM data	2	2	WINEP Upgrade not included in model
BURFS1ZZ	BURFORD STW	1,601	19.2	2		2		2		0	0		2	2		0	0	
BURGS1ZZ	BURGHFIELD STW	7,355	68.2	0		2		0		0	0		0	0		0	0	
BURSS1ZZ	BURSTOW STW	11,315	80.2	2		2		2		0	0		2	2		2	2	WINEP Upgrade not included in model
BUSCS1ZZ	BUSCOT STW	52	0.5	0		0		0		0	0		0	0		0	0	
BYFIS1ZZ	BYFIELD STW	5,656	42.8	0		2		0		0	0		0	0		0	2	
CADDS1ZZ	CADDINGTON STW	5,590	41.4	2		0		0		0	0		0	0		0	1	
CAMBS1ZZ	CAMBERLEY STW	143,563	1,074.6	0		0		2		0	0		0	0		0	2	AMP7 Upgrade not included in model.

Level 3 Tactical Planning Unit				Planning Objective - Internal Sewer Flooding Risk		Planning Objective - Pollution Risk		Planning Objective - Sewer Collapse Risk		Planning Objective - Risk of Sewer Flooding in a 1 in 50-year storm			Planning Objective - Storm Overflow performance			Planning Objective - Risk of WwTW Compliance Failure		
Ref	Name	Total Population Equivalent (Per APR Table 4S Line 16)	Baseline (2020) sewer length (km)	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment
Non Thames Water Treatment	CAMP FARM STW (PRIVATE)	5,786	24.5	0		0		0		0	0	Manually assessed	Not assessed	Not assessed	Non -TW STW	Not assessed	Not assessed	Non -TW STW
CARTS1ZZ	CARTERTON STW	12,939	97.4	0		2		1		0	0		0	0		0	1	
CASSS1ZZ	CASSINGTON STW	17,836	126.6	1		2		1		1	1		0	0		0	0	
CHACS1ZZ	CHACOMBE STW	596	5.1	0		0		0		0	0		0	0		0	0	
CHALS1ZZ	CHALGROVE STW	3,259	19.0	0		0		0		0	0		0	2		1	2	
Non Thames Water Treatment	CHALTON (AW) STW	68,582	544.8	0		0		1		0	0		Not assessed	Not assessed	Non -TW STW	Not assessed	Not assessed	Non -TW STW
CHARS1ZZ	CHARLBURY STW	2,954	25.6	2		0		0		0	0		0	0		0	0	
CHARS2ZZ	CHARLTON-ON-OTMOOR STW	1,089	8.6	0		2		0		0	0		0	0		0	0	
CHARS5ZZ	CHARNEY BASSETT STW	272	2.8	0		0		0		0	0		0	0		0	0	
CHARS4ZZ	CHARWELTON STW	168	2.1	0		0		0		0	0		0	0		0	0	
CHATS1ZZ	CHATTER ALLEY (DOGMERSFIELD) STW	89	0.4	0		0		0		0	0		Not assessed	Not assessed	No spills to the environment	1	1	
CHERS1ZZ	CHERTSEY STW	83,085	646.4	1		2		2		1	2		2	2		2	2	
CHESS1ZZ	CHESHAM STW	38,113	263.2	0		2		1		0	0		0	0		0	2	WINEP Upgrade not included in model
CHIES1ZZ	CHIEVELEY STW	5,497	43.2	0		2		0		0	0		0	0		1	1	AMP7 Upgrade not included in model.
CHILS1ZZ	CHILTON FOLIAT STW	349	2.9	0		0		0		0	0		2	2		0	0	AMP7 Upgrade not included in model.
CHILS2ZZ	CHILTON STW	207	2.1	0		0		0		0	0		0	0		0	0	AMP7 Upgrade not included in model.
CHINS1ZZ	CHINNOR STW	7,580	56.4	0		2		2		0	0		0	0		0	0	WINEP Upgrade not included in model
CHIPS1ZZ	CHIPPING NORTON STW	9,635	79.6	1		2		2		0	0		0	0		0	0	AMP7 Upgrade not included in model.
CHIPS2ZZ	CHIPPING WARDEN STW	1,350	12.7	0		0		0		0	0		2	2		0	0	
CHOBS1ZZ	CHOBHAM STW	13,162	108.3	0		2		1		0	0		0	0		1	2	WINEP Upgrade not included in model
CHOLS1ZZ	CHOLSEY STW	17,234	93.6	2		0		2		0	0		0	0		1	1	WINEP Upgrade not included in model
CHURS1ZZ	CHURCH HANBOROUGH STW	7,699	67.9	0		2		2		0	0		0	0		2	2	AMP7 Upgrade not included in model.
CIRES1ZZ	CIRENCESTER STW	30,084	212.4	2		2		1		0	0		2	2		0	0	WINEP Upgrade not included in model
CLANS1ZZ	CLANFIELD STW	952	8.1	2		2		0		0	0		2	2		0	0	
CLAVS1ZZ	CLAVERING STW	1,851	27.7	2		2		0		0	0		0	0		0	0	
CLIFS1ZZ	CLIFTON STW	214	2.6	0		0		2		0	0		0	0		0	0	
COBES1ZZ	COBERLEY STW	90	0.8	0		2		0		0	0		0	0		1	1	
COLGS1ZZ	COLGATE STW	151	0.9	0		2		0		0	0		2	2		0	0	
COMPS1ZZ	COMPTON STW	1,656	12.1	0		0		0		0	0		2	2		0	0	
COTTS1ZZ	COTTERED STW	462	4.2	0		0		0		0	0		2	2		0	0	
CRANS1ZZ	CRANLEIGH STW	14,842	139.8	2		2		2		1	2		0	0		1	2	AMP7 Upgrade not included in model.
CRAWS1ZZ	CRAWLEY STW	118,103	1,043.5	0		2		1		0	0		2	2		0	2	
CRICS1ZZ	CRICKLADE STW	4,214	42.5	0		0		0		0	0		2	2		0	0	WINEP Upgrade not included in model
CRONS1ZZ	CRONDALL STW	1,364	9.2	2		2		0		0	1		0	0		0	0	WINEP Upgrade not included in model
CROPS1ZZ	CROPREDY STW	1,306	15.3	0		2		0		0	0	Manually assessed	2	2	No model data, assessed based on EDM data	0	0	
CROSS1ZZ	CROSSNESS STW	1,955,874	11,632.3	2		0		1		0	0		0	0		0	2	2020 risk position deteriorates in AMP7 with upgrades to address
CROUS1ZZ	CROUGHTON STW	885	8.3	0		0		0		0	0		0	0		0	0	WINEP Upgrade not included in model
CUDDS1ZZ	CUDDESDON STW	483	4.7	0		2		0		0	0		0	0		0	0	
CULHS1ZZ	CULHAM STW	4,149	22.6	2		0		2		0	0		0	0		0	0	
DEEPS1ZZ	DEEPHAMS STW	964,969	6,640.4	2		2		1		0	0		1	1		0	0	
DIDCS1ZZ	DIDCOT STW	47,555	285.8	0		2		1		0	0		0	0		2	2	AMP7 Upgrade not included in model.
Non Thames Water Treatment	DODDINGHURST (AW) STW	2,407	21.1	2		2		2		0	0		Not assessed	Not assessed	Non -TW STW	Not assessed	Not assessed	Non -TW STW
DORCS1ZZ	DORCHESTER STW	2,045	21.6	0		0		0		0	0		2	2		1	2	AMP7 Upgrade not included in model.
DORKS1ZZ	DORKING STW	28,247	264.7	2		2		2		0	0		1	0		1	2	AMP7 Upgrade not included in model.
DORTS1ZZ	DORTON STW	204	1.2	0		0		0		0	2		2	2		0	0	
DRAYS1ZZ	DRAYTON STW	6,786	61.8	0		2		2		0	0		2	2		2	2	WINEP Upgrade not included in model
Non Thames Water Treatment	DUNSTABLE (AW) STW	2,076	12.4	0		0		0		0	0		Not assessed	Not assessed	Non -TW STW	Not assessed	Not assessed	Non -TW STW
EARLS1ZZ	EARLSWOOD STW	65,927	537.9	2		2		2		0	0		1	2		2	2	WINEP Upgrade not included in model
EGRAS1ZZ	EAST GRAFTON STW	400	4.4	0		0		0		0	0		0	0		0	0	
EHYDS1ZZ	EAST HYDE STW	167,639	1,217.3	0		0		2		0	1		2	2		0	2	AMP7 Upgrade not included in model.
ESHES2ZZ	EAST SHEFFORD STW	6,076	46.5	2		2		2		0	0		0	0		0	2	AMP7 Upgrade not included in model.

Level 3 Tactical Planning Unit				Planning Objective - Internal Sewer Flooding Risk		Planning Objective - Pollution Risk		Planning Objective - Sewer Collapse Risk		Planning Objective - Risk of Sewer Flooding in a 1 in 50-year storm			Planning Objective - Storm Overflow performance			Planning Objective - Risk of WwTW Compliance Failure		
Ref	Name	Total Population Equivalent (Per APR Table 4S Line 16)	Baseline (2020) sewer length (km)	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment
EASTS1ZZ	EASTHAMPSTEAD PARK STW	6,679	67.9	0		2		0		0	0		2	2		0	2	AMP7 Upgrade not included in model.
EBRI01ZZ	EBRINGTON STW	30	0.6	0		0		0		0	0		Not assessed	Not assessed	No spills to the environment	0	0	
ELSFS1ZZ	ELSFIELD STW	86	1.8	0		2		0		0	0		0	0		0	0	
ELSTS1ZZ	ELSTEAD STW	4,936	64.0	1		2		0		0	0		2	2		0	0	
ENSTS1ZZ	ENSTONE STW	987	10.7	0		2		2		0	0		0	0		0	0	
ESHES1ZZ	ESHER STW	110,251	1,076.9	2		2		1		1	2		0	0		0	0	
EYDOS1ZZ	EYDON STW	399	4.6	0		0		0		0	0		0	0		0	2	
FAIRS1ZZ	FAIRFORD STW	4,587	41.6	0		0		0		0	0		2	2		1	2	WINEP Upgrade not included in model
FARIS1ZZ	FARINGDON STW	8,654	55.8	2		0		0		0	0		2	2		0	0	
FARNS1ZZ	FARNBOROUGH STW	259	2.8	0		2		0		0	0		2	2	No model data, assessed based on EDM data	0	0	
FARNS3ZZ	FARNHAM STW	46,111	405.1	1		2		2		0	0		0	0		0	0	
FIDDS1ZZ	FIDDLERS HAMLET STW	13,945	112.3	2		2		1		1	2		0	0		1	2	
FINSS1ZZ	FINSTOCK STW	4,086	35.7	2		2		2		0	0		2	2		0	0	WINEP Upgrade not included in model
FLEES1ZZ	FLEET STW	48,650	355.2	0		2		2		0	0		0	2		1	2	WINEP Upgrade not included in model
FORES1ZZ	FOREST HILL STW	450	4.2	0		0		0		0	0		2	2		0	0	
FROXS1ZZ	FROXFIELD STW	321	3.1	0		0		0		0	0		0	0		0	0	
FURNS1ZZ	FURNEUX PELHAM STW	370	3.8	0		0		0		0	0		0	0		0	0	
FYFIS1ZZ	FYFIELD STW	1,520	22.8	0		2		0		0	0		2	2		0	0	WINEP Upgrade not included in model
GERRS1ZZ	GERRARDS CROSS STW	8,124	109.6	0		2		2		0	0		0	0		0	1	AMP7 Upgrade not included in model.
GODAS1ZZ	GODALMING STW	31,326	290.2	0		2		1		0	0		2	2		1	2	
GORIS1ZZ	GORING STW	7,412	75.6	0		0		2		0	0		0	0		0	0	
GBEDS1ZZ	GREAT BEDWYN STW	1,367	13.5	0		2		0		0	0		2	2		0	0	
GGADS1ZZ	GREAT GADDESDEN STW	276	2.8	0		0		0		0	0		0	0		0	0	
ROLLS1ZZ	GREAT ROLLRIGHT STW	398	5.8	0		0		0		0	0		0	0		0	0	
GREAS1ZZ	GREATWORTH STW	1,022	7.5	2		2		2		0	0		0	0		0	2	
GREES1ZZ	GREENHAM COMMON STW	1,233	5.9	0		0		0		0	0		0	0		0	0	
GRENS1ZZ	GRENDON UNDERWOOD STW	801	9.8	0		0		0		0	0		2	2		1	2	
GUILS1ZZ	GUILDFORD STW	95,717	771.8	2		0		1		1	1		0	0		0	2	AMP7 Upgrade not included in model.
GUITS1ZZ	GUITING POWER STW	216	3.3	0		0		0		0	0		0	0		0	0	
HADDS1ZZ	HADDENHAM STW	6,312	44.5	0		2		0		0	0		2	2		1	2	
HAMBS1ZZ	HAMBLEDEN STW	540	7.2	2		0		0		1	1		0	0		0	0	
HAMPS2ZZ	HAMPSTEAD NORREYS STW	560	5.0	0		0		0		0	0		2	2		0	1	
HAMPS3ZZ	HAMSTEAD MARSHALL STW	160	2.1	0		2		0		0	0		2	2		0	0	
HANWS1ZZ	HANWELL STW	278	2.8	0		0		0		0	0		2	2		0	0	
HARPS1ZZ	HARPENDEN STW	38,574	282.2	0		2		1		0	0		0	0		1	2	AMP7 Upgrade not included in model.
HARTS1ZZ	HARTLEY WINTNEY STW	17,881	178.1	2		2		1		0	0		0	2		1	1	
HASLS1ZZ	HASLEMERE STW	14,812	130.9	0		1		2		0	0		0	0		0	0	AMP7 Upgrade not included in model.
HATFS1ZZ	HATFIELD HEATH STW	2,741	28.2	0		0		2		0	0		0	0		0	0	
HEADS1ZZ	HEADLEY STW	287	4.7	0		0		0		0	0		0	0		Not assessed	Not assessed	Discharges covered by Groundwater Regs rather than permit conditions
HENLS1ZZ	HENLEY STW	11,010	87.9	2		2		0		0	0		0	0		1	2	WINEP Upgrade not included in model
HIGHS1ZZ	HIGHWORTH STW	8,616	80.6	0		2		0		0	0		0	0		0	0	AMP7 Upgrade not included in model.
HOCKS1ZZ	HOCKFORD STW	16,442	150.9	0		2		1		0	0		0	0		0	2	
HOGSS1ZZ	HOGSMILL STW	382,758	3,018.0	2		1		1		2	2		0	2		0	2	
HOLMS1ZZ	HOLMWOOD STW	6,367	68.6	0		2		2		0	0		2	2		0	0	
HOOKS1ZZ	HOOK NORTON STW	2,108	21.8	0		2		0		0	0		2	2		2	2	
HORLS2ZZ	HORLEY (SURREY) STW	39,480	207.4	0		0		1		2	2		1	1		0	2	
HORTS1ZZ	HORTON-CUM-STUDLEY STW	438	6.2	0		0		2		0	0		2	2		0	0	
HUNGS1ZZ	HUNGERFORD STW	5,376	48.5	2		0		0		0	0		0	0		0	1	AMP7 Upgrade not included in model.
HURLS1ZZ	HURLEY STW	1,908	12.4	0		2		2		0	0		0	0		0	0	WINEP Upgrade not included in model
IRONS1ZZ	IRONSBOTTOM STW	103	1.7	0		2		0		0	0		2	2		0	0	
ISLIS1ZZ	ISLIP STW	873	7.4	0		0		0		0	0		2	2		0	0	
IVERS1ZZ	IVER (NORTH) STW	8,920	66.2	0		2		2		0	0		0	0		0	2	
KIMPS1ZZ	KIMPTON STW	2,270	22.7	0		0		2		0	0		0	0		1	1	WINEP Upgrade not included in model
KINGS2ZZ	KINGS SUTTON STW	4,017	32.6	0		0		2		0	0		2	2		0	0	
KINGS1ZZ	KINGSCLERE STW	4,213	49.3	2		0		0		0	0		0	0		2	2	
KINGS3ZZ	KINGSTON BAGPUIZE STW	3,912	28.4	0		2		2		0	0		2	2		1	2	WINEP Upgrade not included in model
KINTS1ZZ	KINTBURY STW	3,670	25.6	0		2		0		0	0		2	2		0	0	AMP7 Upgrade not included in model.
LEADS1ZZ	LEADEN RODING STW	671	6.8	0		2		0		0	0		2	2		0	0	
LEATS1ZZ	LEATHERHEAD STW	46,848	440.3	2		2		1		0	0		0	2		2	2	WINEP Upgrade not included in model

Level 3 Tactical Planning Unit				Planning Objective - Internal Sewer Flooding Risk		Planning Objective - Pollution Risk		Planning Objective - Sewer Collapse Risk		Planning Objective - Risk of Sewer Flooding in a 1 in 50-year storm			Planning Objective - Storm Overflow performance			Planning Objective - Risk of WwTW Compliance Failure		
Ref	Name	Total Population Equivalent (Per APR Table 4S Line 16)	Baseline (2020) sewer length (km)	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment
LECHS1ZZ	LECHLADE STW	2,710	19.3	0		2		2		0	0		0	0		0	0	
LEWKS1ZZ	LEWKNOR STW	398	3.6	0		2		2		0	0		0	0		0	0	
LIGHS1ZZ	LIGHTWATER STW	19,924	185.0	0		2		1		1	1		0	0		0	0	
LBERS1ZZ	LITTLE BERKHAMSTED STW	244	2.3	0		0		0		0	0		0	0		0	0	
LCOMS1ZZ	LITTLE COMPTON STW	372	3.6	0		0		0		0	0		2	2		1	1	
LHALS1ZZ	LITTLE HALLINGBURY STW	1,676	16.1	0		0		0		0	0		0	0		1	2	
LMARS1ZZ	LITTLE MARLOW STW	183,963	1,422.8	0		1		1		0	0		0	0		1	2	
LMILS1ZZ	LITTLE MILTON STW	930	12.0	2		2		2		0	0		0	0		0	0	
LITTS1ZZ	LITTLEWORTH STW	156	1.3	0		0		0		0	0		0	0		0	0	
LCRES1ZZ	LONG CRENDON STW	2,586	23.0	0		2		0		0	0		2	2		1	2	
LREAS1ZZ	LONG REACH STW	878,262	6,659.4	1		0		1		0	0		0	1		0	2	2020 risk position deteriorates in AMP7 with upgrades to address
LSUTS1ZZ	LONG SUTTON STW	79	0.6	0		0		0		0	0		0	0		1	1	
LWITS1ZZ	LONG WITTENHAM STW	959	6.3	2		2		0		0	1		0	0		0	0	
LONGS1ZZ	LONGWATER STW	967	10.5	2		0		0		0	0		0	0		1	2	
LBASS1ZZ	LOWER BASILDON STW	218	2.1	0		0		0		0	0		0	0		0	0	
Non Thames Water Treatment	LOXWOOD (SW) STW	629	5.3	0		2		0		0	0		Not assessed	Not assessed	Non -TW STW	Not assessed	Not assessed	Non -TW STW
LUDGS1ZZ	LUDGERSHALL STW	394	4.6	0		2		0		0	0		2	2		0	0	
MAIDS1ZZ	MAIDENHEAD STW	81,471	514.8	0		2		2		0	0		2	2		0	2	
MANUS1ZZ	MANUDEN STW	819	7.8	0		0		0		0	0		0	0		0	0	
MAPLS1ZZ	MAPLE LODGE STW	522,120	5,160.3	1		2		1		0	0		0	0		0	2	
MARKS1ZZ	MARKYATE STW	5,973	46.0	0		2		0		0	0		0	0		1	1	
MARLS1ZZ	MARLBOROUGH STW	9,563	99.1	2		2		2		0	0		0	0		0	1	AMP7 Upgrade not included in model.
MARSS1ZZ	MARSH GIBBON STW	2,364	20.5	2		2		2		0	0		0	0		0	0	
MERSS1ZZ	MERSTHAM STW	9,621	70.8	0		0		0		0	0		0	0		0	0	
MBARS1ZZ	MIDDLE BARTON STW	1,793	13.4	0		2		0		0	0		0	0		0	0	
MIDDS2ZZ	MIDDLETON CHENEY STW	4,792	37.3	2		2		0		0	0		2	2		2	2	WINEP Upgrade not included in model
MILLS1ZZ	MILL GREEN STW	18,442	172.2	0		0		2		0	0		0	0		1	2	AMP7 Upgrade not included in model.
MILTS1ZZ	MILTON-UNDER-WYCHWOOD STW	3,825	42.3	0		2		0		0	0		2	2		0	1	WINEP Upgrade not included in model
MOGDS1ZZ	MOGDEN STW	2,050,464	13,264.5	2		2		1		1	2		2	2		0	2	2020 risk position deteriorates in AMP7 with upgrades to address
MORES2ZZ	MORETON PINKNEY STW	364	4.0	0		2		0		0	0		2	2		0	0	
MORES1ZZ	MORETON STW	293	4.2	0		0		0		0	0		0	0		0	0	
MORES3ZZ	MORETON-IN-MARSH STW	5,306	35.2	1		2		0		0	0		0	0		2	2	
MORTS1ZZ	MORTIMER STW	5,182	32.7	0		2		2		0	0		0	0		1	1	
NAGSS1ZZ	NAGS HEAD LANE STW	34,195	201.4	1		0		0		2	2		0	2		0	0	
NETTS1ZZ	NETTLEBED STW	704	7.8	0		0		0		0	0		0	0		0	1	
NEWBS1ZZ	NEWBURY STW	81,708	604.4	2		2		2		0	0		0	0		2	2	AMP7 Upgrade not included in model.
NWEAS1ZZ	NORTH WEALD STW	5,755	44.1	0		2		2		0	0		0	0		2	2	
NORTS1ZZ	NORTHLEACH STW	1,734	14.9	0		2		0		0	0		2	2		0	0	AMP7 Upgrade not included in model.
NUNES1ZZ	NUNEHAM COURTENAY STW	355	5.3	0		0		2		0	0		2	2		0	0	
OXFOS1ZZ	OXFORD STW	222,322	1,484.7	2		2		2		0	0		2	2		2	2	WINEP Upgrade not included in model
PANGS1ZZ	PANGBOURNE STW	11,844	106.5	0		2		0		1	2		0	0		2	2	AMP7 Upgrade not included in model.
PRINS1ZZ	PRINCES RISBOROUGH STW	13,125	120.3	0		2		2		0	0		0	0		0	0	
PURTS1ZZ	PURTON STW	4,198	31.9	2		2		0		0	0		1	1	No model data, assessed based on EDM data	1	1	
Non Thames Water Treatment	QUENDON (AW) STW	74	0.4	0		0		0		0	0		Not assessed	Not assessed	Non -TW STW	Not assessed	Not assessed	Non -TW STW
RAMSS1ZZ	RAMSBURY STW	3,414	29.2	0		2		0		0	1		0	0		0	0	WINEP Upgrade not included in model
READS1ZZ	READING STW	201,122	1,656.0	2		0		1		0	0		0	0		2	2	
REMES1ZZ	REMENHAM STW	86	0.9	0		0		0		0	0		0	0		0	0	
RIPLS1ZZ	RIPLEY STW	19,884	162.3	0		2		2		2	2		0	0		2	2	
RIVES1ZZ	RIVERSIDE STW	411,945	2,831.6	0		1		1		0	0		2	2		0	2	
ROWSS1ZZ	ROWSHAM STW	105	1.5	0		2		0		0	0		0	0		0	0	
RUSPS1ZZ	RUSPER STW	381	3.9	0		0		0		0	0		2	2		1	2	
RYECS1ZZ	RYE COMMON STW	29	0.3	0		0		0		0	0		0	0		0	0	
RYEMS1ZZ	RYE MEADS STW	398,524	3,375.7	1		2		2		0	0		0	2		0	2	
SANDS1ZZ	SANDFORD ST MARTIN STW	154	1.7	0		0		0		0	0		0	0		0	0	
SANDS2ZZ	SANDHURST STW	36,279	414.8	0		2		2		0	0		0	0		2	2	AMP7 Upgrade not included in model.

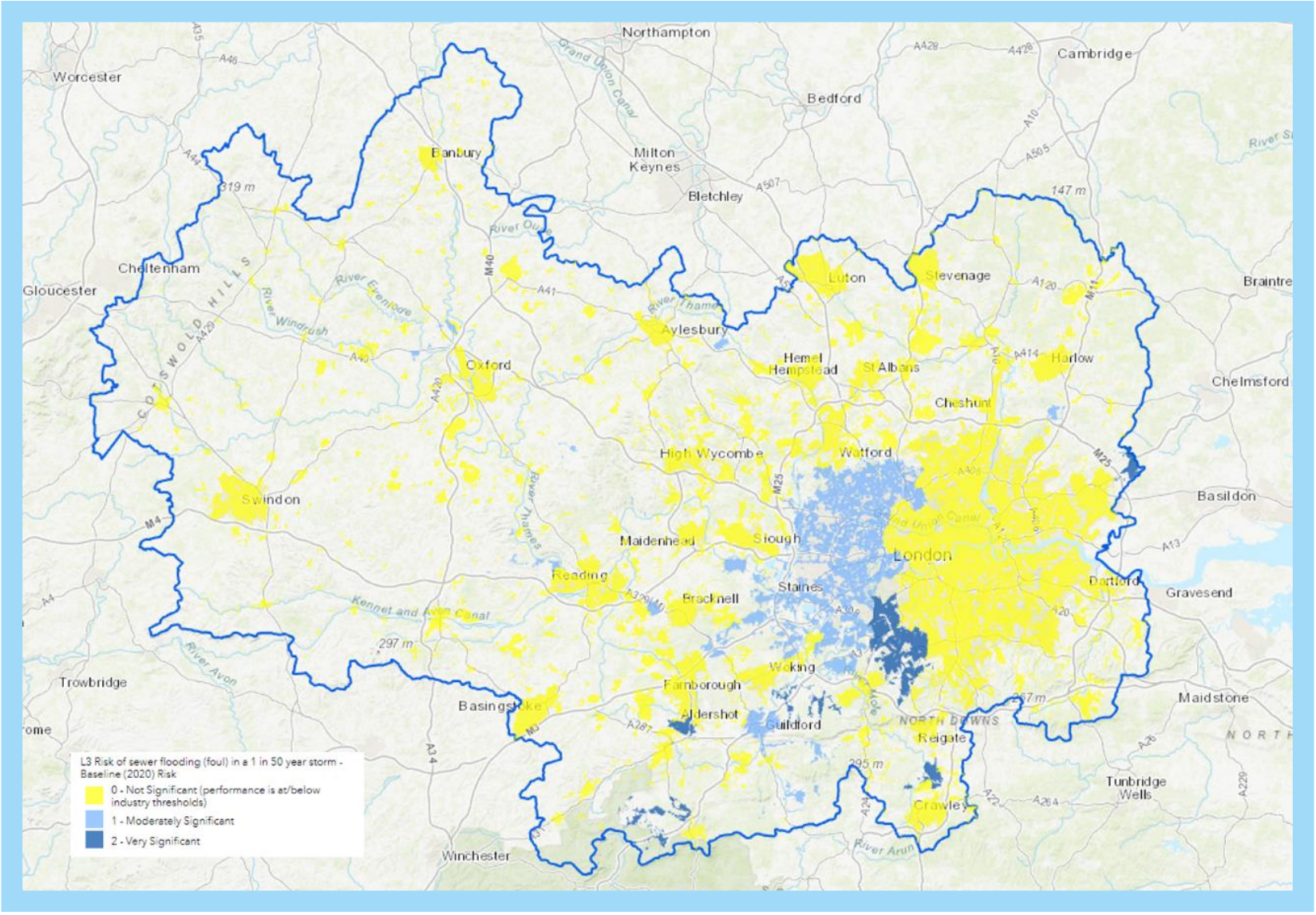
Level 3 Tactical Planning Unit				Planning Objective - Internal Sewer Flooding Risk		Planning Objective - Pollution Risk		Planning Objective - Sewer Collapse Risk		Planning Objective - Risk of Sewer Flooding in a 1 in 50-year storm			Planning Objective - Storm Overflow performance			Planning Objective - Risk of WwTW Compliance Failure		
Ref	Name	Total Population Equivalent (Per APR Table 4S Line 16)	Baseline (2020) sewer length (km)	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment
SELBS1ZZ	SELBORNE STW	503	7.3	0		0		0		0	0		2	2		0	0	
SEVES1ZZ	SEVENHAMPTON STW	114	1.5	0		0		0		0	0		0	0		0	0	
SHABS1ZZ	SHABBINGTON STW	505	3.6	0		0		0		0	0		2	2		0	0	
SHAMS1ZZ	SHAMLEY GREEN STW	5,753	52.3	0		2		2		0	0		0	0		1	1	
SHELS1ZZ	SHELLINGFORD STW	147	2.0	0		0		0		0	0		0	0		0	0	
SHERS2ZZ	SHERBORNE ST JOHN STW	1,894	35.4	0		0		0		0	0		0	0		0	0	
SHERS3ZZ	SHERFIELD-ON-LODDON STW	5,973	47.2	2		0		0		0	0		2	2		0	1	
SHIRS1ZZ	SHIRBURN STW	62	1.3	0		2		0		0	0		0	0		Not assessed	Not assessed	Discharges covered by Groundwater Regs rather than permit conditions
SHOTS1ZZ	SHOTTESWELL STW	160	2.3	0		0		0		0	0		2	2		0	0	
SHRIS1ZZ	SHRIVENHAM STW	5,859	62.5	0		0		2		0	0		2	2		2	2	
SHUTS1ZZ	SHUTFORD STW	1,219	18.6	0		0		0		0	0		0	0		0	1	AMP7 Upgrade not included in model.
SILCS1ZZ	SILCHESTER STW	18,876	190.1	0		2		1		0	0		0	0		0	0	
SLOUS1ZZ	SLOUGH STW	221,694	1,347.5	0		0		1		0	0		0	2		2	2	WINEP Upgrade not included in model
SONNS1ZZ	SONNING COMMON STW	5,114	35.5	0		0		0		0	0		2	2		0	0	AMP7 Upgrade not included in model.
SLEIS1ZZ	SOUTH LEIGH STW	308	6.6	0		2		0		0	0		0	2		2	2	
SMORS1ZZ	SOUTH MORETON STW	1,287	12.7	0		2		0		0	0		2	2		0	0	
STADS1ZZ	STADHAMPTON STW	1,126	11.3	0		0		0		0	0		0	0		0	1	
STANS2ZZ	STANDON STW	3,971	25.6	0		0		0		0	0		2	2		0	0	
STANS3ZZ	STANFORD IN THE VALE STW	2,377	19.2	0		2		0		0	0		2	2		0	0	AMP7 Upgrade not included in model.
STANS4ZZ	STANFORD RIVERS STW	8,870	73.6	0		2		2		0	0		Not assessed	Not assessed	No spills to the environment	1	2	
STANS5ZZ	STANSTED MOUNTFITCHET STW	9,793	85.6	0		0		2		0	0		0	0		1	2	AMP7 Upgrade not included in model.
STANS8ZZ	STANTON HARCOURT STW	1,353	11.5	2		0		2		0	0		0	0		2	2	
STANS7ZZ	STANTON ST JOHN STW	317	4.5	0		2		0		0	0		2	2		0	0	
Non Thames Water Treatment	STEEPLE CLAYDON (AW) STW	823	0.7	0		0		0		0	0		Not assessed	Not assessed	Non -TW STW	Not assessed	Not assessed	Non -TW STW
STONS1ZZ	STONE STW	3,306	33.4	0		2		0		0	0		2	2		0	0	
STRAS1ZZ	STRATFIELD SAYE STW	52	0.5	0		0		0		0	0		Not assessed	Not assessed	No spills to the environment	0	0	
STRES1ZZ	STREATLEY STW	766	5.9	2		2		0		1	2		0	0		0	0	
SULHS1ZZ	SULHAMSTEAD STW	100	0.1	0		0		0		0	0		0	0		0	0	
SWINS1ZZ	SWINDON STW	219,878	1,953.2	0		2		1		0	0		2	2		0	2	
SYRES1ZZ	SYREFORD STW	10	0.0	0		0		0		0	0		0	0		Not assessed	Not assessed	Discharges covered by Groundwater Regs rather than permit conditions
TACKS1ZZ	TACKLEY STW	925	8.7	0		0		0		0	0		0	0		0	0	
TAKES1ZZ	TAKELEY STW	111	28.8	0		0		0		0	0		2	2		0	0	WINEP Upgrade not included in model
TETSS1ZZ	TETSWORTH STW	1,185	9.8	2		2		0		0	0		0	0		0	0	
THAMS1ZZ	THAME STW	11,253	90.8	2		0		2		0	0		0	0		2	2	AMP7 Upgrade not included in model.
THERS1ZZ	THERFIELD STW	1,201	19.3	0		2		0		0	0		2	2		0	0	
THEYS1ZZ	THEYDON BOIS STW	4,229	44.5	2		0		2		0	0		2	2		0	0	
THORS1ZZ	THORNWOOD STW	977	8.3	0		2		0		0	0		0	2		2	2	AMP7 Upgrade not included in model.
THORS2ZZ	THORPE MANDEVILLE STW	136	1.6	0		0		0		0	0		0	0		0	0	
TIDDS1ZZ	TIDDINGTON STW	704	6.7	2		0		2		0	0		0	0		0	0	
TOWES1ZZ	TOWERSEY STW	468	4.2	0		0		0		0	0		Not assessed	Not assessed	No spills to the environment	0	0	
TRINS1ZZ	TRING STW	12,694	93.3	0		0		0		1	2		2	2		0	0	AMP7 Upgrade not included in model.
UFFIS1ZZ	UFFINGTON STW	682	6.8	0		2		0		0	0		2	2		0	0	
UHEYS1ZZ	UPPER HEYFORD STW	2,573	81.8	0		2		2		0	0		2	2		0	0	WINEP Upgrade not included in model
WADDS1ZZ	WADDESDON STW	3,466	23.1	0		2		2		0	0		0	0		0	0	
WANBS1ZZ	WANBOROUGH STW	2,410	33.1	0		2		0		0	0		0	0		0	0	
WANTS1ZZ	WANTAGE STW	29,748	228.9	0		2		1		0	0		0	0		0	2	
WARGS1ZZ	WARGRAVE STW	124,515	1,050.9	2		2		1		0	0		0	0		0	2	
WASHS1ZZ	WASH WATER STW	7,888	75.4	2		2		2		0	0		0	0		0	0	
WATLS1ZZ	WATLINGTON STW	2,911	24.7	0		0		0		1	1		0	0		0	1	WINEP Upgrade not included in model
Non Thames Water Treatment	WESTCOTT STW (PRIVATE)	401	8.8	0		0		0		0	0		Not assessed	Not assessed	Non -TW STW	Not assessed	Not assessed	Non -TW STW
WESTS1ZZ	WESTON STW	1,063	9.5	0		2		0		0	0		0	0		0	0	
WESTS3ZZ	WESTON-ON-THE-GREEN STW	550	6.7	0		0		2		0	0		0	0		1	1	
WEYBS1ZZ	WEYBRIDGE STW	20,353	181.8	1		2		1		0	0		2	2		0	1	
WHEAS1ZZ	WHEATLEY STW	5,971	40.5	0		2		2		0	0		0	0		2	2	

Level 3 Tactical Planning Unit				Planning Objective - Internal Sewer Flooding Risk		Planning Objective - Pollution Risk		Planning Objective - Sewer Collapse Risk		Planning Objective - Risk of Sewer Flooding in a 1 in 50-year storm			Planning Objective - Storm Overflow performance			Planning Objective - Risk of WwTW Compliance Failure		
Ref	Name	Total Population Equivalent (Per APR Table 4S Line 16)	Baseline (2020) sewer length (km)	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment	Baseline (2020) Score	2050 score	Comment
WHITS3ZZ	WHITE RODING STW	207	2.8	0		2		2		0	0		0	0		0	0	
WHITS4ZZ	WHITE WALTHAM STW	7,910	72.1	0		2		0		0	0		0	0		0	1	
WHITS6ZZ	WHITWELL STW	1,063	7.4	0		0		0		0	0		2	2		0	0	
WIDFS1ZZ	WIDFORD STW	3,430	39.4	2		0		0		0	0		2	2		0	0	
WILLS1ZZ	WILLINGALE STW	723	12.1	0		0		0		0	0		0	0		0	0	
WILTS1ZZ	WILTON STW	147	1.5	0		2		0		0	0		0	0		0	0	
WINDS1ZZ	WINDSOR STW	34,822	335.2	2		2		1		1	2		0	2		0	1	AMP7 Upgrade not included in model.
WINGS1ZZ	WINGRAVE STW	1,495	9.0	2		0		0		0	0		0	0		1	2	
WINTS1ZZ	WINTERBOURNE STW	63	0.8	0		2		0		0	0		0	0		0	0	
WISLS1ZZ	WISLEY STW	23,709	226.5	0		2		2		0	0		Not assessed	Not assessed	No spills to the environment	1	2	
WITNS1ZZ	WITNEY STW	47,321	334.6	2		2		1		0	0		2	2		0	0	WINEP Upgrade not included in model
WOKIS1ZZ	WOKING STW	78,042	686.5	1		2		1		0	0		0	0		1	2	WINEP Upgrade not included in model
WOLVS1ZZ	WOLVERTON COMMON STW	11	0.1	0		0		0		0	0		0	0		Not assessed	Not assessed	Discharges covered by Groundwater Regs rather than permit conditions
WOLVS2ZZ	WOLVERTON TOWNSEND STW	21	0.1	0		2		0		0	0		0	0		0	0	
WOODS1ZZ	WOODEATON STW	67	1.1	2		0		0		0	0		0	0		0	0	
WOODS2ZZ	WOODSTOCK STW	4,479	31.4	2		2		2		0	0		2	2		0	1	
WOOLS1ZZ	WOOLHAMPTON STW	1,308	14.2	0		2		0		0	0		0	0		2	2	
WORMS1ZZ	WORMINGHALL STW	3,348	32.6	2		2		0		0	0		0	0		0	0	AMP7 Upgrade not included in model.
YATTS1ZZ	YATTENDON STW	151	1.4	0		0		0		1	1		0	0		0	0	

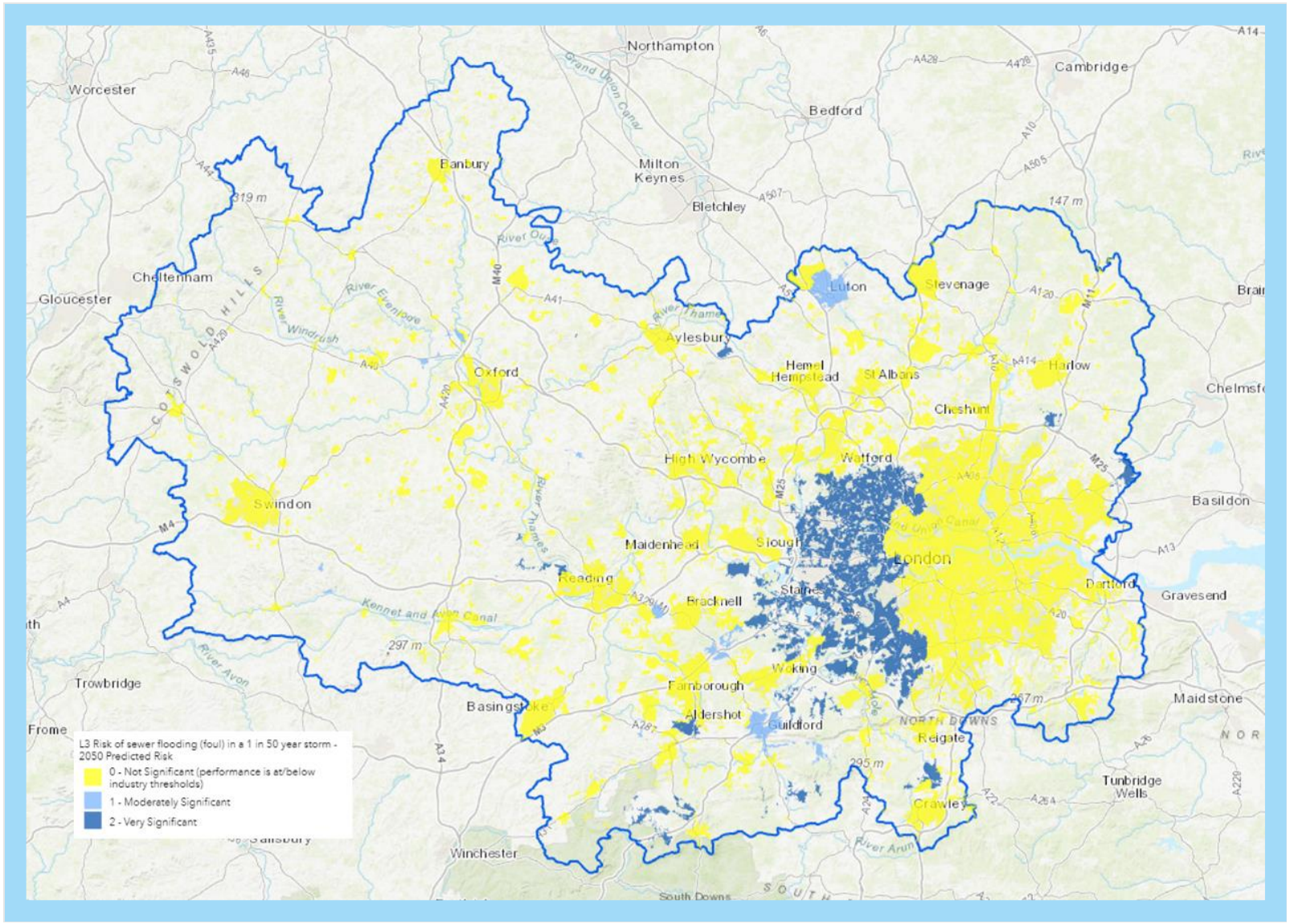
Appendix B BRAVA Risk Maps

B.1 BRAVA L3 geospatial representations

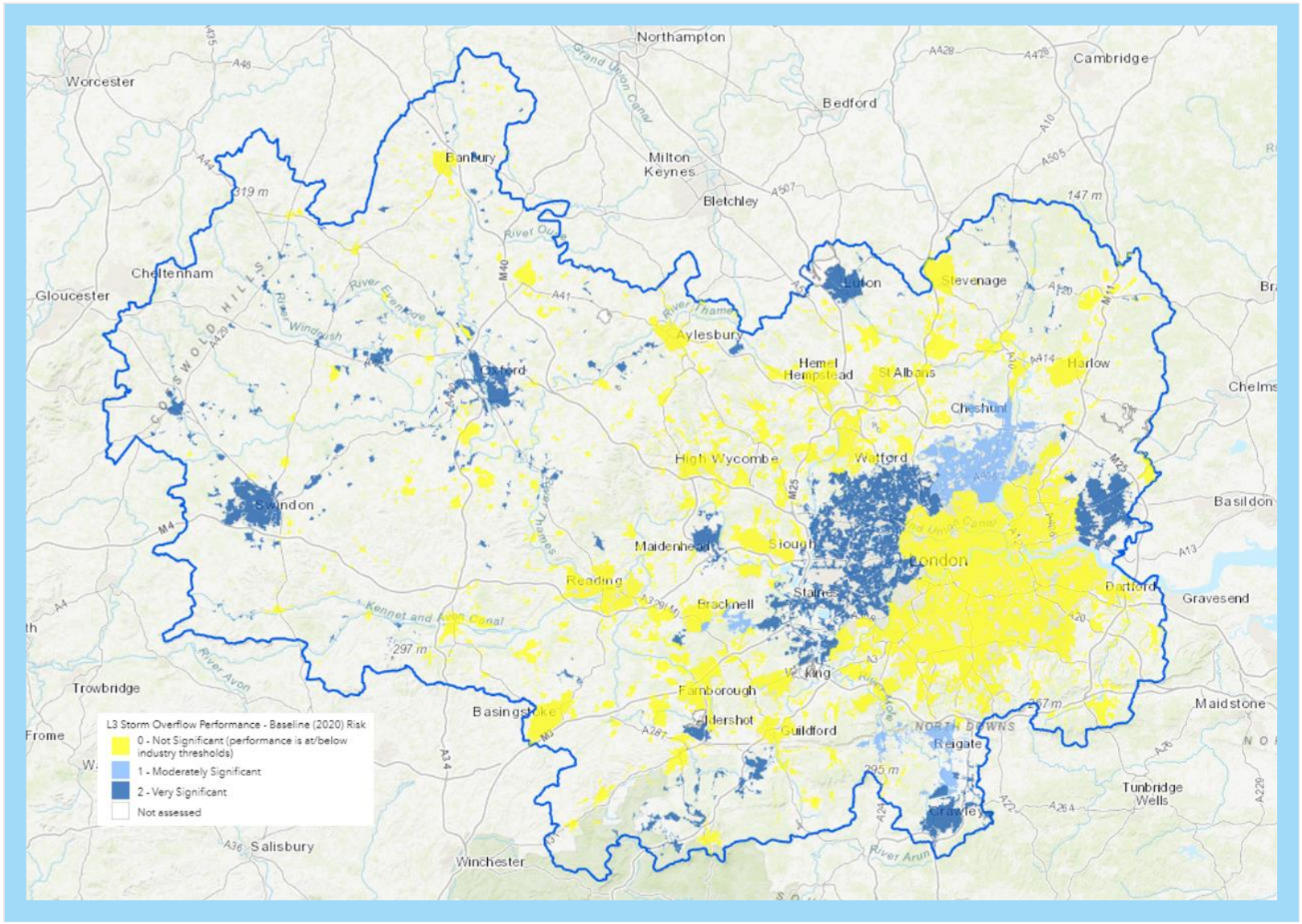
Risk of flooding in a 1 in 50-year storm 2020 baseline



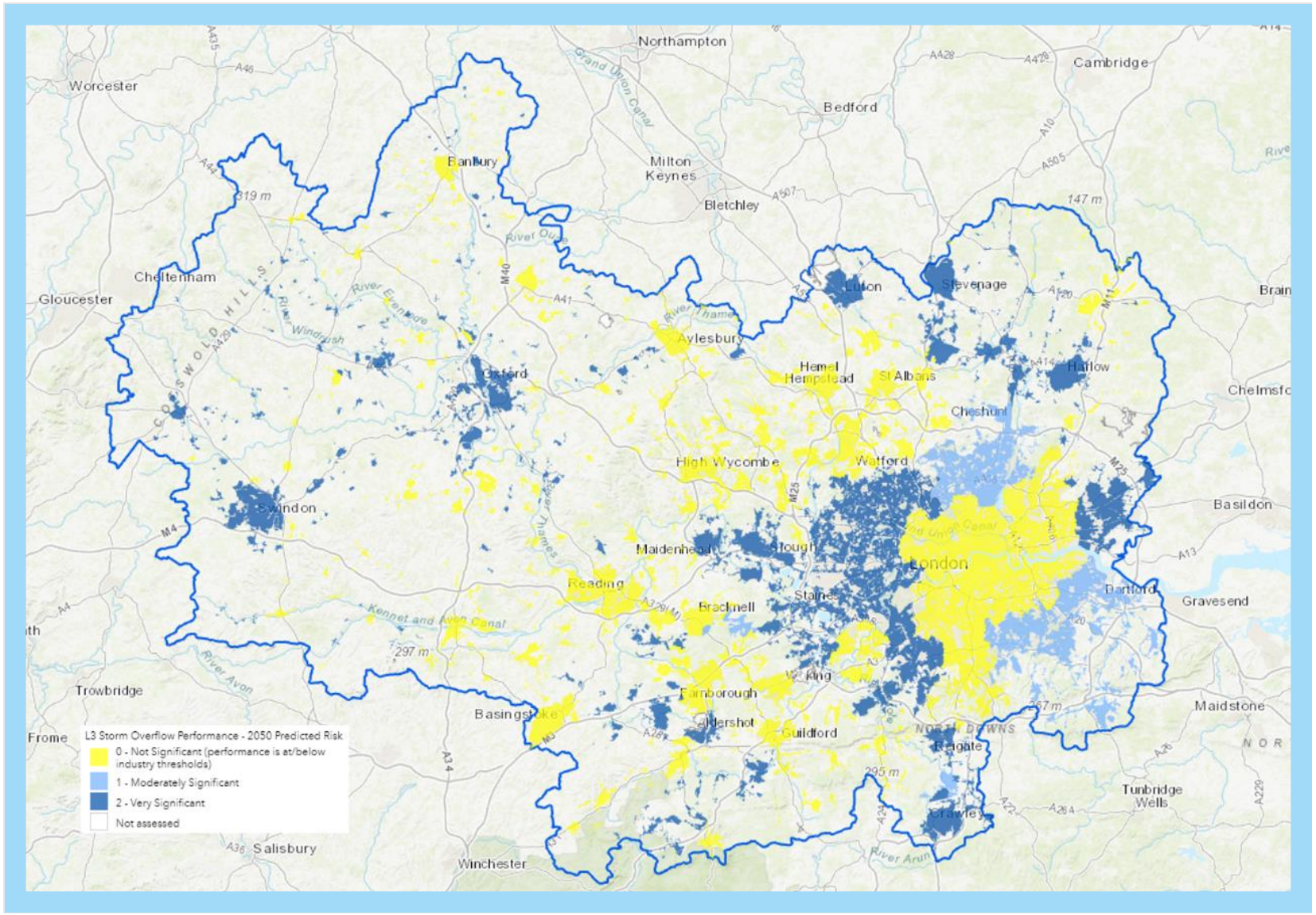
Risk of flooding in a 1 in 50-year storm 2050



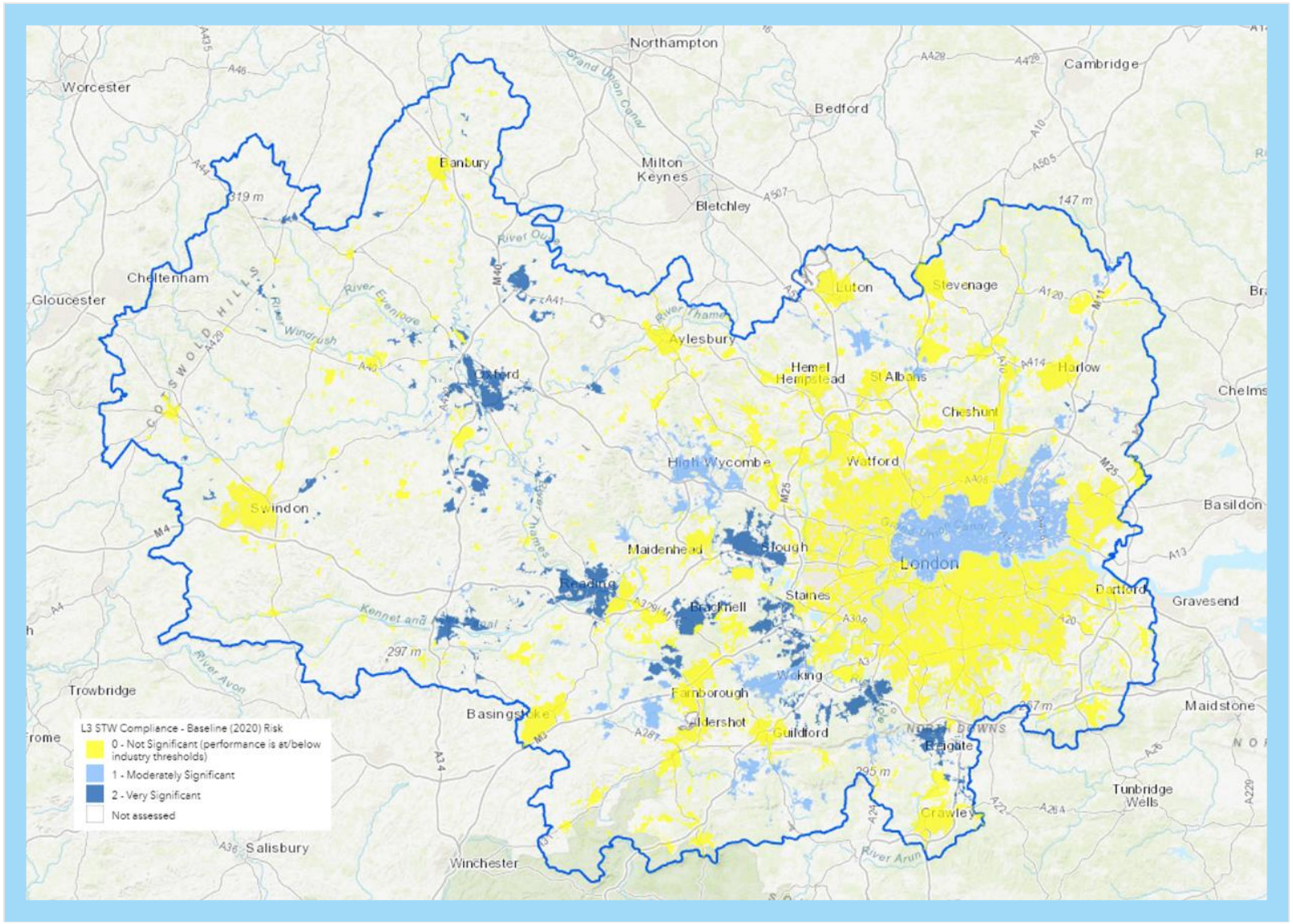
Storm overflow performance 2020 baseline



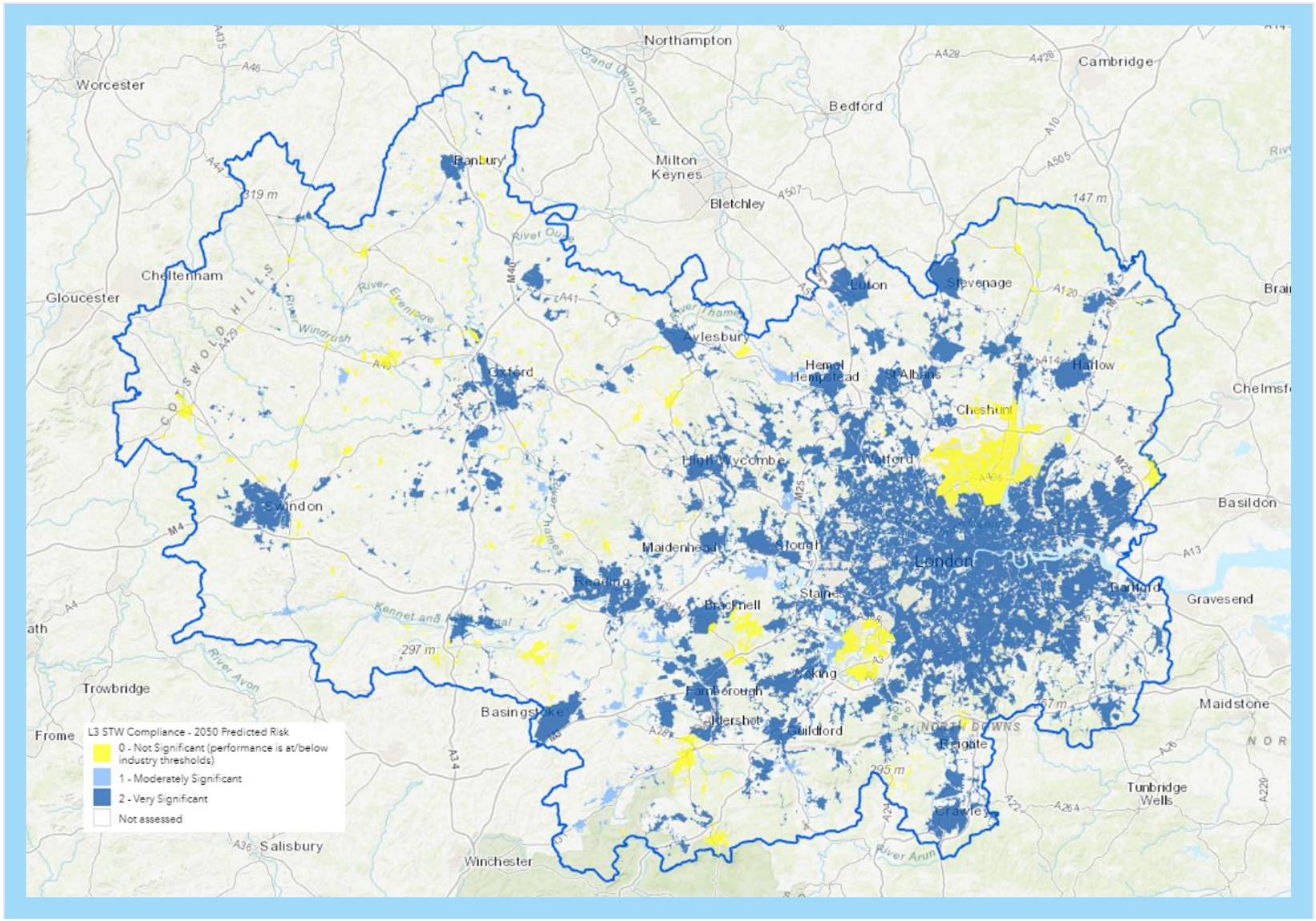
Storm overflow performance 2050



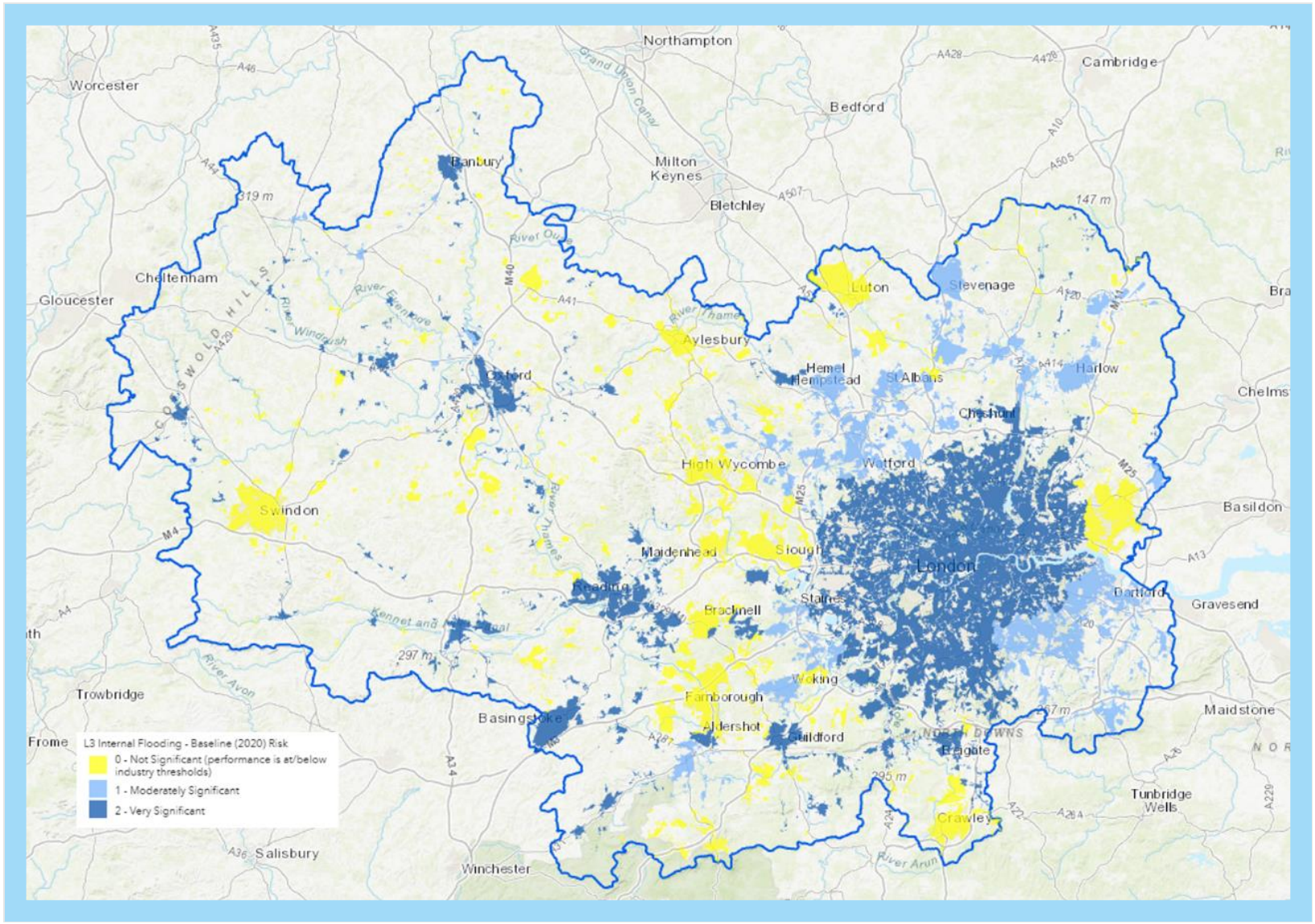
Sewage treatment works (STW) quality compliance 2020 baseline



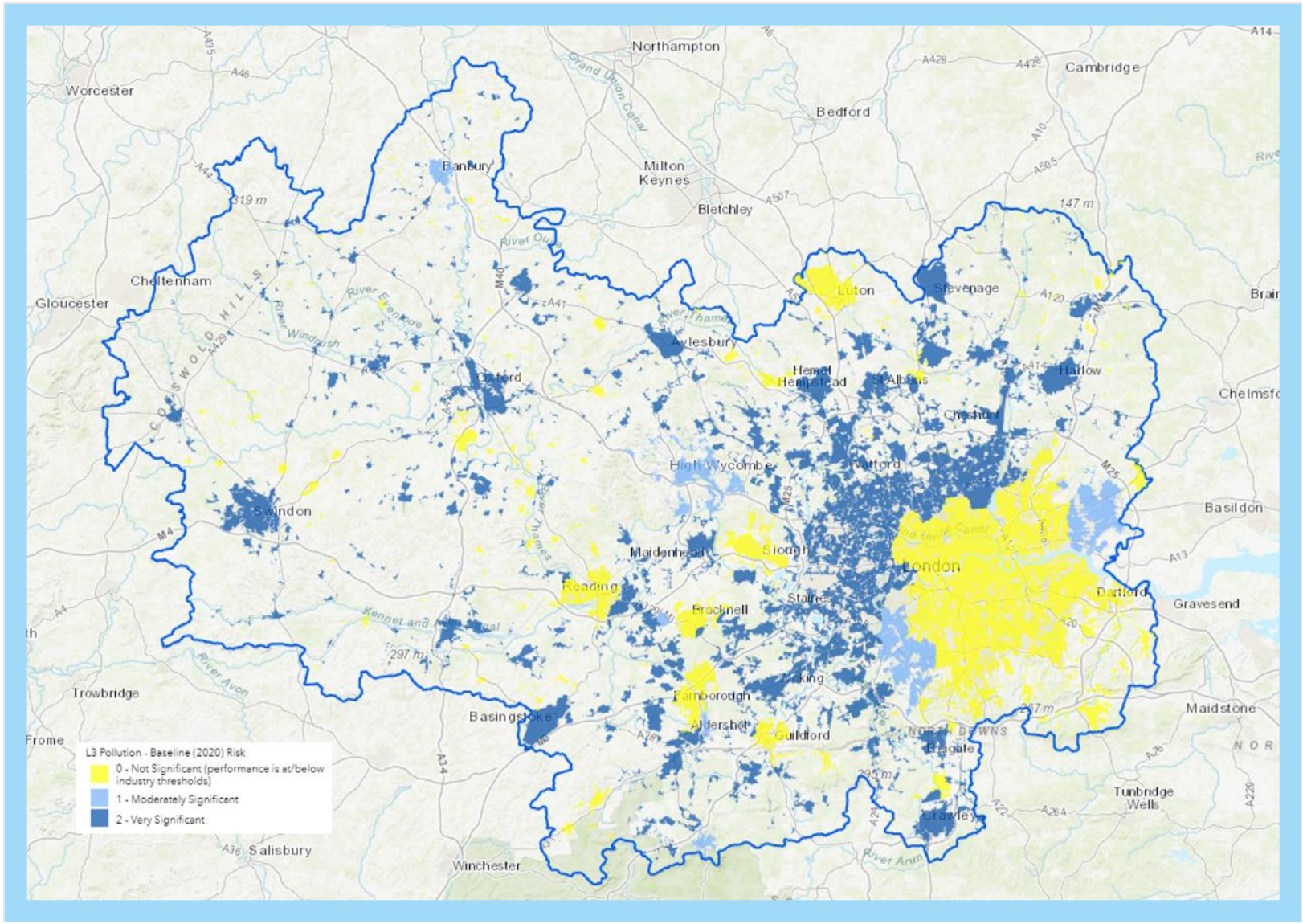
Sewage treatment works (STW) quality compliance 2050



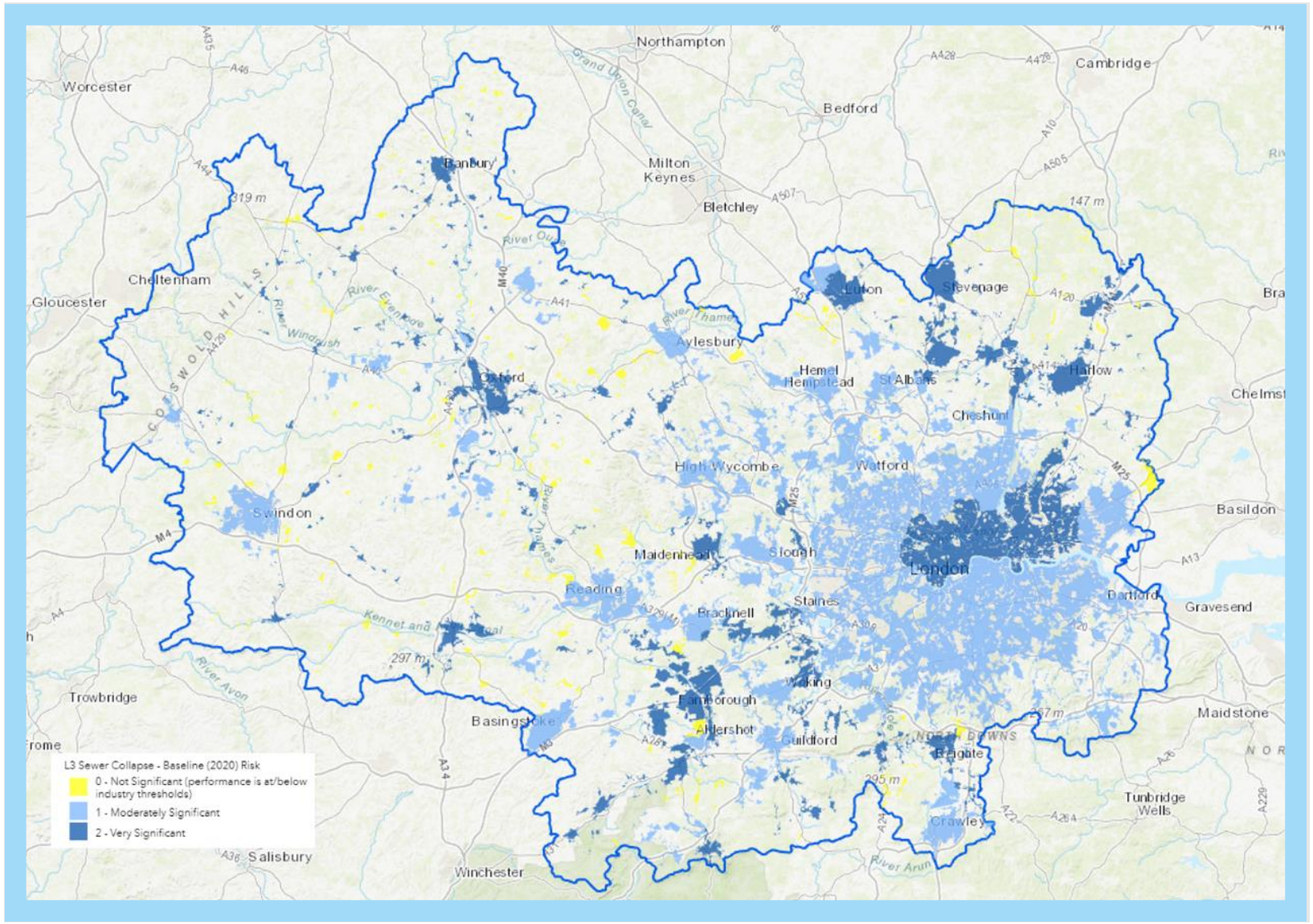
Internal sewer flooding risk 2020 baseline



Risk of pollution incidents 2020 baseline



Sewer collapses 2020 baseline



Glossary

Term	Description
1 in 30-year storm	A storm that has a 1 in 30 chance (3.33% probability) of being equalled or exceeded in any given year. This does not mean that a 30-year storm will happen regularly every 30 years, or only once in 30 years.
1 in 50-year storm	A storm that has a 1 in 50 chance (2% probability) of being equalled or exceeded in any given year. This does not mean that a 50-year storm will happen regularly every 50 years, or only once in 50 years.
Asset Management Plan (AMP)	A five-year planning cycle used by English and Welsh water industry regulators to set allowable price increases for privately owned water companies and for the assessment of performance indicators such as water quality and customer service.
Baseline Risk And Vulnerability Assessment (BRAVA)	Following Risk Based Catchment Screening (RBCS), more detailed risk assessments on those catchments where we believed there was an adverse risk to performance over time. We modelled their performance to 2020 (baseline), 2030, 2035 and 2050.
Business Plan	Business Plans are produced by water companies every 5 years. They set out their investment programme to ensure delivery of water and wastewater services to customers. These plans are drawn up through consultation with the regulators, stakeholders and customers and submitted to Ofwat for detailed scrutiny and review.
Catchment Strategic Plans (CSPs)	Summary reports to promote system thinking across large wastewater catchments. These provide early sight of our final plans enabling co-authoring opportunities for our stakeholders. Each document outlines the challenges that the catchment will face in the future and the long-term plans to address these issues.
Combined sewer	A sewer designed to receive both wastewater and surface water flow from domestic and industrial sources conveyed to a treatment works in a single pipe.
Customer Challenge Group (CCG)	An independent body that challenges both our current performance and our engagement with customers on building our future plans.
Cycle 1 and Cycle 2 DWMP	Our current DWMP is referred to as Cycle 1, it covers a planning period of 2025-2050. Our next plan will be published in five years' time and is referred to as our Cycle 2 DWMP, it will cover a planning period of 2030-2055.
Department for Environment, Food and Rural Affairs (Defra)	UK government department responsible for safeguarding the natural environment, food and farming industry, and the rural economy.
Drainage and Wastewater Management Plan (DWMP)	A Drainage and Wastewater Management Plan (DWMP) is '*a long-term strategic plan that sets out how wastewater systems, and the drainage networks that impact them, are to be extended, improved and maintained to ensure they are robust and resilient to future pressures*'. The planning period is 25 years, from 2025 to 2050. DWMP is iterated every five years; the first known as 'Cycle 1', published as a final plan in May 2023.
dDWMP	The draft version of the Drainage and Wastewater Management Plan, published in June 2022[16].
fDWMP	The final version of the Drainage and Wastewater Management Plan, to be published in May 2023.

[16] https://www.thameswater.co.uk/about-us/regulation/drainage-and-wastewater-management

Dry Weather Flow (DWF)	Dry Weather Flow is the flow to a Sewage Treatment Works (STW) during a period without rain, typically in the preceding 24 hours.
Environment Agency (EA)	UK government agency whose principal aim is to protect and enhance the environment in England and Wales.
EA Pollution Categories 1 to 3	Category 1 incidents have a serious, extensive or persistent impact on the environment, people or property. Category 2 incidents have a lesser, yet significant, impact. Category 3 incidents have a minor or minimal impact on the environment, people or property with only a limited or localised effect on water quality. Further Ofwat guidance available here: WatCoPerfEPAmethodology v3-Nov-2017-Final.pdf (ofwat.gov.uk)
Event Duration Monitoring (EDM)	Event duration monitoring (EDM) measures the frequency and duration of storm discharges to the environment from storm overflows.
External hydraulic sewer flooding	External flooding occurs within the curtilage of a property due to hydraulic sewer overload. Further Ofwat guidance available here: Reporting-guidance-sewer-flooding.pdf (ofwat.gov.uk)
Foul sewer	A foul sewer is designed to carry domestic or commercial wastewater to a sewage works for treatment. Typically, it takes wastewater from sources including toilets, baths, showers, kitchen sinks, washing machines and dishwashers from residential and commercial premises.
Grey infrastructure	New sewers, sewer upsizing and attenuation storage to provide additional capacity in the wastewater networks. Also covers new pumping stations, rising mains and/or civil structures at STWs.
Green infrastructure	Sustainable surface water management solutions, including sustainable drainage systems (SuDS), that are designed to mimic naturally draining surfaces. Typically applied to surface water or combined sewerage systems, but can also be applied to land, highway or other forms of surface drainage.
Historic England (HE)	A non-departmental public body of the government whose aim is to protect the historical environment of England by preserving and listing historic buildings, ancient monuments.
Hydraulic overload	Hydraulic overload occurs when a pipe, sewer or sewerage system is unable to cope with the receiving flow.
Internal hydraulic sewer flooding	Flooding which enters a building or passes below a suspended floor caused by flow from a sewer. Further Ofwat guidance available here: Reporting-guidance-sewer-flooding.pdf (ofwat.gov.uk)
L2 Area (Strategic Planning Area)	An aggregation of level 3 catchments (tactical planning units) into larger level 2 strategic planning areas. The level 2 strategic planning areas allow us to describe strategic drivers for change (relevant at the level 2 strategic planning area scale) as well as facilitating a more strategic level of planning above the detailed catchment assessments.
L3 Catchment (Tactical Planning Unit)	Geographical area in which a wastewater network drains to a single STW. Stakeholders may be specifically associated with this area. Includes for surface water sewerage that may exist which serves the wastewater geographical area but drains to a water course.
Lead Local Flood Authorities (LLFAs)	LLFAs are Risk Management Authorities as defined by the Flood and Water Management Act 2010. They have statutory duties with respect to flood risk management, investigating flooding and the compilation of surface water management plans.

Long-Term Delivery Strategy (LTDS)	A requirement by Ofwat on water companies, to ensure that short term expenditure meets long term objectives for customers, communities, and the environment. These will be submitted as part of the Price Review.
Misconnections	Misconnections are where either surface water drainage or foul water is connected to the wrong system e.g., surface water to foul only or foul to surface water systems.
Natural capital accounting	The process of calculating the total stocks and flows of natural resources in a given system, either in terms of monetary value or in physical terms.
Natural England (NE)	A non-departmental public body sponsored by the Department for Environment, Food and Rural Affairs to protect the natural environment in England, helping to protect England's nature and landscapes.
Non-governmental organisation (NGO)	An organisation that operates independently of any government, typically one whose purpose is to address a social or political issue.
Options Development and Appraisal (ODA)	A method to focus the level of planning effort, i.e., proportionate to the risks identified, with a view to providing a measure of consistency across the industry.
Ofwat	The regulatory body responsible for economic regulation of the privatised water and wastewater industry in England and Wales.
PR24	Every five years, water companies set out their plans for what they'll deliver and how much they'll charge customers[17]. Their plans over the next five years should include how they will: • Provide a safe and clean water supply • Provide efficient sewerage pumping and treatment services • Control leaks • Install meters • Maintain pipes and sewers • Maintain and improve environmental standards This process is known as the price review, and the next one will be in 2024, when Ofwat will make its final decisions. We call this PR24.
Risk-Based Catchments Screening (RBCS)	A first-pass screening exercise of catchment vulnerability against 17 different risk indicators. To understand which catchments are low risk catchments and those that are likely to be at risk in the future if not supported by our long-term plan.
Risk Management Authorities (RMAs)	Authorities responsible for Flood Risk as defined in the Flood and Water Management At 2010. These include, Lead Local Flood Authorities, Highway Authorities, Local Planning Authorities, Natural England and the Environment Agency.
Sewage Treatment Works (STW)	A sewage treatment works receives and treats wastewater to a standard legally agreed with the Environment Agency, before it is released back into the environment.
Specific, Measurable, Achievable, Relevant, and Time-Bound (SMART)	A framework for setting effective targets.
Storm overflow discharges	Storm overflows are used to manage excess flows, which typically occurs during heavy rainfall. Excess flow that may otherwise have caused flooding is released through a designated outfall to a water course, land area or alternative drainage system.

[17] https://www.ccwater.org.uk/priorities/price-review/

Strategic Environmental Assessment (SEA)	A systematic decision support process to ensure that environmental and other sustainability aspects are considered effectively in policy, plan and programme making.
Surface water sewer	A surface water sewer collects rainwater from domestic and commercial roofs, driveways, patios etc to a local watercourse or suitable surface water drainage system.
Sustainable Drainage systems (SuDS)	Drainage solutions that provide an alternative to the direct channelling of surface water through networks of pipes and sewers to nearby watercourses. SuDS aim to reduce surface water flooding, improve water quality, and enhance the amenity and biodiversity value of the environment. SuDS achieve this by lowering flow rates, increasing water storage capacity and reducing the transport of pollution to the water environment.
Thames Regional Flood and Coastal Committee (TRFCC) area	The TRFCC area was established by the Environment Agency under the Flood and Water Management Act 2010 that brings together members representing the Constituent Authority. Featured TRFCCs are listed here on our DWMP portal: Drainage and Wastewater Management Plan (arcgis.com)
Water Industry National Environmental Programme (WINEP)	The framework under which Defra and the EA require environmental improvements to be delivered by water companies. Guidance is released by regulators, which water companies interpret for their geographical area, and resubmit the outputs back to regulators for endorsement.

Navigating our DWMP

We've developed a comprehensive document suite to share our final DWMP. This includes five summary documents that contain increasing levels of detail. To help you to navigate around our document suite and to find key DWMP content, we provide a Navigation index below and on our DWMP webpage. The orange cells refer to where key DWMP content can be found across our final document suite.

Navigation index		Protecting the environment and providing a reliable, sustainable wastewater service							Best value and delivery					Working together		DWMP stages and data				
		Storm overflows	Sewer flooding	Level of ambition & pace of delivery	Growth & climate change	Resilience: flooding & power	Groundwater	Environmental assessments	Affordability & bill impact	Best Value	Base vs Enhancement	Solutions & deliverability	Programme alignment	Partnership working	Stakeholder & customer engagement	DWMP stages & process	Level 2 regional summaries	Level 3 regional summaries	Data tables	Risk & Assurance
Summary documents	Customer summary	■	■											■	■	■				
	Non-technical summary	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	Technical summary	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	The Plan	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	Catchment Strategic Plans x13	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■		
Technical appendices x11	Appendix A - Strategic context												■			■				
	Appendix B - Risk-Based catchment screening															■				
	Appendix C - Baseline risk and Vulnerability assessment				■	■										■				
	Appendix D - Options development and appraisal	■										■				■				
	Appendix E - Programme appraisal	■		■		■			■	■	■	■	■			■				
	Appendix F - Stakeholder engagement														■	■				
	Appendix G - Adaptive pathway planning	■	■		■															
	Appendix H – Customer engagement Part A – Draft DWMP														■	■				
	Appendix I - Risk and uncertainty											■								■
	Appendix J - DWMP and WRMP alignment												■							
	Appendix M - Assurance																			■
New technical appendices x9	Appendix N - You Said, We Did (YSWD)	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
	Appendix O - What base buys										■									
	Appendix P - Response to July 2021 Floods		■	■	■	■			■			■	■	■	■					
	Appendix Q - Storm overflows	■		■	■				■				■							
	Appendix R - Delivery of SuDS and nature-based solutions	■	■	■	■	■			■	■		■	■	■	■					
	Appendix S - Partnership opportunities and working			■								■		■	■					
	Appendix T - Groundwater quality						■													
	Appendix U - Resilience		■		■	■							■	■	■					
	Appendix V – Customer engagement Part B – Consultation Survey Report														■					
Environmental assessments	Appendix K - Strategic environmental assessment (SEA)							■												
	Appendix L - Habitats regulations assessment (HRA)							■												
Portals and data	Customer portal	■	■							■		■		■	■	■	■	■		
	Practitioner portal	■	■											■	■		■	■		
	Data tables			■							■								■	
	Data tables commentary																		■	

We welcome your views on our DWMP. Please share them with us by emailing: DWMP@thameswater.co.uk.

This document reflects our DWMP 2025-2050 as published in May 2023.