TMS-DD-038
Thames Water PR24 DD Response Enhancement Cases

Contents

1 Executive Summary

The enhancement programme that Thames Water and the rest of the industry are required to deliver in AMP8 is by far the largest and most complex since privatisation. The improvements it will deliver to customers, communities and the environment are substantial. We welcome the fact that Ofwat has addressed deliverability and uncertainty in its Draft Determination. However, we consider that the scale of the cost efficiency challenge that has been set is not realistic. We urge Ofwat to carefully consider the additional evidence and analysis contained in this representation. We remain open to constructive dialogue with Ofwat and wish to work towards an acceptable Final Determination.

1.1. Deliverability

We are concerned about the deliverability of the AMP8 enhancement programme and welcome the inclusion of a Delivery Mechanism in the Draft Determination. In our representation, we provide an updated view of the cost of the WINEP storm overflow, phosphorous and chemicals programmes to be considered through the Delivery Mechanism. Our programme to comply with the Industrial Emissions Directive will also need to be included in the Delivery Mechanism, as per our discussions with DEFRA, the EA and Ofwat earlier this year. This is because we do not agree with the scale of the efficiency challenge applied in the Draft Determination and because the operational challenges of undertaking this programme are substantial.

1.2. Asset Health

We are pleased at the inclusion of the Asset Health Improvement Gated Process and accept the £1bn split evenly between water and waste as an appropriate allowance to improve a number some of our asset cohorts in AMP8, including rising mains and service reservoirs. This will allow us to deliver additional performance improvements for customers, communities and the environment – and to start to address specific challenges highlighted to Ofwat through the AMP7 London Water Improvement Conditional Allowance[1]. We also agree that our plans to reduce the risk of flooding from trunk mains should pass through this process.

As requested, our representation has utilised your asset health improvement gated allowance guidance[2] document. We have taken account of the requirement and provided an Asset Health Improvement Strategy document covering an overview of the asset management approach and asset classes included against the allocation[3]. Also included in our representation is an initial gate zero paper for rising mains[4]. Our approach has taken account of the assurance requirements guideline[5] to confirm that the scope required for gate 0 has been met.

[1] TMS-DD-116 Rationale for London Additional Expenditure Factors Affecting Performance and Costs (Mott MacDonald report LWICA reference LWI.G2.E1) November 2021
[2] PR24-draft-determinations-Expenditure-allowances-Thames-Water-asset-improvement-gated-allowance-appendix
[3] TMS-DD-44: Asset Heath Improvement Strategy
[4] TMS-DD-52: Asset Health Improvement Rising Mains Gate 0
[5] PR24-draft-determinations-Expenditure-allowances-Assurance-requirements-for-delivery-of-enhancement-schemes-appendix

We welcome this asset health improvement allocation included in the Draft Determination and look forward to reviewing the developing content with you through the gated process.

1.3. Uncertainty

The other gated processes introduced in the Draft Determination are also welcome. We accept that the Enhanced Engagement Gate will be applied to our Rye Meads STW catchment project to reduce phosphorous and also on our growth project for Didcot STW. We also accept the Large Scheme Gated Process and its application to our SEMD programme and plans to reduce the risk of cryptosporidium at our large London water production sites. Our representation contains other projects that may also benefit from passing through a gated process and we would welcome further discussions with Ofwat about this before the Final Determination.

1.4. Changes to requested enhancement totex

Despite the innovative mechanisms that Ofwat has introduced in the Draft Determination to address deliverability and uncertainty, we believe that the scale of the efficiency challenge that has been set is simply unrealistic. We have reflected on our cost estimates following Ofwat's assessment. Our view remains that the majority are efficient.

In the case of our WINEP investigations and monitoring programmes, we have reviewed the latest market evidence from our supply chain and have reduced our costs. For these programmes, we have set a stretching efficiency challenge to the forecasts that were last submitted in April.

There is some additional enhancement scope and cost in our representation that was not included in our April business plan. Our WINEP storm overflow programme has been updated in discussion with the EA and now includes a large project at Benson STW amongst some other substitutions and revisions. We have identified additional water and wastewater resilience projects as requested by Ofwat to align with the allowance set in the Draft Determination. We have increased the scope of our metering enhancement programme to include our GER programme carried over from AMP7. The forecast cost of completing the London Water Improvement Conditional Allowance in AMP8 has been included and we have proposed enhancement expenditure to reduce leakage, building on the analysis and allowance set by Ofwat in the Draft Determination.

In terms of the programme of work for Strategic Resource Options, we have requested the Beckton recycling funding is re-instated. This aligns with RAPID's approach of ensuring ongoing water resource resilience if the chosen strategic option, in this case Teddington Direct River Abstraction, is denied consent. The full funding request for SESRO has been re-instated.

We also welcome the additional uplift for climate change resilience whilst acknowledging the allowances in base costs for managing climate change risks.

In all other areas, our enhancement costs remain broadly unchanged from those that we put forward in April. Our representations set out in this document focus on the two key fundamentals of Ofwat's cost assessment: models and deep dives.

Table 1- Summary of changes to water enhancement totex request (£m)

Enhancement Case	Data Table Ref	April Business plan £m	DD Allow £m	DD Response £m
WINEP Water	CW3.1-40	151	81	144
Cyber	CW3.124-126	54	38	135
Water Efficiency	CW3.44-46	55	59	41
Asset Health Improvement	CW3.134-135	612	500	474
Trunk mains	~	167	0	0
LWICA Carryover	CW3.136-137	0	0	76
Lead	CW3.106-117	94	82	94
Leakage (New)	CW3.47-49	0	48	140
Metering	CW3.60-90	257	187	311
Crypto	CW3.130-131	179	178	179
Reservoir Safety	CW3.138	11	0	11
Water supply resilience (WSSRP)	CW3.118-120	459	437	451
Water resilience	CW3.118-120	0	34	33
SEMD	CW3.121-123	500	486	500
Strategic Resource Options	CW3.53-55	389	297	973
Other Water Resources schemes	CW3.41-43	22	78	79
WINEP7 Carryover	CW3.132-133	173	98	174
TOTAL		**3123**	**2602**	**3814**

Table 2 - Summary of changes to wastewater enhancement totex request (£m)

Enhancement Case	Data Table Ref	April Business plan £m	DD Allow £m	DD Response £m
WINEP Storm Overflows	CWW3.13-48	815	517	809
WINEP Phosphorous	CWW3.64,67,70,115	1508	968	1519
WINEP Chemicals	CWW3.49-51	212	125	218
WINEP Other	CWW3 various	358	257	279
TTT Price Control	CWW3.187-188	85	-16	57
First time sewerage	CWW3.159-161	10	10	10
Sewage treatment growth	CWW3.153-155	355	204	355
IED	CWW3.189-190	563	230	534
WINEP7 carryover	CWW3.183-184	961	265	1007
Resilience	CWW3.168-170	0	30	29
Cyber	~	81	0	0

Asset Health Improvement	CWW3.185-186	497	500	512
WAAP	CWW3.181-182	677	0	1044
TOTAL		6121	3091	6374

1.5. Our concerns with Draft Determination enhancement models

With respect to enhancement cost modelling in the Draft Determination, our main areas of concern are:

- WINEP phosphorous model. The cost drivers of the p-removal models explain a small proportion of the variation in cost, in particular when historical data is used (c. 30%). We consider that the model includes outliers and demonstrate that a good fit model can be obtained when Anglian Water is excluded. We provide evidence to demonstrate that historical costs are not a reliable basis of forecasting the cost of future projects. We are also concerned that the Draft Determination model does not adequately take account of design capacity (Population Equivalent) and tightness of new permits.
- WINEP storm overflow model. This uses equivalent storage volume as a single explanatory factor and does not adequately reflect the cost of storm overflow schemes in our plan. We recommend that Ofwat needs to capture the cost of providing additional flow to full treatment in its modelling (by considering the capacity at sewage treatment works or increases in litres per second as an explanatory variable)
- Sewage Treatment Growth. We would like Ofwat to deep dive a greater proportion of our plan for AMP8 rather than rely on a Population Equivalent model that does not capture the cost of decommissioning and providing additional treatment capacity on sites with a limited footprint.
- Industrial Emissions Directive. The length of bunding wall does not adequately explain the cost of containment at a sludge treatment centre. Other items that need to be taken into account include the height of the wall and the introduction of impermeable surfaces within the secondary containment area whilst for tank coverings it is not only the surface area which is important but all associated assets required to manage the captured fugitive emissions ensuring compliance with other regulations such as COMAH etc.
- Metering Enhancement. Ofwat's model accounts only for the volume of new meters but does not take into account companies' differing work mix for AMP8 (e.g. the blend of expensive internal meter installations versus comparatively cheaper external meters). Furthermore, average unit costs do not place enough weight on companies that are now experienced at delivering smart metering programmes and have a robust view of cost estimates. Our AMP8 metering has been competitively tendered and is the source of our unit costing.
- Leakage enhancement. We disagree with the modelling assumption that leakage can be reduced for £1.1m per Ml/d. This is unrealistic in our area of operation to provide a sustainable reduction in leakage.

1.6. Addressing concerns raised by Ofwat in Deep Dives

Turning to concerns raised by Ofwat in deep dives, we have addressed these specific comments with additional pieces of evidence. We have focussed on demonstrating optioneering and cost efficiency:

- Optioneering. We set out the range of options that we have appraised prior to including solutions in our plan. By way of example, we provide optioneering information for our WINEP storm overflows and chemicals programmes, sewage treatment growth, industrial emissions directive and cyber case.
- Cost Efficiency. In August, we commissioned ARUP to provide third party cost assurance to a sample of our enhancement cases including sewage treatment growth and the compliance with the Industrial Emissions Directive. We have included ARUP's findings and report with this representation response[6].

1.7. Beckton Sludge Powered Generator

Work on a replacement of the Sludge Powered Generator (SPG) at Beckton sewage treatment works has been progressing for many years. Our plan was to continue operating the SPG until the end of AMP8. However, the operational risks of doing so are now substantial and we need to progress a replacement. Details of our proposals are in Section 4 – we would like to progress this project through Ofwat's large scheme gated allowance.

1.8. Our concerns with Price Control Deliverables

We have compared the PCDs included in our business plan submission enhancement case documents with those set out in the Draft Determination. Our concerns are set out in a separate representation document[7].

[6] See TMS-DD-115 ARUP Third Party Cost Assurance
[7] See TMS-DD-044 Thames Water PR24 DD Response - Price Control Deliverables

2 Water enhancement cases

2.1 WINEP Water

2.1.1 Brief outline of Ofwat's position

Ofwat's assessment of our programme can be summarised as follows:

Table 3 – Outline of Ofwat's assessment of our programme, divided into deep dive, shallow dive, and benchmarking

Deep dive	Shallow dive	Benchmarking
WFD schemes	Fish passages	Investigations
INNS	SSSI	
Biodiversity	Eels	
Drinking Water Protecting Areas		

2.1.2 Thames Water argument and supporting evidence

Our response challenges Ofwat's cost assessment in the following areas:

Table 4 – Areas we are challenging Ofwat's cost assessment in our response, divided into deep dive, shallow dive, and benchmarking

Deep dive	Shallow dive	Benchmarking
WFD schemes	Fish passages	Investigations
INNS		
Biodiversity		
Drinking Water Protecting Areas		

We set out our position on each area in turn below. Further information for each area can be found in the supporting document TMS-DD-058: PR24 WINEP Enhancement Case supporting information - Water WINEP annex.docx.

2.1.2.1 WFD Schemes

Our response in this area addresses the following two points:

1. We note that Ofwat has made an error in applying its stated efficiency challenges;
2. We provide additional evidence of cost efficiency to justify our proposed costs.

We provide a Cost breakdown of WINEP water resources WFD schemes in TMS-DD-066: PR24 WINEP EC supporting evidence - WR WFD cost breakdown.

1. **Incorrect application of efficiency challenges**

Our WFD programme for AMP8 consists of 15 schemes:

- Ofwat applied a 30% cost challenge to 14 non-interconnector schemes;
- Ofwat assessed Netley WTW sustainability reduction scheme separately and applied a 58% cost challenge.

We replicated Ofwat's assessment. It appears that the cost challenge of 58% has been applied to all 15 schemes submitted: of the total £46.945m we requested (for all 15 schemes), Ofwat allowed £19.514m.

Based on the breakdown of costs provided to Ofwat (Ref: Query OFW-OBQ-TMS-244) if the 58% efficiency challenge is applied to the Netley Mill WTW scheme only, and 30% to the others, the correct allowance would be £24.331m.

We request that Ofwat re-assesses the application of efficiency to ensure the intended efficiency challenge is applied. We note that, as described below, we disagree with the level of efficiency that has been applied.

2. Our proposed costs are efficient

In the Draft Determination, Ofwat reduces our allowance for Netley WTW on the grounds that it has already been partially funded under the PR19 allowance to increase resilience in the Guildford Water Resource Zone.

We want to make it clear that the scope and costs submitted in PR24 only cover the elements above and beyond the PR19 scheme, i.e., Ofwat has incorrectly identified that the scheme has already been partially funded. We provide the Options Development Report as supporting evidence in document TMS-DD-059: SR_NetleyMill_ODR.pptx along with a summary table below. The report was submitted to the Environment Agency (EA) as part of the WINEP process and demonstrates that the costs are consistent with the EA WINEP requirements.

The Netley Mill scheme which was funded in PR19 was intended to ensure integrity of the Guildford Water Resource Zone (WRZ), with there being a lack of connectivity between East and West Guildford, and differing levels of forecast growth in East and West Guildford. It was identified that WRZ integrity could be maintained with a 300mm pipeline.

In the PR24 WINEP, it has been highlighted that a licence reduction at our Netley Mill source (in the Guildford WRZ) is needed. The licence reduction at this source means that the 300mm pipeline would no longer be sufficient to ensure WRZ integrity and resilience. Additionally, a further licence reduction at Netley Mill may be needed in the future (under Environmental Destination). The best value solution identified is the proposed 300mm main with an additional 450mm main. This solution is best for efficiency, planning for the future, and resilience.

The funding request that has been made is only for the difference between the 300mm scheme (funded in PR19) and the dualled 300mm + 450mm scheme.

	Pipeline capacity (Ml/d)	Pipeline Diameter (mm)

PR19 Scheme	9	300
PR24 Scheme total	14	Dual solution – 300mm main + 450 mm main
PR24 Enhancement Request	Difference in cost between the 300mm solution and the dualled 300mm + 450mm solution.	

We provide Options Development Reports for the rest of the schemes here as evidence of cost efficiency, optioneering and solution optimisation:

TMS-DD-060	SR_Bradfield_ODR.pptx
TMS-DD-061	SR_UpperSwell_ODR.pptx
TMS-DD-062	SR_Hornsey_ODR_Jan23.pptx
TMS-DD-063	FishPassages_ODR.pptx
TMS-DD-064	SR_RiverRestoration_ODR.pptx
TMS-DD-065	SR_UpperKennetRR_ODR.pptx

These reports reflect the programme as submitted to the Environment Agency in November 2022 and January 2023.

River restoration and fish passage projects were costed based on our delivery experience of the last two AMPs.

We request that Ofwat review the cost efficiencies applied considering this additional evidence.

2.1.2.2 Investigations

Our response in this area addresses the following two elements:

1. Hornsey WTW Bromate investigation and no deterioration scheme (WINEP Action ID 08TW1 00032a) is complex and unique, which makes it not suitable for a benchmarking assessment.

2. Water Resource Investigations

We also provide an updated response to Query145 which maps the investigations to the relevant data tables in TMS-DD-111: OFW-OBQ-TMS-145 Response UPDATED 22.08.24 for DD Response.

1. Hornsey WTW

The scope of these investigations addresses the requirement to deliver enabling works for a partial abstraction reduction for the New Gauge sources at Hornsey WTW for Bromate removal, as well as an exploration of additional options for a larger abstraction reduction to be delivered in future AMPs. The actions to enable the partial licence reduction would usually fall under a

"Delivery" driver (as we will be delivering a solution to enable a partial licence reduction), while the investigation into the larger abstraction reduction would usually fall under an "Investigation" driver. The Environment Agency merged these activities into one investigation scheme in our WINEP submission.

In our October 2023 Business Plan submission, we partially allocated the costs for the no deterioration scheme at Hornsey WTW under the original WFD_ND (Delivery) driver. As part of our August 2024 Draft Determination submission, we are allocating the full costs of the Hornsey WTW scheme to the original WFD_ND (Delivery) driver and have allocated the cost of the investigation to the "Investigation" driver.

The investigation would be large and complicated and would be significantly more complex than a usual investigation requirement within the water resource investigations. The planned licence reductions reduce the blend capacity within the system, requiring a full investigation into new management options. The scope will include short term measures as well as long term solutions to align with our overall environmental ambition set out in our WRMP. The investigations would include reviewing alternative treatment technologies that could be implemented in AMP9 if further flow reductions are implemented.

The River Lee / Coppermills / Hornsey New River system is complex. There are surface water abstractions, groundwater abstractions, water transfers, groundwater contamination (bromate) and reservoirs that are all managed to ensure consistent supply to our customers. This places significant constraints on managing water quality.

Due to these complexities, the scope of this requirement exceeds the scope of a standard investigation. Therefore, benchmarking is not appropriate to assess the cost requirement for this investigation.

We request Ofwat to assess this investigation as an outlier.

2. Water resource investigations

Within our WINEP some investigation lines cover multiple abstraction sources that have been grouped together. The scope of these investigations is therefore larger than would be usual for a WINEP investigation and therefore the benchmark costing is not appropriate. The lines that were combined includes a combination of sources within the same catchments or a programme of works linked to the same workstream. We recognise that Ofwat have used a unit-rate benchmarking approach to determine cost allowances and therefore, we have requested these sources be split out across different WINEP IDs to ensure they are treated equitably. We confirm that the cost estimate included in our submission was appropriate to ensure each one is funded adequately.

The investigations that were grouped are as follows:

1. Eynsford, Horton Kirby, Lullingstone - 08TW100029
2. Sundridge, Westerham, Darenth, Green St Green, Wilmington and Dartford - 08TW100030
3. Vulnerable catchments - 08TW101405

These grouped lines include the following investigation components, showing that the scope is much wider than one individual investigation.

Table 5 – Investigation components included in the following WINEP action IDs: 08TW100029, 08TW100030, 08TW101405

08TW100029	08TW100030	08TW101405
Eynsford	Sundridge	Fobney –Environmental Destination
Horton Kirby	Westerham	Fognham Down and Ashdown Park - Environmental Destination
Lullingstone	Darenth	Syreford - Environmental Destination
	Green St Green	Seven Springs - Environmental Destination
	Wilmington	Dovedale and Blockley - Environmental Destination
	Dartford	Orpington, Wansunt and Crayford & Benefits assessment
		Guildford sources – Environmental Destination
		Scarp Slope sources – Environmental Destination
		Bishops Green, East Woodhay, Ufton Nervet – Environmental Destination
		Mitigation measure assessment - Environmental Destination
		Chess baseline monitoring and benefits assessment
		Pang baseline monitoring and benefits assessment

As per our revised PR24 RES1 table submission, we request Ofwat to consider these investigations as individual 21 investigations rather than the 3 grouped investigations.

2.1.2.3 INNS

We believe that the conclusion of Ofwat's deep dive assessment fails to reflect the complexity of INNS management within our supply area. Our programme consists of 82 transfers, including all main transfers ('pathway 1') and overflows/washouts/discharges associated with them, either along the transfer or for particular receptors.

Ofwat has applied 3 elements of cost challenge to our INNS enhancement request, resulting in a total of a 50% cost efficiency challenge:

- 10% efficiency challenge – lack of convincing evidence that there is no overlap with base spend
- 20% efficiency challenge – lack of convincing evidence that an appropriate number of alternative options have been considered
- 20% efficiency challenge – lack of convincing evidence that costs are efficient

The funding requested is that required to fulfil the WINEP requirement for our INNS strategy under the AMP8 WINEP. As is highlighted in the company-wide INNS plan (TMS-DD-068: Thames Water Company-wide INNS Plan_v2.0.pdf, p.40), the AMP7 INNS WINEP action

involved understanding the key pathways of INNS spread on our assets and within the catchments we operate in, and how those pathways of spread can be mitigated. The PR24 funding request is for the implementation of measures identified and so does not overlap with base.

As further evidence of the complexity of scope, we provide the Options Development Report TMS-DD-067: INNSpecies_ODR.pptx. This ODR highlights the detailed investigation behind the INNS implementation plan, and the options considered. We consider that this demonstrates that different options have been considered. Further, elements of the INNS plan in itself were subject to options appraisal, as described in Appendix D of the company-wide INNS plan (TMS-DD-068: Thames Water Company-wide INNS Plan_v2.0.pdf).

We also provide supplementary evidence on the efficiency of our costs. We commissioned AtkinsRéalis to undertake a comprehensive cost assessment of INNS options in our company-wide plan (CWP). This CWP has been signed off by the Environment Agency, and we are confident the costs are efficient and align with the industry standard of INNS work. The AtkinsRéalis report is provided in TMS-DD-068: Thames Water Company-wide INNS Plan_v2.0.pdf).

We request that Ofwat review the cost efficiencies applied considering this additional evidence.

2.1.2.4 Drinking Water Protected Areas

We do not own the land in our catchments. To protect raw drinking water quality, we rely on interventions to incentivise landowners – largely farmers – to adopt practices which reduce pollution. This includes offering farm advice, direct funding of high benefit activities, assistance with applying to other funding schemes and awareness raising events. Our programme has been developed in line with PR24 WINEP driver guidance provided at TMS-DD-070: PR24 WINEP driver guidance - Drinking Water Protected Areas.

To address Ofwat's concerns regarding whether our proposed investment in these interventions is the best option for customers, we provide a full Option Development Report in TMS-DD-069: DrWaterPA_ODR.pptx. The report presents the alternative initiatives which have been considered and the different approaches explored.

Our flagship scheme in this area is the Catchment Fund. The Fund is an essential engagement tool that not only offers direct water quality benefits from the uptake of funded activities, such as the purchase of precision application technology or the construction of centralised pesticide handling facilities, but also opens a channel of communication with farmers that allows us to get out on the farm. This helps to highlight issues that can be mitigated to help protect water quality, that we would have otherwise been unaware of.

The following points justify why the Fund provides best option for customers and is cost efficient:

- The options offered under the Catchment Fund are similar to what is offered through other organisations, including water companies such as Seven Trent and their STEPS scheme (see TMS-DD-089: STEPS-Handbook-Spring-2024), South East Water's Capital Grants Scheme (see TMS-DD-090: SEW Capital Grants Scheme), and similar government

schemes such as Countryside Stewardship8 and the Sustainable Farming Incentive9 (SFI) programmes provided by the Rural Payments Agency. A summary of the different options and their costings can be seen below in Table 6.

- Funding rates offered under the Catchment Fund are comparable to other schemes provided (by water company and Government), and our costs are comparable to other companies. We provide the evidence of benchmarking at Table 6 below, with more detail provided in TMS-DD-058: PR24 WINEP Enhancement Case supporting information - Water WINEP annex.docx.
- The proposed scheme's costings are based on successful farmer applications in each catchment of below 20% with our average uptake this year being around 15%.
- We undertake an annual tender process to award work for on-ground delivery of farmer engagement. Project partners are selected based on a cost benefit analysis and tender for work each year to ensure work is delivered for the minimum efficient cost.

Table 6 - Comparison of Thames Water funding rates and two other water companies and two government schemes

Activity	Thames Water Year 2023-2024	South East Water 2024-2025	Severn Trent 2024-2025	Countryside Stewardship	SFI 2024-2025
Winter Cover Crops	£129 per ha	£130/ ha	£120 per ha	£129/ ha	£129/ ha
One year Cover crops	£570 per ha	£385/ ha	£136 per ha (groundwater catchments)	N/A	N/A
Enhanced management following maize crops	£203 per ha	£185/ ha for grass drilled maize	£136 per ha	£203 per ha	£203 per ha
Undersown spring cereals	£380 per ha	N/A	N/A	£380 per ha	N/A

We request that Ofwat review the cost efficiencies applied considering this additional evidence.

2.1.2.5 Biodiversity

Our response to Ofwat covers three areas:

1. The Biodiversity Net Gain Performance Commitment
2. Cost efficiency
3. Clarification of scheme ID 08TW100896 with NERC_IMP

1. The Biodiversity Net Gain Performance Commitment

The substance of our response on this point is set out in the Outcomes section of our representations, being TMS-DD-39: Outcomes, Sections 14 and 19.

8 https://www.gov.uk/government/publications/revenue-payment-rates-from-january-2024-countryside-stewardship/revenue-options-payment-rate-changes-from-1-january-2024

9 https://www.gov.uk/government/publications/payment-rates-from-january-2024-sustainable-farming-incentive/sfi-2023-and-sfi-pilot-payment-rate-changes-from-1-january-2024

2. Cost efficiency

Our costs are based on the outputs from the Surface Water Management Teams SUDS programme cost model. These costs were then calibrated based on our delivery experience from AMP7, based on actual tendered contract prices. The costs were independently assured by WSP, who were our partners in developing the WINEP biodiversity proposals.

3. ID 08TW100896: clarification

Actions under ID 08TW100896 with NERC_IMP cover our contribution to increasing the quantity, quality, and connectivity of habitats. In February 2024, Ofwat asked for further details of these schemes. An actions specification form had been produced but had not been uploaded by Thames Water for Ofwat to review.

We have ensured that these projects reflected the priorities of our stakeholders in Colne Valley, Lea Valley and the 18 developing Local Nature Recovery Groups. An updated version of the action specification form is provided in TMS-DD-071: Biodiversity 08TW100896 NERC_IMP. This work has been produced with WSP as our 3rd party assurers, who we have worked closed with us to deliver biodiversity net gain for the last AMP period.

WINEP proposals for biodiversity included the Performance Commitment of biodiversity net gain, which has been responded to in further detail in the Outcomes Chapter. This chapter demonstrates why we cannot feasibly do large biodiversity gains across all our landholdings and discusses in detail the costs associated with our more strategic and sensible proposals (broken down into years and unit gains), partners and stakeholders as well as 3rd party assurers. We have worked with the consultants WSP to come up with our Performance Commitment. The suggested PC by Ofwat is not fit for purpose, it incentivises wrong behaviours against what is right to support strategic local nature recovery and needs to be revisited.

Thames Water has the additional pressure of less available land and higher contractor costs than many other water companies with additional pressures including higher than anticipated levels of growth at our operational sites, solar projects to help achieve our net zero targets, and additional planning pressures for mandatory Biodiversity Net Gain that cannot be stacked.

In summary we are confident in the costs submitted in our Business Plan and are submitting additional supporting information to justify these. The cost efficiencies applied to biodiversity would have a material impact on our ability to deliver the schemes set out in the WINEP. We would also be unable to deliver the proposal performance commitment for Biodiversity Net Gain. We ask that Ofwat re-look at the cost model associated with our PC and additional WINEP deliveries.

2.1.2.6 Fish Passage

Ofwat has applied an efficiency factor of 19% to our enhancement request for fish passage schemes. This factor has been applied in the absence of any justification or evidence. The submitted costs of our fish passage schemes has been assessed according to our delivery

experience across the last two AMPs. We request that Ofwat reconsiders the application of this efficiency factor.

2.1.3 Summary of our request for FD

We have set out our assessment of the cost efficiency applied and additional information to support the justification of the costs included within our Business Plan.

Table 7 – Summary of our request for FD, covering the following investment areas: WINEP schemes, WINEP water investigations, drinking water protected areas, INNS, and biodiversity

Investment area	Costs included in BP (£mill)	DD allowance (£mill)	Requested allowance (£mill)	Summary
WINEP Schemes	46.94	19.51	46.94	Significant cost efficiencies were applied to Netley Mill and our other WINEP Schemes. We do not believe it possible to deliver the scope associated with the PR24 requirement with the cost efficiencies applied. We request that Ofwat reconsider the cost efficiencies applied. We have submitted additional information justifying our costs and split between PR19 and PR24 requirements.
WINEP Water Investigations	26.702	18.115	26.702	We included some grouped investigation lines within our submission. We request Ofwat to consider these investigations as individual investigations rather than grouped investigations. Additionally, we request the Hornsey WTW Bromate investigation to be assessed according to the extensive scope and complexity of the catchment. The overall scope of this requirement exceeds the scope of a normal investigation and therefore the benchmarking is not appropriate to assess the cost requirement.
Drinking Water Protected Areas	14.132	7.066	14.132	In summary we are confident in the costs that were submitted in our Business Plan. The cost efficiency applied would have a material impact on the scale of our catchment management activities and thus the associated water quality benefits. We request that Ofwat consider the costs submitted in our business plan and the cost efficiencies that have been applied to our catchment management programme.

INNS	15.074	7.5	15.074	We have completed detailed appraisals and cost assessments to support our Company-Wide INNS Plan and are therefore confident in the costs submitted as part of our business plan. We request that Ofwat reconsider the cost efficiency applied.
Biodiversity	23.85	9.54	23.85	WINEP proposals for biodiversity included the Performance Commitment of biodiversity net gain, which has been responded to in further detail in the Outcomes Chapter. The suggested PC by Ofwat is not fit for purpose. In summary, the total allowance put forward in the Deep Dive is not enough to deliver the asks under biodiversity. We ask that Ofwat re-look at the cost model associated with our PC and additional WINEP deliveries.

2.1.4 Summary of reference documents supplied for this section

1	TMS-DD-058: PR24 WINEP Enhancement Case supporting information - Water WINEP annex.docx.
2	TMS-DD-059: SR_NetleyMill_ODR.pptx
3	TMS-DD-060: SR_Bradfield_ODR.pptx
4	TMS-DD-061: SR_UpperSwell_ODR.pptx
5	TMS-DD-062: SR_Hornsey_ODR_Jan23.pptx
6	TMS-DD-063: FishPassages_ODR.pptx
7	TMS-DD-064: SR_RiverRestoration_ODR.pptx
8	TMS-DD-065: SR_UpperKennetRR_ODR.pptx
9	TMS-DD-066: Cost breakdown of WINEP water resources WFD schemes
10	TMS-DD-111: OFW-OBQ-TMS-145 Response UPDATED 22.08.24 for DD Response
11	TMS-DD-067: INNSpecies_ODR.pptx
12	TMS-DD-068: Thames Water Company-wide INNS Plan_v2.0.pdf
13	TMS-DD-069: DrWaterPA_ODR.pptx
14	TMS-DD-39: Outcomes, Sections 14 and 19
15	TMS-DD-070: PR24 WINEP driver guidance - Drinking Water Protected Areas
16	TMS-DD-071: Biodiversity 08TW100896 NERC_IMP
17	TMS-DD-089: STEPS-Handbook-Spring-2024
18	TMS-DD-090: SEW Capital Grants Scheme

2.2 Metering and Water Efficiency

2.2.1 Brief outline Ofwat's position

Ofwat uses two simple econometric models to calculate smart metering allowances: one model for new installations; and another for meter upgrades. The single cost driver is the volume of work: the number of installations for the former; and the number of meter upgrades for the latter.

This results in a significant efficiency challenge to our proposed metering programme: a 37% challenge on new meter installations (including for our bulk meters); and a 19% challenge on meter upgrades.

Ofwat proposes separate PCDs for new meters, meter replacements, meter upgrades, small bulk meter, and large bulk meter installations. Ofwat stipulates that for a meter to be counted as having been delivered it should:

- Measure and record water consumption data at least once an hour with a 95% or higher success rate.
- Transmit the recorded consumption data to the smart infrastructure network at least once every 24 hours with a 95% or higher success rate.

2.2.2 Thames Water's argument and supporting evidence

Our metering programme is key to meeting Defra's national targets and delivering a resilient water supply, as set out in the WRMP and forming a critical part of the Water Resources South East (WRSE) regional plan. The severe cost challenge in Ofwat's draft determination proposal places the delivery of the WRMPs at risk and undermines the Defra national water target, for which smart metering is the critical enabler.

We have significant concerns with Ofwat's assessment approach of smart metering. While Ofwat states that it has not challenged the volume of meters set out in companies' WRMP – it has only challenged their cost efficiency. In practice, we are concerned that the stiff and ungrounded challenge will put the delivery of the programme and its associated outcomes at risk.

We set out our key concerns below. First, our concerns regarding the assessment approach. Second, our concerns regarding the approach to PCDs.

2.2.2.1 Ofwat's assessment approach is unreliable

Ofwat uses benchmarking models to assess and set an allowance for the metering programme. We consider that the models are unreliable for three reasons:

- They fail to consider important programme variations across companies;
- Their results are non-credible; and
- They rely on unreliable cost forecasts.

We explain each below and propose revisions to Ofwat's proposed NMI model.

The model fails to consider important programme variations across companies

Ofwat's models use a single cost driver (volume of installations or upgrades). This ignores the fact that the unit cost of installing different types of meters can be significantly different, and that

companies may have significant differences in the profile of meters and installation types included in their programme.

Table 8 provides average installation costs for different meter programmes and installation requirements (e.g., external/internal). The table shows material differences in installation costs of different meter types. Unit costs are higher for internal meters compared to external meters. Where a dig is required, the unit cost of external meters is higher yet. Likewise, the installation cost of non-household meters is higher than that of household meters, and it increases with the size of the meter installed.

[redacted]

Companies have a different composition of meter types in their AMP8 programme. The composition of meters often reflects the type of premises, establishments and characteristics of the area. Our projections for the different installation and meter types have been informed by extensive property-level surveying and nearly 10 years of smart meter delivery experience.

Companies that have a high proportion of external replacement household meters in their programme will have a lower average unit cost than companies with a high proportion of digs, internal or large Non-Household installations.

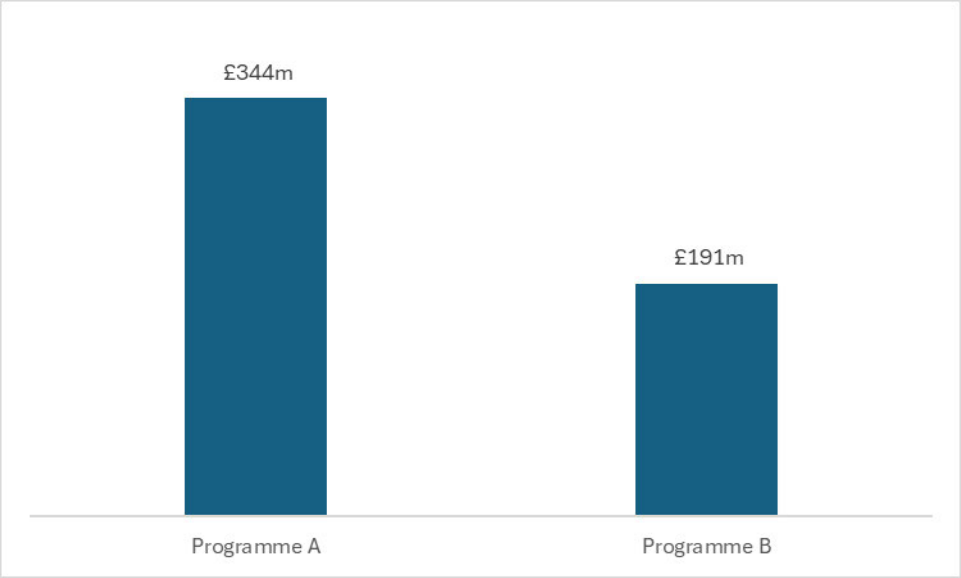
To illustrate the materiality, figure xx compares the cost of two metering programmes with identical volume of meter installations but different composition of meter types. Programme A is Thames Water's smart metering programme. The programme includes a high proportion of relatively expensive installations: of the household meters, 30% require external dig and the remaining are internal installations. In addition, we have 100k Non-Household meters with relatively high unit rates (as the premises require larger meter installs). Programme B has the same number of installations as programme A, but the metering profile is based on the actual programme of another company in the sector. It has a much larger share of simple external Household meters, >75%, and a much smaller share of the costlier internal installation, <1%. The total cost of the two programmes is calculated in the figure below using Thames Water's

unit rates, so that any difference in cost is due to the different meter and installation compositions rather than due to efficiency.

The chart shows that programme A is 1.8 times more expensive that programme B. That is, Thames Water's programme is found to be 80% inefficient even though the unit costs (ie the underlying efficiency) are the same.

The evidence shows that ignoring the composition of meters in the programme has a material effect.

Figure 1 - A comparison of total costs between two smart metering programmes of identical volumes but different composition of meter installation



The models' results are not credible

Ofwat's models result in cost forecasts that are significantly different to companies' own forecast in business plans. The comparative efficiency of companies' metering costs ranges from 40% to 190%. This wide range cannot be considered reliable; it cannot be representing differences in efficiencies across companies. It captures something else that is missing in the models.

As we say above, the models produce a unit cost for meter installations or upgrades that is a hybrid of all meter types. The unit cost may be appropriate for a company whose composition of meter types is close to the sector average, but it does not produce a sensible result for companies with a profile of meter and installation types that are significantly different to the sector average. Indeed, a few companies receive an allowance which is significantly higher than what they have requested in their business plan (e.g., Severn Trent, Welsh Water, and South Staffs). This is unlikely to be in their customers' interest, especially as this is a result of omitted factors from the models rather than genuine efficiency.

When Ofwat benchmarks wastewater treatment costs, for example, it controls for the size of the population, the size of works (to capture economies of scale), discharge quality consents and more. A wastewater treatment model that uses only a scale driver would still produce a high R-squared, but Ofwat correctly considers that it is not accurate enough and it must control for

secondary and tertiary cost drivers to improve the accuracy of the model. Why does it consider that in metering (and other areas in enhancement) it is reasonable to rely on a model that uses a single cost driver, not controlling for material secondary and tertiary effects?

The models use unreliable cost forecasts

The roll out of smart metering features prominently across most water companies' PR24 plans. However, as of today, only a select few have in-flight smart meter roll out programmes. Most companies have not yet delivered large-scale smart metering programmes, have not yet engaged with markets to secure contracts, or have engaged on a trial basis only.

Ofwat's models are based on a combination of forecast costs, some of which are based on actual contractual market prices paid by the companies with existing smart metering programmes (such as us), and others which are not based on actual contractual market prices.

We consider that giving equal weight to both types of forecasts is a flawed approach. Our cost data has been built up over nine years of smart meter procurement, delivery and data analysis. Challenging our cost (by a significant magnitude) on the basis of untested forecasts is not appropriate.

We have shared our insight and evidence with Ofwat's PR24 representatives at Ofwat's request.[10] The evidence and advice provided to Ofwat during this meeting, along with the meter/installation and area-specific work-mix evidence provided in our TMS28 WRMP Demand Reduction enhancement case, has not been utilised in the cost-model methodology used for Draft Determination.

2.2.2.2 Improvements to Ofwat's New Meter Installation econometric model

Table 9 presents results for the New Meter Installation (NMI). In column 1 we provide results for Ofwat's proposed model. Ofwat has mistakenly swapped the time and company dimensions of the panel in its Stata code of the NMI model (i.e., the time dimension of the panel is set as the firm dimension, and the firm dimension as the time dimension). Column 2 provides results after correcting this error. Column 3 presents results with the addition of a density cost driver.

Ofwat consider density as a sensible cost driver for the NMI models because "*installation costs may be higher in more densely populated areas, due to higher labour costs, aborted visits and joint supplies*[11]*"*. Ofwat reports that when it tested the density variable it was not statistically significant and had a counterintuitive negative sign. We obtain that density is statistically significant with the expected positive sign (the results hold for all three density measures). The inclusion of the density variable improves the overall fit of the model and reduces the range of efficiency scores. We consider that population density should be included in the NMI model.

[10] At a meeting held on 5 October 2023.
[11] PR24 Enhancement cost modelling appendix, p. 89.

Table 9 - New Meter Installations Econometric Models

	Ofwat's model	Ofwat's model correcting for panel setup	Ofwat's corrected model plus a density driver
Number of New Meters Installed (log)	0.977***	0.990***	0.966***
MSOA Density (log)			0.419***
Constant	5.969***	5.957***	2.705***
Adjusted R-squared	0.961	0.961	0.973
Range of efficiency scores	1.09	1.02	0.99
Removal most efficient company	G	G	G
Removal least efficient company	G	G	G
Removal first year	G	G	G
Removal last year	G	G	A
Removal most dense company	G	G	A

2.2.2.3 We disagree with Ofwat's efficiency challenge on our bulk meter unit costs

Ofwat applies a 37% efficiency challenge to our bulk meters' unit costs. This is done 'automatically', based on the application of household metering AMI 'efficiency factor' to our proposed bulk meter costs. This approach is not proportionate, not grounded in evidence and results in an unrealistic unit cost for our bulk metering programme.

Bulk meters are complex installations that require significant field labour, large equipment, greater levels of planning and approvals, and isolating mains network supplies. We have extensive experience of installing bulk meters, we understand the cost components in detail, and we are confident that our costs are efficient.

Table 10 - Factors that increase cost of bulk installations over standard household meters

- Multiple person dig gang
- Bus stop suspension and bus diversion arrangement
- Traffic management (TM) set up – 2 or 3 way lights
- Lane closure
- Bus Lane/Cycle Lane closure
- TTRO – 3 months approval
- Larger sized meters
- Concrete section chambers
- Deeper excavation
- Larger/more heavy-duty pit cover
- Concrete surround to chamber
- Carriageway reinstatement

- Parking bay suspensions (per bay) Larger/more widespread letter drop to residents
- Additional operative plus 7.5t truck to muck away individual job rather than standard HH muck away at end of day
- Mini excavator for carriageway and verge (not used on new or optant)
- Standing time waiting for mains shut waiting for Network Service Technician (NST)
- Time for NST to draw down main
- Jobs spaced further apart than New HH - increased travelling time
- towing heavier machinery – greater plant & fuel cost
- Out of hours, weekend and night working dependant on location and dig approval.

2.2.2.4 Our unit costs are based on detailed market testing and are efficient

Challenging the cost of our well-tested metering programme by 37% based on inappropriate models results in unachievable unit rates for us, which will risk the delivery of this crucially important programme.

We have been delivering smart meter installations and infrastructure for nearly 10 years. This is an area where Thames Water is a sector leader. Our costs are market tested. Unlike for many companies, our costs are informed by actual delivery costs based on tendered offerings from the market providers and continual improvement to customer engagement, installation delivery and cost efficiency.

Given the strength of the market for smart meter installations, we consider that Ofwat could depart from a benchmarking assessment of our costs. Instead, Ofwat can rely on evidence related to the robustness of our tendering and procurement and the improved cost efficiency over time as we keep up with market progress.

Considering the evidence we have provided to you on the strength of our market-tested contracts and the meter installation work-mix specific to our customer base, we consider that our proposed costs should be accepted, enabling the demand reduction delivery against WRMP and Government water targets.

In future, Ofwat could consider assessing the smart metering programmes of all companies based on the same evidence of robust market testing.

We recognise that our unit costs appear relatively high. As we highlight above, this is largely due to our work mix, some of which are due to our London service area (e.g., prevalence of internal meters).

Ofwat acknowledged that the energy sector smart metering roll-out provides useful lessons learned for the water sector. We draw Ofwat's attention to Ofgem's RIIO-ED1 decision regarding unit costs for DNO activities associated with metering roll out. Ofgem has allowed the London DNOs a significantly higher unit cost for smart meter interventions:

Figure 2 – Ofgem's RIIO-ED1: allowed unit cost of Smart Meter Interventions (£ per site, in 2012/13 prices)12

DNO	Unit rate
ENWL	326
NPgN	332
NPgY	332
LPN	422
SPN	329
EPN	315
SPD	346
SPMW	319
SSEH	309
SSES	331

2.2.2.5 The proposed PCDs are too high for the water sector and delivery profiles too prescriptive

The proposed PCDs are overly punitive and would hinder our ability to make efficient programme decisions in the interest of consumers during the AMP8 period. The plethora of prescriptive, inflexible PCDs in the PR24 draft determinations proposals, and particularly in smart metering, detract from the potential gains that the totex and outcomes framework is intended to provide.

It is important to understand and acknowledge within any PCD framework associated with smart metering, that a 95% connectivity and data success rate every day is not required to achieve the primary objective of AMI smart metering investment, which is to deliver greater volumes of demand reduction. If a daily 95% data capture success rate is not achieved, it doesn't mean that the data is lost, nor does it hinder the required demand reduction capability. AMI smart water meters do not provide customers or companies with 'live' data, so achieving 95% connectivity and data capture performance levels each day, is not necessary, nor achievable.

Through the Smart Meter Advisory Group (SMAG), performance of AMI Meters deployed across the few companies already delivering smart meter rollouts, the average connect to a network performance is around 89.8%, whilst achieving average read performance results of around 84.7%. These performance levels have been achieved in areas that provide favourable communications coverage and via a proactive rollout programme, which are unlikely to be available across all remaining regions to be smart metered.

We understand that Ofwat based the PCD completeness and connectivity thresholds on the performance of smart meters observed in the energy sector. Energy smart metering has achieved between ~80-92% of meters in "Smart Mode" since 2019 (DESNZ annual reports), as highlighted by Ofgem in 2023. These energy sector performance levels are significantly lower than the PCD levels proposed by Ofwat. These lower performance levels quoted from smart energy meters are from meter devices that are located inside buildings, protected from environmental impacts, within wi-fi range and connected to a power source. It is important to

12 RIIO-ED1: Final determinations for the slow track electricity distribution companies, Detailed figures by company, November 2014 page 23.

highlight that water meters will be exposed to much more difficult operating environments - typically being installed outside, partly exposed to temperate and weather impacts, buried under pavement, using a battery. It is also important to note that the energy sector benefits from the common network infrastructure, the Smart DCC, which is not available in the water sector.

The proposed PCDs for connectivity and read success would inappropriately influence choice of technology as high resilience is required to meet these thresholds. This limits options, choice and vendor competition. The proposed PCDs will result in meter rollouts being focussed in areas where there is a high confidence in connectivity, rather than where there is a priority to reduce demand. This does not support technologies where an AMI comms network roll-out follows the meter roll-out. The market would be skewed toward the highest cost providers and/or to networks that are already in place, limiting innovation as it imposes a barrier to new solutions emerging into the market with time to prove performance at scale.

Meters configured to meet the proposed PCD target levels for connectivity and data capture are likely to consume more battery power to improve connectivity success. This would result in batteries being depleted more rapidly thus reducing asset life. This could cause unintended cost impact for customers with meters needing to be replaced more frequently.

Any PCD associated with performance needs to account for these influencing factors when benchmarked against energy sector performance levels. Any PCDs should allow more flexibility and account for more challenging installation areas and new emerging communications options.

Whilst our metering programme is based on extensive surveying and previous delivery experience, it would sometimes be necessary to amend our plans considering new information received from the teams on the ground, once they begin the work. This is to be expected in any operational environment. Therefore, we believe that Ofwat should complement the PCD regime with an appropriate uncertainty mechanism (e.g., caps and collars on the volume of meters delivered) to allow us the flexibility to make the best operational decisions in the interest of consumers.

2.2.2.6 Updates and clarifications

We have amended the proposed scope of our AMP8 metering programme (and, as a result, our AMP8 water efficiency programme) in a revised submission, and as such the data submitted in Tables CW3, CW7 and CW8 has changed significantly. We have adopted the same cost estimation approach as in our original submission in this submission. The metering programme set out in our October 2023 business plan submission was founded on the assumption that we would deliver our proposed Green Economic Recovery (GER) metering programme in AMP7. Following Ofwat's decision not to amend the funding conditions for the scheme, Thames Water was left with no option but to cancel the GER programme.

We have adjusted our AMP8 metering programme to re-profile the meter installations initially included within the GER scope, taking into account insight gained from the survey programme which was carried out prior to the decisions referenced above. As a result, we have significantly increased the proposed size of our selective metering programme (known as PMP), and the water efficiency programme.

We note that our October 2023 submission of Table CW3 included a number of errors, such as incorrect enhancement expenditure requests for Smart Metering Infrastructure, meter upgrades, water efficiency and new meters. We have since revised our CW3 submission to correct for these errors. Given that Ofwat's cost models use data from Table CW3, we would request that, if they are used, the cost models are re-populated with correct data per our revised submission.

Regarding the inconsistencies raised in Ofwat's deep-dive of our Bulk meter unit-rates. We acknowledge a typographical error in Table 5.2. The meter unit-rates contained in Table 5.1 are the correct meter unit-rates to use for the various types of bulk meters.

2.2.3 Summary of our request for FD

We request Ofwat to accept our proposals as efficient. Our smart metering contracts have been tendered competitively and are based on 10 years of experience.

We request Ofwat to amend the NMI model to include density and to request additional information to train a model with more explanatory variables (e.g., the model should distinguish between internal and external installations).

We request that Ofwat reconsider the PCDs that are proposed for metering as these will limit ability to make efficient programme decisions in the interest of consumers.

We recommend that Ofwat consults directly with the SMAG and a range of smart metering delivery providers in the water sector (communication providers in particular) to develop sector-appropriate performance levels.

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2.4 WINEP7 carry-over

2.4.1 Brief outline of Ofwat's position

We requested funding of £106m for several water resources items that are being carried over from AMP7. Ofwat proposed to provide £97.7m alongside PCDs to protect customers.

2.4.2 Thames Water arguments and supporting evidence

We are unclear how the PCD rates have been calculated as there is a significant discrepancy between the values included in the Business Plan and the values in the PCD. There is also a difference in the number of solutions included as detailed in Table 19.

Table 19 - Reconciliation of Draft Determination and Business Plan submission for Water Resources AMP7 carryover

Non-delivery PCD payment (WINEP action ID)	Payment rate (£m)	Scheme Name	Funding requested in BP £m	Comment
7TW100007	7.416	BEXLEY PUMPING STATION	56.3369	
7TW100008	7.416	BEXLEY PUMPING STATION		
7TW100044	23.709	HAWRIDGE PUMPING STATION	35.559977	
7TW100021	6.604	CHINGFORD SOUTH - RIVER LEE DIVERSION	0	
7TW100064	23.709	RIVER RESTORATION PROJECTS - CHESS	0.067076	
7TW100065	6.604	RIVER RESTORATION PROJECTS - LOWER LEE	0.167494	
7TW300092	7.416	Upper Cray Restoration		
7TW100009	7.416	Upper Darent Restoration - SUNDRIDGE PUMPING STATION	0.058735	
7TW100081	7.416	Upper Darent Restoration - WESTERHAM HILL PS		
7TW300085		Nitrates river lee	12.818556	Missing
7TW200851, 7TW200855, 7TW200852, 7TW200853		Fish passes	0.434871	Missing

It is unclear what has driven the changes to the payment rates for these solutions and how this has driven the PCD; there are also some schemes missing from the cost assessment. We assume that there may have been a misunderstanding with how costs were allocated.

We are confident in the costing process that was completed for the current scope of the schemes. These costs are based on the latest cost forecast completed by the project managers, although for one scheme this is still under review to take account of live developments due to the HS2 railway project. To achieve alignment, we therefore suggest that the business plan submission values requested should be used as a basis for the PCD.
An example of the cost variation is for 7TW100064, based on our project cost forecast we requested £0.067076m, but as shown in the above table the PCD allocated £23.7m to this scheme. It is not reasonable to anticipate this level of spend for this project or assign a PCD to it, and we therefore request alignment between the PCD rates and the project costs.

2.4.3 Summary of our request for FD

We request the PCD rates to be aligned with the costs submitted in our Business Plan and may need to include the schemes missing from the cost assessment as shown in Table 19.

2.4.4 Summary of reference documents supplied for this section

1	Thames Water PR24 DD Response - Strategic Resource Options

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2.6 Lead

2.6.1 Brief outline of Ofwat's position

Ofwat triangulated an econometric model and industry median unit cost for pipe replacement programme and undertook a shallow dive on the customer trial element.

The assessment results in a 12.5% efficiency challenge to our forecast: we requested £94.06m and received £82.25m.

Ofwat did not challenge the proposed volume of work.

2.6.2 Thames Water argument and supporting evidence

We make two points of representation in relation to the approach to lead. The first relates to an error in our tables which needs correcting. The second relates to the assumed profiling of work across the AMP8 period.

2.6.2.1 Data correction

There is an error in table CW3 lines 106 (lead comms pipe replacement) and 115 (other lead activity). Line 106 states overall costs to be £91.873m but should have stated £85.435m. Line 115 states £2.187m but should have stated £8.625m.

The error above was noticed before business plan submission but was too late to correct. We highlighted the error in the data table commentary (stating the overall funding request for Lead was correct, but the split between the two elements was not - the Enhancement Case document clearly showed the correct split).

2.6.2.2 Profiling of work

Due to the reduction in the rate of replacement in 2024-25[13] we will not be able to ramp up enough during 2025-26 to achieve the current target of 10,800 lead comms pipes replaced.

[13] We will still deliver at least the overall AMP7 target of 53,837, we were ahead of programme and looking for further investment to maintain replacement rate, but this could not be secured.

Our new programme profile is provided in table 20, with the overall AMP8 volumes of lead pipes replaced remaining unchanged.

We ask that Ofwat accepts our re-profiled lead programme, which delivers the same outcome for customers under a Totex approach.

Table 20 - our lead communication pipe replacement programme for AMP8

	2025-26	2026-27	2027-28	2028-29	2029-30	AMP Total
Original	10,800	10,800	10,800	10,800	10,800	54,000
New	8,000	11,500	11,500	11,500	11,500	54,000

2.6.3 Summary of our request for FD

1. Correct our data error in table CW3 and address implications for efficiency assessment.
2. Adjust the replacement target of lead comms pipes per our new programme in table 20.

2.7 Cryptosporidium Protection

2.7.1 Brief outline of Ofwat's position

Ofwat has introduced a "large scheme gated process" to fund our proposed cryptosporidium protection schemes, with an initial development funding of 6% (~£10M).

Revenue will be logged-up after passing through each decision gate.

2.7.2 Thames Water argument and supporting evidence

We are comfortable with a gated process for this important investment. However, we would expect it to be streamlined, effective and aligned with other milestone related items (eg DWI Notices) to prevent it becoming unnecessarily onerous and open to conflicting timescales and reporting requirements.

We are concerned that a "logging-up" or "true-up" approach without any upfront funding will add significant cashflow pressure, which we may struggle to accommodate. We consider that a more appropriate approach is whereby we receive a conditional allowance ex-ante, with appropriate customer protection mechanisms (similar to the approach employed for our conditional allowance at AMP7). This approach provides a better alignment of customer charges and the benefits they receive through the schemes.

2.7.3 Summary of our request for FD

- Ensure that the gated process is efficient and aligned to other reporting / gated-type processes
- Change the logging-up approach to more of a conditional allowance approach, conditionally applying funded allowances which are protected through the gated process

2.8 Reservoir safety

2.8.1 Brief outline of Ofwat's position

As part of our Asset Health enhancement case, we included costs to address emerging reservoir safety risk. Specifically, the reservoir safety costs are associated with the inspections of 45 reservoir cells and one contact tank that would be affected by changes to the reservoir capacity threshold under the Reservoirs Act 1975 size (from 25Ml to 10Ml).

Ofwat reallocated these costs (£11m) from our Asset Health enhancement case to a common assessment of companies' plans for reservoir enhancement.

Ofwat proposes to reject these costs in the Draft Determination, as the change to the Reservoir Act has not been brought into force in England and there is currently uncertainty as to the timing of any change.

2.8.2 Thames Water argument and supporting evidence

The latest update from the EA is that the change to the Reservoir Act is expected around 2027 or earlier if the Environmental Permitting Route is used. Both Defra and the EA are actively pushing to implement this change.

In light of that, we consider that an uncertainty mechanism to recover these statutory costs is appropriate.

We also consider that given that this change is expected to happen sooner or later, and that making our reservoirs safer is decidedly in the interest of Thames Water and our customers, providing funding for our proposed schemes would be the most appropriate regulatory approach.

2.8.3 Summary of our request for FD

We consider that our request for enhanced reservoir inspections arising from reform to the Reservoir Act should be funded. As a minimum, an uncertainty mechanism to recover statutory reservoir safety costs should be implemented.

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2.10 Leakage Enhancement

2.10.1 Brief outline of Ofwat's position

Ofwat proposes 44.43 Ml/d of leakage reduction be funded as enhancement. This volume comprises the portion of our planned leakage reduction which is set out to be delivered through pressure management and calm systems, and mains replacement/rehabilitation.
Ofwat allocates £47.9m of enhancement funding, calculated using a unit rate of £1.11m per Ml/d of leakage reduction, and adjusting for the expected leakage benefit of the asset health base uplift.

Ofwat states that Thames Water should increase its ambition for leakage reduction, in line with comments made regarding the rdWRMP24. We have confirmed through a query that this increased ambition would be funded through a commensurate increase in leakage enhancement expenditure allowance.

In addition to the 44.43 Ml/d of leakage reduction to be delivered through enhancement, 51.77 Ml/d of leakage reduction is planned for delivery through customer-side leakage fixes (enabled through our smart metering programme) and carryover benefit from our AMP7 activities.

2.10.2 Thames Water argument and supporting evidence

Our response to Ofwat's leakage enhancement allowance covers two primary points:

1. The unit rate allowed is too low. It has been calculated using a flawed approach. £1.11m per Ml/d is not sufficient.
2. We quantify the additional leakage reduction which we have included in our revised PR24 submission, and which we will include in our final WRMP24.

2.10.2.1 Unit rate:

Ofwat's proposed unit cost of £1.11m does not provide sufficient funding to deliver the required leakage reduction, putting at risk the sustainable delivery of our PC and, more importantly, demand reduction and resilience, which is not in the interest of our customers or the environment.

We consider that the method used to derive the unit rate is flawed for the reasons outlined below. The method compares the leakage reduction expenditure and leakage reduction reported by companies to derive an industry median unit rate (£m per Ml/d leakage reduction). This is conceptually sound; however, the selective use of data and statistical methods applied in the calculation bias the result. We therefore consider that the resultant unit rate is not representative of the cost of reducing leakage.

Firstly, only two years of data are included (2019/20 and 2021/22) 'due to the weather in these years being less extreme', presumably to avoid the results being impacted by weather-induced leakage. However, this approach does not consider that the analysis looks at leakage reduction compared to the previous year. The years 2018/19 and 2020/21 did include severe weather events and significant weather-induced leakage and as such the leakage reduction in 2019/20 and 2021/22 include significant recovery from bad weather events in the preceding years. This recovery does not represent sustainable reduction in underlying leakage but rather the absence of seasonal breakout, meaning that the approach used overinflates the leakage reduction delivered and therefore underestimates unit rates. It would be more appropriate to look at leakage performance and expenditure over a longer period, like 2017/18 to 2021/22.

Secondly, the analysis assumes that leakage reduction (as measured by change in annual average leakage) corresponds to the leakage reduction expenditure in year. In fact, the annual average calculation means that half the leakage reduction expected from a given intervention/expenditure falls into the subsequent year. When the spend profile is uneven, the mismatch between leakage reduced and expenditure on leakage can distort the analysis, particularly when selecting individual years as mentioned above. For this reason, an approach that considers leakage reduction and associated expenditure over a period of several years is more reliable.

Thirdly, data points have been excluded when leakage reduction is negative. Leakage performance year-on-year is the net result of leakage recurrence and mitigating interventions, such as leak repairs. In some years, the underlying increase in leakage due to weather events is so great as to mean that, despite their best efforts to fix leaks and significant expenditure, companies are not able to keep pace with rates of recurrence, and leakage increases. Excluding years with negative reduction (ie, leakage increase) ignores the fact that the underlying rate at which leakage occurs can increase because of variable exogenous factors (eg bad weather), and that this influences the year-to-year change in leakage. Given that our PCLs are, by virtue of being based on a 3-year rolling average, measured to include such events, it is inappropriate to exclude this phenomenon when calculating industry median unit rates. Only including periods where companies achieve a net reduction compares the best performance across the industry and excludes the worst, therefore not representing the industry median.

Finally, given the need to include periods - and companies - when leakage reduction is negative, the metric calculated (£m per Ml/d) is inappropriate for calculating the median cost performance. This is because the metric is inversely proportional to cost performance. This means that when including negative leakage reduction (and hence unit rate), ordering companies from highest to lowest unit rate does not order them worst to best cost performance. Consequently, the 50th percentile (median) of such a set of company unit rates does not represent median cost performance. We consider that Ofwat should instead calculate the median 'Ml/d leakage reduction per £m', which is directly proportional to cost performance, and then invert this figure to determine the industry median unit rate in £m per Ml/d.

Our proposal to Ofwat is that the unit rate should be calculated:

- Based on leakage expenditure and reduction over a longer time frame, eg 2017-18 to 2021-22 (in order to ensure that the extreme weather of 2022-23 does not bias the endpoint) or even up to 2023-24.
- Inclusive of any companies reporting a leakage increase over the chosen time frame
- By of comparison of Ml/d per £m across the industry, finding an appropriate figure for this value from industry-wide analysis, and then inverting it.

Using the data from the Ofwat cost model and considering a longer time period (2017-18 to 2021-22, removing data where companies had reported £0 in "reduce expenditure"), the table below demonstrates that the allocation of a £1.11m per Ml/d unit rate is not appropriate. This analysis suggests the median company delivers 0.36 Ml/d of leakage reduction per £m spent. When inverted, this would mean that the median company would need to have spent £2.78m per Ml/d of leakage reduction. Our consideration is that this value, adjusted for the more expensive work mix which will come from ever reducing leakage levels, would be a more appropriate enhancement allocation.

Table21 - Leakage Reduction Achieved and Expenditure on Leakage Reduction over the period 2017-18 to 2021-22, excluding years where £0 leakage reduction expenditure is reported, using data from the Ofwat leakage enhancement cost model.

Company	Total Leakage Reduction (Ml/d)	Total "Reduce Expenditure" (£m)	Ml/d Leakage Reduction per £m
AFW	18.42	69.19	0.27
ANH	11.31	70.11	0.16
BRL	10.77	6.34	1.70
HDD	-1.80	0.51	-3.50
NES	16.26	4.08	3.99
NWT	25.33	50.56	0.50
PRT	3.44	4.64	0.74
SES	2.81	7.74	0.36
SEW	-0.03	8.23	0.00
SRN	-8.71	9.65	-0.90
SSC	4.22	6.29	0.67
SVE	-17.08	37.59	-0.45
SWB	12.95	31.05	0.42
TMS	83.32	231.68	0.36
WSH	18.02	12.21	1.48
WSX	5.04	62.28	0.08
YKY	12.08	83.57	0.14
		Median (Ml/d / £m)	0.36
		Invert to Unit rate (£m / Ml/d)	2.78

Further to the analysis above, we have concerns that the proposed unit rate of £1.11m does not seem representative when considering additional context. The allowance given at PR19 was £2.03m per Ml/d (£2.4m per Ml/d, when adjusting from 17/18 to 22/23 prices), based on the industry median from company deep dive assessments. Additionally, as companies strive for ever lower levels of leakage, there is less scope for more cost-effective leakage reduction techniques (e.g., pressure management) as the most cost-effective interventions will already have been addressed, and so a higher unit-rate for leakage reduction would be expected.

2.10.2.2 Additional Leakage Reduction Included in our Plan:

In line with Ofwat's recommendation within the Draft Determination that Thames Water should increase our leakage reduction ambition, and on the basis of the advice provided in the letter which gives Thames Water permission to publish its final WRMP24, we have included additional leakage reduction in our revised business plan. An additional 1.8 Ml/d of leakage reduction is

planned for delivery in the SWOX water resource zone, without adjustment to the leakage reduction plan in other water resource zones. We have included an additional enhancement funding request on this basis. This additional leakage reduction has also been reflected in the revised PCL forecast for leakage.

2.10.3 Summary of our request for FD

- We request that Ofwat changes the approach used in assessing the unit rate for leakage reduction. The approach should consider a longer time period (2017-18 to 2021-22, rather than 2019-20 and 2021-22 only) and the industry median should be calculated on the basis of Ml/d leakage reduction delivered per £m (before then being inverted to give a unit rate in £m per Ml/d).
- We have increased the ambition of our leakage reduction programme and have included a commensurate increase in the enhancement expenditure request for leakage reduction.
- In line with the two points above, we have amended our enhancement expenditure request to include £139.6m, in order to deliver 46.23 Ml/d of leakage reduction.

2.11 Non-SROs

2.11.1 Brief outline of Ofwat's position

Ofwat uses a unit cost approach to determine allowances for supply enhancement, as per PR19. Ofwat builds on the PR19 approach by splitting water supply schemes into five complexity/asset intensity categories, each with a separate unit cost.

Ofwat allows Thames Water an additional £66.97m to achieve 18.06 Ml/d of supply benefit by delivering more interventions than planned (potentially bringing some forward) over the 2025-2030 period. This allowance has been calculated by using Ofwat's modelled unit cost rate for options of a medium complexity.

All the non-SRO options are subject to PCDs, with the PCD calculated based on Ml/d of WAFU benefit delivered.

2.11.2 Thames Water argument and supporting evidence

We welcome the additional funding allocation for the delivery of new supply-side schemes. However, we have some concerns regarding the suitability of the unit cost applied and the proposed PCD.

Separately, we challenge the appropriateness of the PCD mechanism for the Didcot licence transfer scheme.

We discuss each of these points below.

2.11.2.1 Additional supply schemes: unit cost

The cost of a new supply option is a function of the engineering and environmental design requirements of that specific option. For non-SRO options in our plan, which have not received the same degree of highly detailed consideration as the SROs, there may be design or scope changes which impact the cost of delivering WAFU benefit. We accept that Ofwat needed to

make an assumption for the unit cost to give us an indication of the funding allowance. However, the final design of the scheme/s may mean that efficiently designed and constructed schemes may cost a different amount to the set allowances. We would like a statement of comfort from Ofwat that it would allow us to use a different cost rate for the new supply options, subject to us demonstrating the costs are efficient, and/or a discussion regarding cost adjustment mechanisms in relation to the allowances set for non-SRO supply schemes.

2.11.2.2 Additional supply schemes: PCD

Benefit uncertainty

The proposed PCD is not appropriate for a scheme/s yet to be designed in detail: it is too prescriptive and fails to recognise the uncertainty inherent in delivery of new supplies. The actual yield of some new schemes, particularly new groundwater schemes, may be different to that anticipated at the conceptual design stage. The PCD should either be set for individual schemes after detailed design is completed (subject to substitution arrangements by agreement with Ofwat), or it should be set to include a dead band to account for uncertainty in WAFU delivery.

Further to the above, some of the potential new schemes are at risk of being deemed infeasible due to the Water Framework Directive licence capping policy (the policy could cap licences of many sources and would inhibit the granting of new licences). To fully investigate whether a given scheme can be licensed under this new policy we need to carry out further investigations and modelling. We propose that, where a licence capping or WFD No Deterioration issue prevents or delays a scheme from being delivered, the PCD should not apply on the basis of limited management control.

Programme risk

The PCD does not explicitly state the penalty rate that would apply at the end of AMP8 if the WAFU benefit is delivered in AMP9. Following Ofwat's recent query response, our understanding is that Ofwat may adopt a different rate to incentivise companies to deliver WAFU benefits within AMP8 without disincentivising them from continuing to develop schemes if there are changes to the programme timeframe.

Ofwat should clarify this penalty rate in the Final Determination.

2.11.2.3 Didcot licence transfer scheme: PCD

Our contractual agreement with RWE for the abstraction licence transfer includes a clause which allows the agreement to be terminated within the AMP. The agreement is due to expire in 2030. RWE's decision to terminate the agreement within AMP is outside our management control.

Therefore, we propose that the PCD for this temporary scheme is set on the annual basis, £m / per Ml/d / per year (as opposed to £m per/ Ml/d as is the case for long-term supply schemes). The PCD rate should be calculated by dividing the cost allowance by WAFU benefit, divided by 5 years. This results in a figure of £0.14m per Ml/d per year.

2.11.3 Summary of our request for FD

We would like a statement of comfort from Ofwat that it would allow us to use a different cost rate for the new supply options, subject to us demonstrating the costs are efficient.

The PCD for the new schemes should be amended to better reflect benefit uncertainty at this early development stage and risks associated with WFD licence capping policy. Ofwat should

also provide greater clarity on the calculation of AMP8 PCD where programme delivery changes mean benefits are delivered in AMP9.

We propose an alternative PCD for Didcot licence transfer scheme, given limitations of our management control should RWE choose to terminate the agreement in-AMP.

3. Wastewater enhancement cases

3.1. WINEP storm overflows

3.1.1. Brief outline of Ofwat's position

Ofwat assessed our green solutions, FFT and outlier sites using a deep dive approach, and our grey solutions using benchmarking models.

Based on a deep dive assessment Ofwat applied

- A 67% (£26.8m) cost challenge to our green solutions, 30% due to insufficient evidence that our solutions represent the best option for customers, and 37% due to insufficient evidence that the costs are efficient.
- A 60% (£43.3m) cost challenge to our wetlands solutions, based on additional modelled information on wetlands through outturn data.

We received a 29% (£100.4m) challenge to our FFT schemes based on a combination of the grey solution efficiency rates, and a 75% (£35.5m) challenge to our proposed costs for outlier sites. Based on benchmarking models, we received a 19% (£39.1m) efficiency challenge to our network grey solution and a 45% (£50.9m) efficiency challenge to our treatment grey solutions.

Ofwat has revised our proposed PCD and introduced a time penalty misaligned to the regulatory completion dates.

3.1.2. Thames Water argument and supporting evidence

Below we set out our representation in relation to Ofwat's proposal for storm overflows. Our representations address the following elements:

- Single cost model variable used in draft determination.
- Interpretation of our submission.
- Benefits from green solutions.
- Land costs, size and location of green solutions.
- Optioneering and alternative solutions.
- Wetlands cost efficiency.

3.1.2.1. Cost model variables

Ofwat's cost models use one variable to determine efficiency – total equivalent storage volume. This approach is does not account for the range of options considered or other significant cost factors.

In particular, this approach does not provide consistent and reasonable estimations for flow to full treatment and sewer relining activities, exacerbated by a lack of standardised methodology for calculating the equivalent storage provided by these solutions. For these activities, we recommend that other cost model variables could better aid Ofwat in their assessment. Specifically, the PE of the sites subject to hydraulic capacity upgrades to increase flow to full treatment or the l/s, or the km and diameter of sewers and number of manholes relined are a more unambiguous and representative cost model variable. We would be happy to provide this data.

Our previous Business Plan data table for storm overflow did not include any quantified measure of total equivalent storage volume for these solutions in our previous submissions as there is no

standard way to calculate this. The data table ADD20 in this submission of our plan now includes our estimated equivalent storage delivered by flow to full treatment and infiltration management solutions. In some case this has resulted in a material increase in forecast equivalent storage volume.

3.1.2.2. Interpretation of our submission

Ofwat assessment is based on the apparent location of the interventions, based on the location of the storm overflows being either at sewage treatment works or in the network. However, only nine of our schemes are currently planned to be delivered either in the network or at STW (i.e., they are a single technology solution). All other 99 schemes are hybrid solutions, for which individual element and technologies of the overall solutions are delivered at different location and/or are of a different category (green / grey).

The detail of technologies according to Ofwat CWW3 categorisation constituting our hybrid solutions are tabulated in TMS-DD-100: PR24 WINEP EC supporting evidence - Storm Overflows schemes scope.xlsx. We have also added the information of which schemes are to be considered hybrid solutions in ADD20 data table.

3.1.2.3. Benefits from green solutions

The development of our storm overflow programme was aligned with the Environment Agency guidance on options development and benefit assessment, as demonstrated by the independent assurance reports, available as supporting evidence TMS-DD-101: PR24 WINEP EC Supporting evidence - WINEP and storm overflows assurance.zip.

Whilst we have quantified the wider environmental outcomes for each solution of our long-term Storm Overflows programme (AMP8-12), the individual benefits of SUDS have not been quantified in relation to the uncertainty related to scope and specific technologies to be deployed in each catchment. In our optioneering process, we have focussed on the benefits provided by delivering the outcomes and the material additional benefits individual solutions would provide, in reason of the Environment Agency guidance on proportionality in approach. In general, for options we have submitted in our plan as best value options despite having underestimated the benefits, a full benefit assessment would confirm the value of the choice.

Furthermore, the benefits provided by green solutions above and beyond traditional grey solutions are widely recognised by academic and industrial literature. Additional evidence and background information can be found in TMS102: PR24 WINEP EC supporting evidence - storm overflows green solutions benefits.

3.1.2.4. Land costs, size and location of green solutions

In the green solutions deep dive, Ofwat raised specific concerns on the cost efficiency of these solutions. Notwithstanding the additional information and evidence provided above, we believe our costs are efficient and in particular:

- Our costs include and are representative of the land costs in the London and Thames Water region, which are significantly higher than other regions in the country.
- Our costing is based on the experience of our Surface Water Management Programme detailed above in the “Benefits of green solutions” section. The majority of these schemes are small scale, local and bespoke interventions in the catchment. The urbanisation characteristics and constraints, as well as the geomorphology and geology of the region we serve drives us to identify this category of interventions.

- The green solutions we are proposing are part of larger hybrid solutions in London and in the Thames region at 56 locations of the 108 actions.

Additional evidence and background information (inclusive of the list of sites we plan to deploy green solutions) can be found in the annex TMS-DD-103: PR24 WINEP EC supporting evidence - land costs and location of interventions.docx.

3.1.2.5. Optioneering and alternative solutions

We detailed our approach, optioneering process and the alternative technologies and options considered in our Options Development Report and methodology, available as annex respectively in TMS-DD-105: STORMOVERFLOWS_ODR.pptx, and TMS-DD-104: PR24 WINEP EC supporting evidence - Storm Overflow assessment methodology.pdf. However, please note that whilst the methodology is still valid, the Options Development Report presents our programme as submitted to the Environment Agency in January 2023.
As demonstrated in these documents, we have carried out an extensive optioneering and considered alternative technologies and options where local conditions allowed. We have also carried out a cost-benefit analysis of each solution for all our sites within our whole long term AMP8-12 programme to define our best value AMP8 programme.

Evidence of independent assurance on the optioneering methodology we followed in the development of our WINEP programme as well as its adherence and alignment with the Environment Agency Solutions Development methodology can be found in TMS-DD-101: PR24 WINEP EC Supporting evidence - WINEP and storm overflows assurance.zip.

3.1.2.6. Wetlands cost efficiency

Ofwat carried out a deep dive on solutions including wetlands where our wetlands solutions were considered to be outliers. The intention for these integrated constructed wetlands in our original submission was to provide (partial or full) treatment of the stormwater as a green alternative to standard grey flow to full treatment hydraulic capacity increase.

In our representation, we address Ofwat concerns by aligning our scoping and costing to the approach seemingly adopted by the other water companies: deploying wetlands to deliver a green alternative to storage solutions. Most of the solutions proposed in our revised submission have been designed by considering a depth of approximately 0.5m.

While this has materially reduced our costs, we expect these will still be comparatively higher than other water companies as a result of land costs. Please see the section “Land costs, size and location of green solutions” above for specific supporting evidence on this topic.

This review implied that for one of the sites which we previously submitted a wetland as a solution, this is no longer the best value option. Instead, a conventional grey hydraulic increase of flow to full treatment became the preferred option according to the Environment Agency WINEP guidance and this is reflected in the data tables submitted in this representation.

3.1.2.7. Concerns related to PCDs

Ofwat’s approach to setting PCDs is linked to activity types, not outputs. While this is logical to flow through the cost allowance modelling, it does not reflect how schemes will be delivered;

where multiple activities (such as screening, wetlands, sewer lining, flow to full treatment, storage) may be combined to fulfil the target spill frequency objectives. By setting individual rates for sub-components of actions, this constrains the ability for companies to, for example, further develop the schemes by working with third parties, or finding innovative or alternative solutions offering better value or outcomes. This approach unnecessarily introduces complexity that will be difficult for customers to understand and for companies to administer/evidence. This could be overcome by setting a rate by overflow akin to the WINEP phosphorus PCD.

We also expect that this will only apply to schemes that have been funded as part of the Final Determination, and any schemes that are agreed for inclusion on a Delivery Mechanism would not be subject to achieving outputs in AMP8.

Additionally, Ofwat has set material timing incentives for "under performance" (potentially incurring up to £19m in penalties) that are not aligned to regulatory delivery dates. Delivery in line with regulatory deadline should not be considered "under performance" and should not incur penalties. Early delivery is already incentivised through the Storm Overflow Performance Commitment.

3.1.2.8. Changes to our Storm Overflow programme since our submission

Since we submitted our Business Plan the WINEP has been updated with some changes to our Storm Overflow programme for AMP8. These changes have been agreed with the Environment Agency. Specifically:

- Following the designation of Wallingford Beach as a bathing water, the overflow at Benson STW has been added with a EnvAct_IMP3 driver to achieve the <2 spills per bathing season objective.
- Two sites have been assessed as requiring early upgrades under the Urban Wastewater Treatment Regulations (U_IMP4 driver) – namely Bletchingdon STW and Holmwood STW.
- Following investigation, 15 sites have been assessed as no longer requiring investment and have been removed from the programme.
- Fourteen sites formerly planned for AMP9 have been accelerated into AMP8.
- One site has been deferred to AMP9 to balance the programme in terms of numbers of outputs and overall cost (before the new bathing water designation added Benson).

These changes are presented in our updated data tables and evidence available as annex to this document.

3.1.3. Summary of our request for FD

We ask that Ofwat:

- Incorporates the changes to our Storm Overflow programme in the assessment
- Develops a cost model for flow to full treatment cost allowances, using either STW PE or the increases in litres per second capacity as the explanatory cost variable.
- Reconsider the deep dive on green-only schemes, in consideration of these schemes being hybrid solutions.
- Revises the PCD structure and rate to be per outcome (i.e., per site, and per number of storm overflows discharges reduction), not split by activity
- Revises the PCD outputs to match the agreed outputs for AMP8, with schemes agreed for inclusion on a Deliverability Mechanism removed.
- Revises the PCD timing incentive to match the regulatory delivery dates.

3.1.4. Summary of reference documents supplied for this section

1	TMS-DD-100: PR24 WINEP EC supporting evidence - Storm Overflows schemes scope.xlsx
2	TMS-DD-101: PR24 WINEP EC Supporting evidence - WINEP and storm overflows assurance.zip
3	TMS102: PR24 WINEP EC supporting evidence - storm overflows green solutions benefits
4	TMS-DD-103: PR24 WINEP EC supporting evidence - land costs and location of interventions.docx
5	TMS-DD-105: STORMOVERFLOWS_ODR.pptx
6	TMS-DD-104: PR24 WINEP EC supporting evidence - Storm Overflow assessment methodology.pdf

3.2. WINEP phosphorus

3.2.1. Brief outline of Ofwat's position

Ofwat used four models for the assessment of phosphorous removal costs. Two models use historical costs, and two models use forecast costs (equally weighted). The models are done at scheme level, excluding outlier sites. One outlier site (Rye Meads STW) has been placed under a gated allowance.

Ofwat has revised our proposed PCD and introduced a time penalty misaligned to the regulatory completion dates.

3.2.2. Thames Water arguments and supporting evidence

We raise the following points regarding Ofwat's approach:

- Data by Anglian Water reduces models' quality.
- Ofwat's historical models perform poorly and should be removed from the cost assessment;
- We disagree with Ofwat's use of current population equivalent (PE) and maintain that design PE should be used instead;
- Ofwat's models do not adequately capture implications of enhanced permits and particularly stringent permits on company allowances, resulting in under-estimates of costs associated with the most stringent permits;
- Ofwat's modelling approach results in systematically higher efficiency challenge to larger schemes.

In line with its PR19 approach, Ofwat should provide an additional allowance for schemes with stringent PR24 limits where this results in a significant increase in the local and regional sewage sludge production.

We agree with Ofwat's approach to PCDs. However, Ofwat should correct the proposed timing incentives where they do not align with the statutory deadlines.

We discuss these points in turn below.

3.2.2.1. Anglian Water's influence on the models

Ofwat reports that it has reassessed the PR19 p-removal models but found that the models were not sufficiently robust and that the coefficients of the number of enhanced sites and the number of schemes with p-permit below 0.5mg/L were negative, which is contrary to engineering rationale.

In light of the above, Ofwat moved to using richer data based on scheme level information rather than company level information.
While there may be good reasons to explore p-removal models based on scheme level data, the fact that the PR19 models were not robust and produced counter-intuitive coefficients should raise alarm bells. After all, the PR19 models performed well at PR19, with R-squared of 0.92 and 0.94 respectively. The models are simple, each with two intuitive cost drivers, and therefore they should not produce counter-intuitive coefficients unless there are some serious issues with the underlying data.

Examining the Cook's Distance for the presence of outlier, we identify that Anglian Water stands out. Its Cook's Distance value is far greater than any other company.

Table 22 – Cook's Distance at the PR19 p-removal models

Company	PR19 model 1	PR19 model 2
ANH	1.86713	3.8162
NES	0.26366	0.1134
SRN	0.00212	0.0127
SWB	0.00946	0.0025
TMS	0.04774	0.0289
UUW	0.00558	0.0118
WSH	0.00039	0.0038
WSX	0.31196	0.3010
YKY	0.00001	0.0001
SVE	0.00002	0.0032

This insight was confirmed when we examined modelling results after removing one company at a time. We identified that Anglian Water has a large impact on the estimation, and that when we remove it from the sample, the PR19 models become reasonable again.

The table below shows results of the PR19 models with and without Anglian Water. The models with Anglian are not robust and have counter-intuitive coefficients. When excluding Anglian, the models have a high R-square, the coefficients on the number of enhanced sites has the expected positive sign in both models and are only marginally insignificant. (Given the credibility of the results, marginal insignificance in reference to a random threshold of significance should be acceptable.)

Table 23 – PR19 P-removal models with and without Anglian Water

	PR19 model 1	PR19 model 2

	All companies	Exclude ANH	All companies	Exclude ANH
Current PE	0.358***	0.342***	0.386***	0.317***
Enhanced Sites	-1.259 (0.594)	2.87 (0.156)		
Enhanced Sites <0.5mg			-2.461 (0.352)	4.502 (0.112)
constant	210.039	-31.472	199.817	14.278
R2_Overall	0.714	0.908	0.738	0.916
RESET P_value	0.662	0.903	0.671	0.127
Observations	10	9	10	9

* p<0.10, ** p<0.05, *** p<0.01. For lower levels of significance we provide the P-values in brackets.

Ofwat may also wish to consider removing Anglian from its scheme level models. Our analysis shows a significant improvement in the fit of three out of the four models.

In principle we welcome an attempt to use scheme level data to produce more robust and accurate models. In practice, we consider that the data quality at the scheme level is not as robust as at a programme level (i.e., at the company level) due to, for example, cost allocation of overheads across schemes. When addressing data outliers, company level models perform well, with significantly better diagnostics than scheme level models. We consider that at the minimum Ofwat should use company level p-removal models in its suite of p-removal models.

3.2.2.2. Poor quality of historical models

Ofwat recognises that the historical models have weaker explanatory power relative to the forecast models: (relative average R-square are 0.31 and 0.63). The poor performance of the historical models can also be observed by the wider range of efficiency scores compared to the forecast models. Furthermore, for Thames Water, there is a significant difference in the number of observations available between the historical and forecast models with only nine schemes in the historical data compared to 98 schemes in the forecast data. This further reduces the confidence that the historical models can reliably forecast future costs in our case.

The inclusion of historical models is highly material: the gap between our submitted costs and Ofwat's draft allowance would reduce by half if the two historic cost models used in the triangulation were discounted.

3.2.2.3. Higher real cost of P removal in AMP8

We provide evidence to demonstrate that the higher allowances generated by the forecast models are appropriate. The forecast models capture the revealed material step-change in the supply chain availability pressure witnessed between AMP6 and AMP7 - historical models do not account for this step-change.

The performance step-change required by the Environment Act 2021 is reflected in the very materially larger scale of our PR24 programme. The schemes required in AMP8 have significant implications on the electrical, instrumentation, control and automatization asset base on many sites.

The resultant step-change in required activity across the sector is putting pressure on the supply chain prices well above the inflation rate. Table 22 illustrates this impact for our chemical dosing costs. We set out costs from our 2017 framework agreement and uplift them to current prices (FA line). Comparing the uplifted framework agreement costs against current AMP7 supplier quotes shows a significant remaining price wedge between 11%-16%.

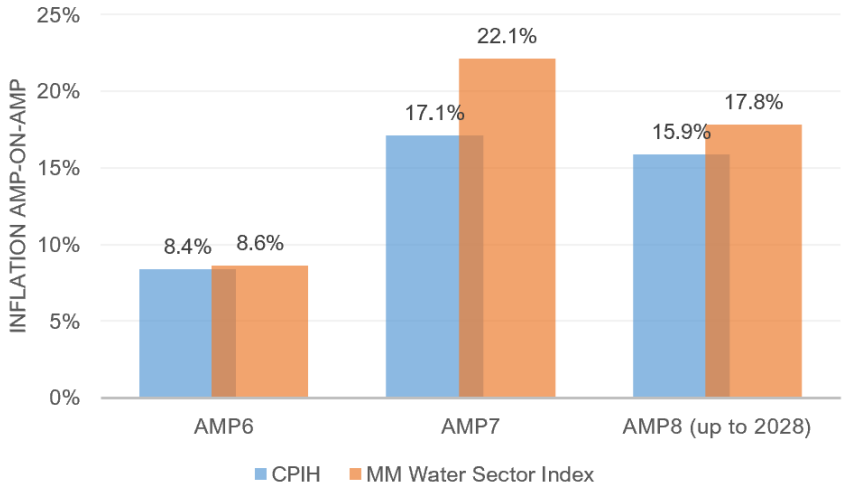
Table 24 - Framework agreement costs vs the latest costs received from suppliers for equivalent scope of works

Site	Date	Manufacturer	Description - FA 1310 Lot 4	Rate	31.08.21 Uplift	31.01.24 Uplift	Increase
Chesham	22.08.21	NPS	Ferric Sulphate/Ferric Chloride NPS/TWUL standard containerised ferric sulphate dosing system 2 x 10m3	£180,242.00	£180,242.00	£210,019.71	12.7%
FA	31.07.17	NPS	Waste Dosing Package Plant 20m3 - Not walk in	£147,710.15	£159,983.65	£186,414.49	
Little Marlow	20.12.21	NPS	Containerised dosing unit. Single point ferric dosing. Storage tank capacity 2 x 10m3	£185,958.00	£185,958.00	£216,680.05	16.2%
FA	31.07.17	NPS	Waste Dosing Package Plant 20m3 - Not walk in	£147,710.15	£159,983.65	£186,414.49	
Dorking	29.11.21	NPS	Containerised dosing unit Single point dosing. Storage tank capacity 2 x 7.5m3	£167,633.00	£167,633.00	£195,327.59	10.7%
FA	31.07.17	NPS	Waste Dosing Package Plant 15m3 - Not walk in	£139,829.77	£151,448.48	£176,469.22	
					Over and above inflation cost increases		13.2%

Source: Thames Water internal data

We have commissioned Mott Macdonald (MM) to analyse price movements from AMP6 to AMP7. MM developed a Water Sector Index by analysing c.£800m of project expenditure data from UK Water and Sewerage Companies. The index is based on a basket of goods with a weighted representation of the labour, plant, material, and other (such as staff) resources which are procured for a typical capital project in the sector. Changes in the cost of these resources are tracked by tagging the items to appropriate indices published by the Office for National Statistics (ONS), the Building Cost Information Service (BCIS), and the British Electrotechnical and Allied Manufacturers' Association (BEAMA). Figure 3 below illustrates the wedge between this index and RPIH.

Figure 3 - CPIH vs Water Sector Index developed by Mott Macdonald



Source: Mott Macdonald analysis

Details of this analysis, and further information showing how our phosphorus actions were priced can be found in TMS-DD-106: PR24 WINEP EC supporting evidence - phosphorus historic costs.docx. This document also provides evidence of external assurance of our costs. This validation has shown both the high level internal/external cost assurance that our costs

have less than <1% variation from the benchmark with some elements showing our costs were significantly lower than the benchmarked mean.

We acknowledge Ofwat's decision to maintain the labour RPE and its introduction of an RPE for materials. However, many elements of the supply chain involved in the phosphorous reduction activities is highly specific and therefore would not be suitably captured in general construction and labour indices. That is, the existing RPEs are not effectively targeted to mitigate the effect of specific cost increases we will face in AMP8, resulting in insufficient company allowances. Historical costs do not reflect future costs as supply chain prices have increased significantly and above inflation due to supply and demand market factors given the industry has faced a very significant increase in phosphorus treatment requirements in AMP7 compared to AMP6.

3.2.2.4. Design PE vs Current reported PE

Enhanced permit levels are required by the Environment Agency to be calculated based on a STW's maximum dry-weather flow (DWF) permit value, irrespective of the current flows. Therefore, using current flows, expressed as PE, is not suitable for determining efficient costs. As noted by Ofwat, using the design PE as the volume cost driver in the cost models explains the highest variation of costs between schemes. This shows the greater relevance of design PE as a driver of costs compared to alternative drivers.

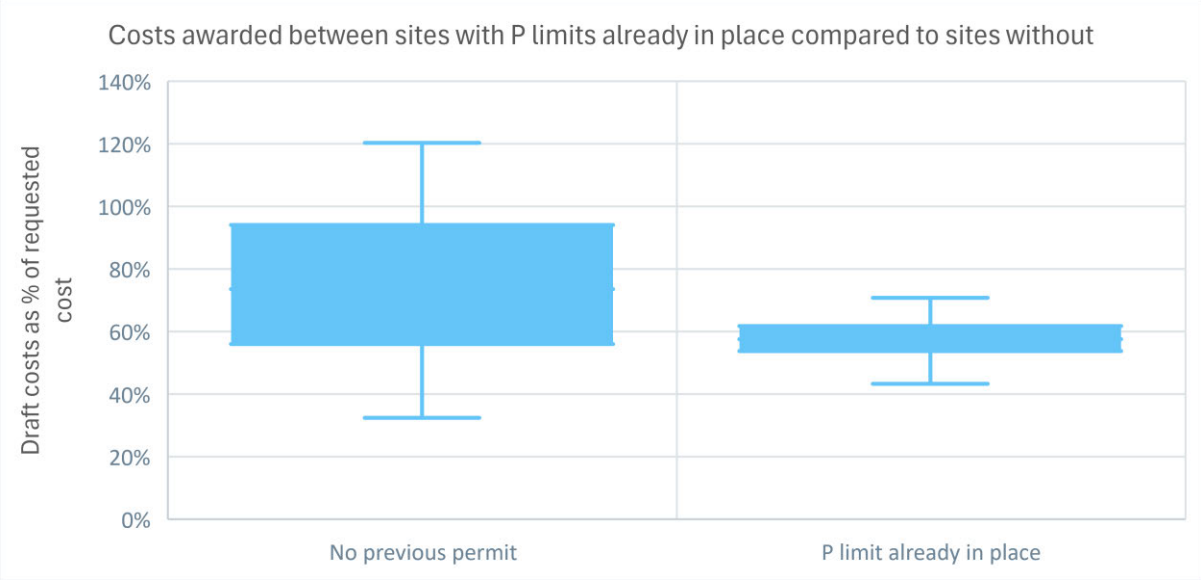
Our approach to optioneering, design criteria and programme has been independently assured, and the report is available in TMS-DD-107: PR24 WINEP EC supporting evidence - Phosphorus Optioneering assurance.docx.

3.2.2.5. Sites with existing P limits

We agree with Ofwat that some increases in P limits can be met with minor changes to the existing site configuration. We did not request additional funding for these sites in the data tables. Our requested costs have already had reductions applied to account for previous P treatment that has been installed wherever this can be reused.

Under Ofwat's approach, on average, the allowance for sites with existing P limits in place is 16% less compared to sites with no prior P limit (Figure4 below). We disagree with the size of the efficiency challenge Ofwat has applied, as it unduly impacts sites where potential for re-configuration and asset re-use is limited.

Figure 4 - Costs awarded between sites with P limits already in place compared to sites without P limits



Source: Thames Water data

There are particularly low opportunities for cost savings at sites with previous P limits where the previous P limit was not stringent (1mg/l upwards), and the new P limit is at the limit of technology or where stretch targets have been agreed. This is because little of previous scope can be used to fulfil the new limit.

Our approach, relevant additional evidence and specific examples of our PR24 submission can be found in TMS-DD-108: PR24 WINEP EC supporting evidence - phosphorus historic permits.docx.

We ask that Ofwat reduces the discount factor applied for sites with previous permit limits, particularly for sites with only basic levels of phosphorus treatment moving to very advanced levels of treatment where little to no savings can be found.

3.2.2.6. Sites with very stringent permit requirements

We recognise that some provision for low permit levels has been made in the cost models. However, for sites with the most stringent permit requirements, particularly those with stretch targets, the model significantly underestimates costs. We have identified (in collaboration with the Environment Agency) stretch target limits where this is either the only option to achieve the environmental objective or where taking this approach avoids a more costly option of updating additional sites[14].

Ofwat's models include a dummy cost driver for consent levels of 0.25mg/l or less. This approach does not sufficiently account for schemes with very stringent permits. Compared to other companies, we have the highest proportion of schemes with stringent permits, with particular difference when the most intensive treatment (ie below 0.2mg/l) is required. - as seen in Table 24. We are also the only company with permit requirements below **0.15mg/l**.

14 The permits are set to achieve water quality status at a certain point of the waterbody. Other STW upstream could potentially contribute to reducing the load at that location – but this is generally more expensive.

Table 25 – Range of enhanced permit concentrations by company

Company	ANH	HDD	NES	NWT	SRN	SVE	SWB	TMS	WSH	WSX	YKY
P above 0.25mg/l	28%	100%	33%	59%	46%	87%	52%	**23%**	97%	45%	45%
P below 0.25mg/l	72%	0%	67%	41%	54%	13%	48%	**77%**	3%	55%	55%
P below 0.2mg/l	0%	0%	0%	0%	1%	2%	0%	**30%**	0%	0%	0%
P below 0.15mg/l	0%	0%	0%	0%	0%	0%	0%	**6%**	0%	0%	0%

Source: Thames Water analysis of PR24 DD data

By setting the threshold for the dummy cost driver at 0.25mg/l, the models do not reflect the additional scope needed to achieve these stretch limits, thereby penalising companies adopting a stretch target approach which is in the interest of both customers and the environment. This creates a perverse incentive for companies to adopt more costly alternative approaches, such as upgrading additional STWs.

Our approach, relevant evidence and specific examples from the development of our PR24 submission can be found in TMS-DD-109: PR24 WINEP EC supporting evidence - phosphorus stretch targets.

To address this model weakness, we ask that Ofwat either assesses sites with stretch targets using a deep-dive approach or updates the models to better reflect the additional scope requirements for these types of sites.

3.2.2.7. Costs for very large sites

Table 25 summarises company allowances by scheme size (Band 1 is the smallest, band 6 is the largest). This suggests that Ofwat's model systematically apply disproportionately higher efficiencies to larger schemes.

Table 26 – Company allowances by scheme size (Band 1 is the smallest, band 6 is the largest)

	All			
	Requested	**Combined**	**Difference**	**Percentage Change**
Band 1	£ 160,942,007.51	£ 224,604,426.96	£ 63,662,419.45	40%
Band 2	£ 311,754,465.88	£ 315,641,857.81	£ 3,887,391.93	1%
Band 3	£ 889,077,052.80	£ 851,513,011.64	-£ 37,564,041.16	-4%
Band 4	£ 1,284,197,979.93	£ 863,651,683.99	-£ 420,546,295.93	-33%
Band 5	£ 808,510,391.02	£ 593,066,279.95	-£ 215,444,111.06	-27%
Band 6	£ 3,134,671,736.35	£ 2,244,541,357.85	-£ 890,130,378.50	-28%

Source: Thames Water analysis of PR24 Draft Determinations

Thames Water has almost twice the number of larger sites compared to the sector averages and very few smaller sites (figure 5). This means Thames Water is doubly penalised: it is not receiving the benefit of over-allowance and is being underfunded on the larger sites.

Figure 5 – Breakdown of P removal schemes by size (Band 1 is the smallest, band 6 is the largest)

Source: Thames Water analysis of Draft Determinations

This reinforces our concerns with the robustness of Ofwat's models and warrants a re-examination of the modelling approach ahead of the Final Determinations.

3.2.2.8. Second-order effects of tighter P removal limits: sludge treatment

To meet these tighter phosphorus limits sites will need more intensive phosphorus removal processes. These processes typically involve chemical or biological treatments that result in the precipitation of phosphorus as solid matter, increasing the volume of sludge produced. With higher sludge production, wastewater treatment plants need to treat and recycle additional sludge volumes. This management of sludge is costly and logistically challenging, particularly in our service area given the limitations for sludge disposal (see our Bioresources response on disposal costs for a fuller explanation).

We have assessed the impact of the phosphorus programme against our sludge treatment and storage capacity. This has revealed two sludge treatment centres will need to increase capacity to deal with the upgrades – one in AMP8 and another forecasted in AMP9.

At PR19, Ofwat recognised this secondary effect of tighter P removal limits on our costs. We believe this approach should be followed for PR24 and specific allowance is made for dealing with the additional sludge arising from this programme.

3.2.2.9. PCD

We are supportive of Ofwat's approach to set a per-site non-delivery PCD. We expect that this will only apply to schemes that have been funded as part of the Final Determination, and any schemes that are agreed for inclusion on a Delivery Mechanism would not be subject to achieving outputs in AMP8.

Additionally, we note that Ofwat have set material timing incentives for "under performance" (potentially resulting in up to £69m in penalties) that are not aligned to regulatory delivery dates. Delivery in line with regulatory deadline should not be considered "under performance" and should not incur penalties.

3.2.3 Summary of our request for FD

In developing its Final Determinations, Ofwat should:

- Disregard the poorly performing historic cost models;
- Assess costs using design PE rather than current PE;
- Reduce the discount factor applied for sites with previous permit limits, particularly for sites with only basic levels of phosphorus treatment moving to very advanced levels of treatment.

- Assess sites with stretch targets using a deep dive approach or update the models to better reflect the additional scope requirements for these sites.
- Revise the PCD outputs to match the agreed outputs for AMP8, with schemes agreed for inclusion on a Deliverability Mechanism removed.
- Revise the PCD timing incentive to match the regulatory delivery dates.

3.2.4 Summary of reference documents supplied for this section

1	TMS-DD-106: PR24 WINEP EC supporting evidence - phosphorus historic costs.docx
2	TMS-DD-107: PR24 WINEP EC supporting evidence - Phosphorus Optioneering assurance.docx
3	TMS-DD-108: PR24 WINEP EC supporting evidence - phosphorus historic permits.docx
4	TMS-DD-109: PR24 WINEP EC supporting evidence - phosphorus stretch targets

3.3. WINEP chemicals

3.3.1. Brief outline of Ofwat's position

Following a deep dive exercise, Ofwat applied a 41% efficiency on our proposed costs. Ofwat expressed concerns in the following areas:

- whether the investment provided the best option for customers (20% cost challenge);
- concerns regarding cost efficiency of our proposals (21% cost challenge); and
- customer protection from under- or non-delivery (Ofwat amended our proposed PCD).

3.3.2. Thames Water position and supporting evidence

We welcome the Deep Dive approach to assessing costs for chemical upgrades, as there are insufficient historic or planned chemical schemes to create a viable econometric cost model.

However, Ofwat's proposed allowance is significantly below what is needed to achieve the new permit limits. We provide additional evidence below to address Ofwat's concerns in all three areas.

3.3.2.1. Our chosen solutions provide the best option for customers.

Alternative options

Contrary to the assessment, several alternative options were assessed as part of the options development process. The detailed process we have undertaken is set out in sections 5.129-5.140 of our supporting Business Plan submission documentation titled "TMS26 (revised)". We summarise key activities below.

Choosing the solution type

The unconstrained list of options included:

- Treatment of point pollution sources (inputs to sewer) – trader permits
- Treatment of diffuse pollution sources (inputs to sewer)
- Replacing / retrofitting / expanding treatment process using existing process types and/or more intensive processes
- Transfer flow between catchments via new connections / pumping discharge to another STW

- Optimising maintenance performance and
- Changing outfall location.

Options a, c and d were taken forward as preferred options. Option a (trading permits) required further investigation which would not be completed in time to meet the new permit requirements; option d was discounted after GIS screening failed to identify any potential transfer options. Therefore, the only option remaining was to enhance the treatment process.

Choosing the technology type to deliver the solution and consideration of alternative options

To inform our technology choice we reviewed the latest available findings of the industry's leading research programme - UKWIR's Chemicals Investigation Programme phase 3 (CIP3). We complemented this with a review of international scientific literature and case studies[15]. Our approach, optioneering methodology and engineering solution development has been independently assured by Jacobs. Jacobs confirmed that the technologies we have put forward are appropriate to achieve the proposed permits and concluded that our rejection of alternative options was justified: *'most tertiary solids removal technologies alone may prove unreliable in effecting sufficient treatment. This leaves a few alternatives which may be appropriate, as such, the selection of ASPs + Multimedia Filters + GAC is justified'.* The final report prepared by Jacobs is available at TMS-DD-110: PR24 WINEP EC supporting evidence - Cypermethrin Optioneering assurance.

Our technology suitability review considered all technologies where performance data exists (either through the CIP, international literature or data from our own operations) against their expected removal rates and required removal rates.

We assessed each site, and each individual permit limit proposed (against no deterioration standstill, no deterioration, and river needs). Figure 6 illustrates the challenges in identifying a technology effective enough to achieve the stringent permit requirements for cypermethrin removal.

[15] E.g.: Technical Support for the Impact Assessment of the Review of Priority Substances under Directive 2000/60/EC (European Commission (DG Environment), June 2011)
Removal of multiple pesticide residues from water by low-pressure thin-film composite membrane, Applied Water Science, November 2020
Hybrid Multi-Criteria Decision-Making Approach to Choose the Best Treatment Process to Remove Pesticides from Drinking Water Sources: Diuron and Cypermethrin, July 2022

Figure 6 - Technology suitability review

	Technology suitability - STANDSTILL limit					Technology suitability - NO DETERIORATION limit				
STW name	ASP	Mecana / Pile Cloth	NSF	1 point chemical dosing	2 points chemical dosing	ASP	Mecana / Pile Cloth	NSF	1 point chemical dosing	2 points chemical dosing
Alton	>>	>>	>>	>>	>>	Existing-N/A	No	ASP existing - N/A	Existing-N/A	No
Arborfield	>>	>>	>>	>>	>>	No	No	No	Existing-N/A	No
Ascot	Existing-N/A	No	ASP existing - N/A	Existing-N/A	No					
Berkhamstead	Yes	No	Existing-N/A	Existing-N/A	No					
Bracknell	>>	>>	>>	>>	>>	No	No	No	Existing-N/A	No
Camberley	>>	>>	>>	>>	>>	Existing-N/A	Existing-N/A	ASP existing - N/A	Existing-N/A	No
Chertsey	>>	>>	>>	Existing-N/A	>>					
Fleet	>>	>>	>>	>>	>>	Existing-N/A	No	ASP existing - N/A	Existing-N/A	No
Gerrards Cross	No	Existing-N/A	No	Existing-N/A	No	Existing-N/A	No	ASP existing - N/A	Existing-N/A	No
Great Gaddesden	No	No	No	No	No					
Hockford	Yes	No	Yes	Existing-N/A	No					
Kings Sutton	Yes	No	Yes	Yes	Yes					
Manuden	No	No	No	No	No					
Middleton Cheney	>>	>>	>>	>>	>>	No	Existing-N/A	No	No	No
Milton under Wychwood	No	No	No	No	No					
Wokingham	>>	>>	>>	>>	>>	No	Existing-N/A	No	Existing-N/A	No

Source: Thames Water optioneering analysis

The most effective solution we have been able to identify, given the information available to us at this time, is a combination of Activated Sludge Process (ASP) and Granular Activated Carbon (GAC). This is based on a combination of the CIP trial data and international literature.

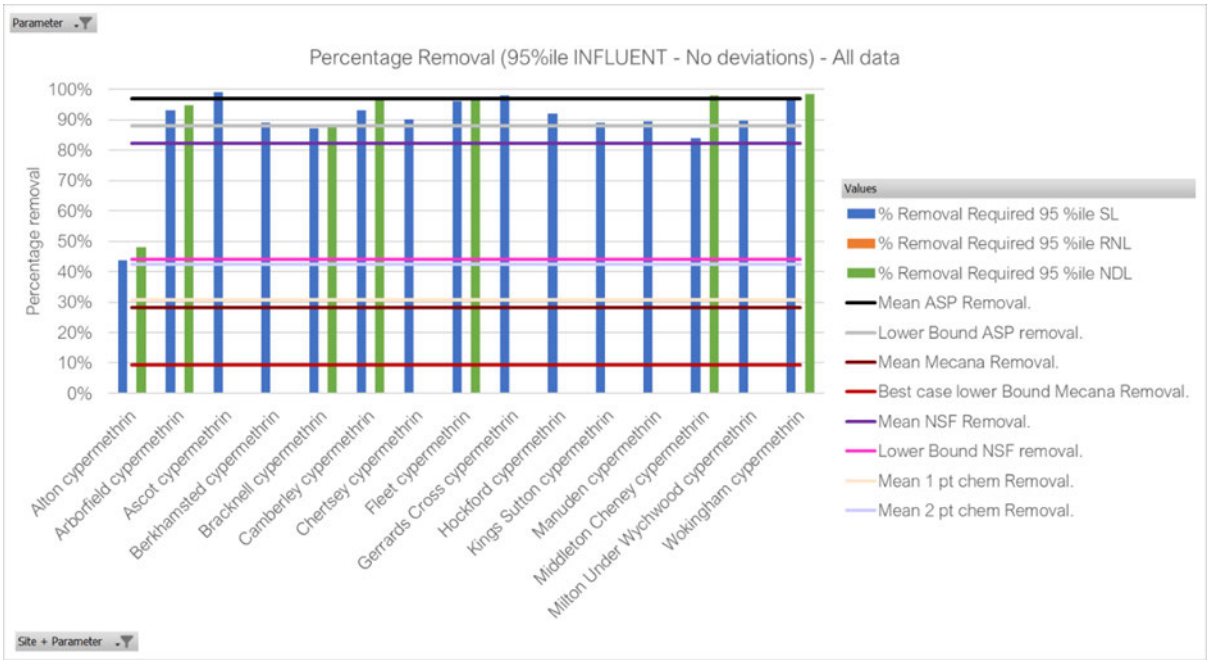
Figure 7 shows the required percentage removal rates to meet the new cypermethrin permit limits compared to both mean and lower bound removal rates for various treatment processes (taken from the Chemical Investigation Programme report). The required removal rates have been calculated using contemporary sampling data, reflecting current performance of the sites.

Blue bars represent required removal rates to meet standstill limits (NDLS) and green bars represent required removal rates to achieve “no deterioration” permit limits.

The horizonal lines on the chart show the CIP removal rates. The upper band for removal rates is not shown. For information these would be at 100%. The chart shows that only advanced ASP (Membrane Bioreactor or ASP with Powdered Activated Carbon) approaches the necessary removal rates, but still does not reliably meet the rates required.

For reference, the seven sites in our programme are Arborfield, Bracknell, Chertsey, Gerrards Cross, Middleton Cheney, Milton Under Wychwood and Wokingham.

Figure 7 – Percentage removal (95th percentile influent – no deviations)



Source: Thames Water and Chemical Investigations Programme – ASP removal rates are for advanced ASP processes (Membrane Bioreactor or ASP with Powdered Activated Carbon)

ASP based processes alone are not sufficient as a standalone technology to achieve the proposed permits for the following reasons:

- Our monitoring shows our ASP based processes are not able to consistently achieve the proposed permits.
- CIP investigations give too little performance data and associated information on operating conditions for these processes to provide a high level a confidence in their performance as well as design criteria to develop a technical solution.
- International scientific literature and case studies do not identify ASP as a robust suitable process for removing cypermethrin to the proposed permit levels.

However, we have higher confidence in the combination of ASP with PAC, which showed the highest mean removal rates in the CIP investigations, as it has been demonstrated to be suitable for cypermethrin removal in other studies. Granular Activated Carbon (GAC) has also been identified as an effective technology to remove Cypermethrin from STWs with an expected ~98% efficiency.

GAC is similar to PAC, but with the added benefit of removing Cypermethrin from both the effluent and sludge streams. When PAC is added to the treatment process it ends up in the sludge stream, while in the case of GAC, the media is regenerated thermally, leading to the destruction of cypermethrin. Therefore, the combination of ASP and GAC is a more robust and effective solution than any of the other ASP based processes evaluated as it is expected to achieve higher removal rates without moving cypermethrin from the effluent stream to the sludge stream.

Our full optioneering process is set out in the Options Development Report, which was submitted to the Environment Agency in November 2022 (TMS-DD-112: CYPERMETHRIN_ODR).

Cost-benefit analysis (CBA)

Meeting the permit requirements is a statutory obligation. In light of the challenges set out above, only one technological solution has been identified as effective in meeting this statutory obligation. Therefore, the value of the CBA as a decision-making tool appears limited in this case: there is no 'do nothing' option and just one feasible option.

3.3.2.2. Our costs are efficient

Lower scope option

As explained above (and in greater detail in "TMS26 (revised)") our chosen option is in consumers' best interest. The independent technical review of our technology selection methodology carried out by Jacobs also confirms thar the technologies we have put forward are appropriate to achieve the permit compliance. Currently, there is simply no alternative lower-cost process effective enough to achieve the proposed permits at the seven sites affected.

We have considered adopting a phased approach, with the initial phase being the implementation of the GAC, followed by a monitoring / optimisation phase. If the optimised GAC is found not to provide an effluent compliant with the new cypermethrin permit, the ASP conversion would be implemented. However, this would take additional time and would result in failure to comply with the permits. Delaying the ASP conversion means it would not be ready in time for the regulatory deadline set for 2026/27 should it be confirmed as necessary.

Cypermethrin is a material driver of costs over and above other chemical determinands

Ofwat's application of a 21% cost efficiency challenge is not grounded in evidence.

Cypermethrin requires more intensive processes relative to those widely employed on our STWs at present – this is supported by international literature (see references above). Ofwat acknowledges in its deep dive assessment comments that 'there is limited historical outturn data to inform benchmarking, as there are very few full-scale sites with existing cypermethrin permits which need capital expenditure to ensure compliance'.

Further, as well as a substances' inherent propensity to respond to known treatment solutions and the efficacy of currently installed treatment processes, two additional key variables in understanding relative treatment difficultly and therefore costs are (1) how stringent the new permit level is, and (2) the influent concentrations received by treatment works. Without this assessment, it is not possible to conclude that our costs should be cheaper, equivalent or more expensive than the very few other sites proposed for capital improvements to meet the new chemical permit levels.

3.3.2.3. PCD

We are content with Ofwat's proposed approach for setting PCDs. We expect the final PCD rates and timing incentives to be aligned with the scheme funding provided for AMP8 and regulatory delivery dates. Unfunded schemes subject to the Deliverability Mechanism should not be subject to a PCD.

3.3.3 Summary of our request for FD

We ask that Ofwat reinstate our requested costs. The additional evidence provided in this response aims to address Ofwat's deep dive concerns, and we share external cost assurance to further support our case.

We also ask that the PCD outputs match the agreed outputs for AMP8, with schemes agreed for inclusion on a Deliverability Mechanism removed from the PCD.

3.3.4 Summary of reference documents supplied for this section

1	TMS-DD-110: PR24 WINEP EC supporting evidence - Cypermethrin Optioneering assurance
2	TMS-DD-112: CYPERMETHRIN_ODR

3.4 Wastewater WINEP Other

3.4.1 Brief outline of Ofwat's position

For the remaining areas of our Wastewater WINEP programme Ofwat have applied various tests for economic efficiency, and carried out shallow dive assessments, where a 20% efficiency was applied irrespective of whether cost models demonstrated the requested costs were efficient or not.

The two areas with the largest monetary delta between our requested costs and the draft allowance are continuous water quality monitoring and wastewater investigations:

3.4.1.1 Continuous Water Quality Monitoring

Ofwat have applied the median requested value for all companies.

3.4.1.2 Wastewater Investigations

Ofwat's view is that we have overestimate the complexity of the storm overflow investigations required and that our costs are inefficient.

3.4.2 Thames Water argument and supporting evidence

3.4.2.1 Continuous Water Quality Monitoring

While we believe there are material variations in cost depending on land purchase/rental prices for siting monitors, with monitors in areas of higher land access/purchase prices subject to significantly larger costs, we are prepared to accept Ofwat's draft median value with the attendant risk associated with our local circumstances causing higher prices. This decision has been informed by new market data and early work with the supply chain in planning for the delivery of this programme now forecasting costs close to Ofwat's proposed allowance.

We are currently working with the Environment Agency and other companies to review the scope and associated cost requirements of the EnvAct_INV1 and EnvAct_MON5 requirements linked to understanding CWQM estuarine monitoring requirements and the sharing of data from all CWQMs. We will restate our costs if this work materially changes our requirements.

3.4.2.1 Wastewater Investigations

Since submission of our Business Plan, we are now in receipt of updated guidance from the Environment Agency regarding storm overflow investigation requirements (EnvAct_INV4). This

has reduced the necessary complexity and scope for some sites – we are therefore in agreement with Ofwat's assessment that the costs for these outputs we requested could be considered inefficient against this revised scope.

Additionally, we have updated our assessment of high priority sites following clarification from the Environment Agency regarding the qualification criteria. This reduces the number of investigations required in AMP8 from 454 to 366. This is reflected in the Environment Agency's most recent formal issue of our WINEP for AMP8.

Furthermore, we have now made significant progress in commencing this investigation programme early and have awarded contracts with the supply chain in line with the new specification and number of investigations required. We have updated our costs in line with this new evidence, and using Ofwat's draft determination models as a guide, we believe these costs can now be assessed as being efficient.

3.4.3 Summary of our request for FD

We request Ofwat to consider the new scope and costs in our Business Plan. We have updated our costs and the associated outputs in the data tables accompanying this representation.

We have split the EnvAct_INV4 investigations by their complexity as follows:

Table 27 – Storm Overflow Investigation complexity scoring (EnvAct_INV4)

Complexity level	EnvAct_INV4 assessment stages required
Desk based studies	Stages 1 and 2
Studies that require a survey, some monitoring or simple modelling.	Stages 1, 2 and 3
Studies that require multiple surveys, and/or monitoring locations, and/or complex modelling.	Stages 1, 2, 3 and 4

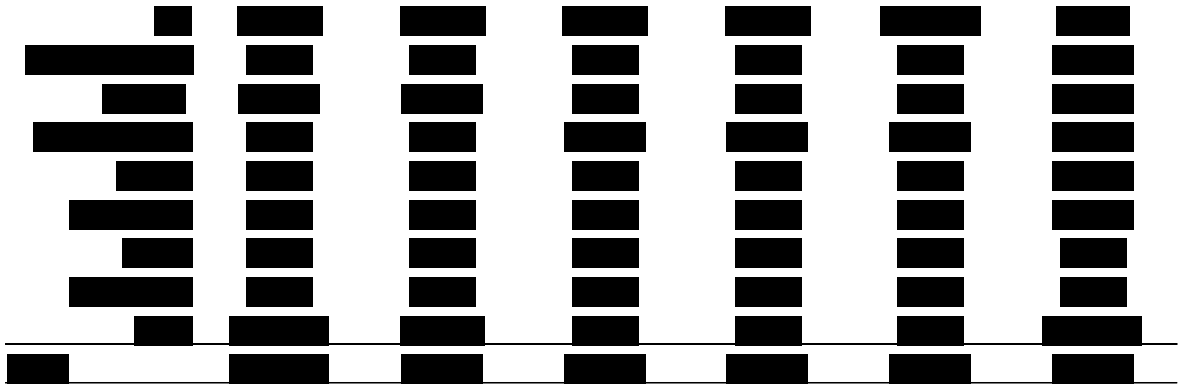
We request Ofwat to assess the costs of investigations appropriately across water companies for each category. We noted that the unit costs of investigations do not appear consistent with expected scope (eg, simple investigations for HDD being more expensive than their complex investigations; SVE simple investigations costing nearly the same as our complex investigations, and less than WSX desktop-based investigations; the second most expensive overall are SRN desktop investigations; NWT complex investigation being approx. 75 times more expensive than the lowest cost in the same category).

Additionally, we have revised our submissions for installation of monitors of Emergency Overflows to align with the recent advice from DEFRA on the expectation of upcoming guidance related to the requirement of installing monitors for 50% of the assets (in lieu of the current 25% guidance requirement).

Finally, we have included in our representation new schemes arising from the recent designation of Wallingford beach as a bathing water. This comprises an investigation into causes of poor water quality and an action to install disinfection at the upstream STW at Benson.

[redacted]

[redacted]



[redacted]

3.6. Sewage treatment growth

3.6.1 Brief outline of Ofwat's position

Our programme of work for AMP8 includes 15 schemes. Six schemes were assessed using a benchmarking model resulting in a 46% challenge. Five schemes were assessed through a deep-dive approach resulting in a 60% challenge. The remaining four schemes have been excluded on the basis that they do not require a DWF permit change.

Overall, we requested £355m and Ofwat is proposing to allow £204m.

3.6.2 Thames Water argument and supporting evidence

3.6.2.1 The four excluded schemes

Andoversford, Cassington, Highworth and Wheatley were excluded from the assessment. Ofwat argued)hat "No expected change in DWF permit but expected change in FFT permit".

From the draft determinations it appears that Ofwat has categorised these schemes as within scenario 3[16]. However, we consider that this is incorrect and these schemes should be assessed within scenario 1[16].

We discuss each of the four schemes in turn.

Andoversford

The PE at Andoversford is forecast to increase by 119 (760 to 879) during AMP8. Consistent with efficient asset management planning approach, we propose to increase the capacity by 139 PE to accommodate expected growth up to 2036. This site does not require a revision to the Dry Weather Flow (DWF) permit. We had stated under cost driver 4 that the FFT would need to be increased. This is an error, the FFT increase at this site will be resolved by the WINEP Storm Overflow programme.

Andoversford should be assessed as a scenario 1 scheme as the Totex requested is to increase the PE capacity by 139. This is required to enable compliance with the existing permit conditions due to additional flow and load associated with population growth.

Cassington

The PE at Cassington is forecast to increase by 2,608 (18,381 to 20,989) during AMP8. Our proposal is to increase the capacity by 6,014 PE to accommodate expected growth up to 2036. This site does not require a revision to the Dry Weather Flow (DWF) permit. We stated under cost driver 4 that the expected FFT would be 152.9 l/sec. This site does not currently have a stated FFT permit limit and we are not proposing to increase the FFT as part of this growth scheme. Any FFT increase at this site will be resolved by the WINEP Storm Overflow programme.

Cassington should be assessed as a scenario 1 scheme as the Totex requested is to increase the PE capacity by 6,014. This is required to enable compliance with the existing permit conditions due to additional flow and load associated with population growth.

[16] https://www.ofwat.gov.uk/wp-content/uploads/2024/07/PR24-draft-determinations-Expenditure-allowances-Enhancement-cost-modelling-appendix.pdf - Table 17

Highworth

The PE at Highworth is forecast to increase by 1,049 (9,205 to 10,254) during AMP8. Our proposal is to increase the capacity by 2,261 PE to accommodate expected growth up to 2036. This site does not require a revision to the Dry Weather Flow (DWF) permit. We had stated under cost driver 4 that the FFT would need to be increased from 55 l/sec to 57.25 l/sec. This small increase is to remain compliant with Defra guidance[17], where the PG value will increase as a result of population growth.

Highworth should be assessed as a scenario 1 scheme as the Totex requested is to increase the PE capacity by 2,261. This is required to enable compliance with the existing permit conditions due to additional flow and load associated with population growth.

Wheatley

The PE at Wheatley is forecast to increase by 1,057 (5,507 to 6,564) during AMP8. Our proposal is to increase the capacity by 1,057 PE to accommodate expected growth up to 2036. This site does not require a revision to the Dry Weather Flow (DWF) permit. We had stated under cost driver 4 that the FFT would need to be increased, this is an error, the FFT increase at this site will be resolved by the WINEP Storm Overflow programme.

Wheatley should be assessed as a scenario 1 scheme as the Totex requested is to increase the PE capacity by 1,057. This is required to enable compliance with the existing permit conditions due to additional flow and load associated with population growth.

We have implemented these changes in data table ADD19.

3.6.2.2 Modelled assessment

Revision to our permit data

Ofwat's model uses a variable to capture if the new ammonia permit level required due to the change in the DWF permit is expected to be below 3mg/l. This is a key exogenous treatment complexity driver.

At time of submission of our PR24 plan we calculated the expected ammonia permit using a simple 'load standstill' calculation. This assumes that the expected ammonia permit will be reduced in line with the expected increase in DWF permit to ensure that the total load entering the watercourse does not increase. An example is provided below;

- If a site has a DWF permit of 100 m³/day and an ammonia permit of 10 mg/l then the ammonia load will be 1kg per day.
- If the DWF permit is increased to 200 m³/day then the ammonia permit would need to be reduced to 5 mg/l to ensure that no more than 1kg of ammonia is discharged per day.

We have now refined these calculations by using the Environment Agency methodology as detailed below:

1. Obtain RQP app
2. Obtain estimates for long term mean and 5%ile watercourse flow above STW discharge (taken from SIMCAT/SAGIS Thames catchment model)

[17] Water companies: environmental permits for storm overflows and emergency overflows - GOV.UK (www.gov.uk)

3. Set mean and standard deviation for upstream ammonia (mid objective class estimate if data not available)
4. Obtain mean and standard deviation for STW final effluent ammonia (last 3 years)
5. Set mean STW flow (1.25 x DWF) and standard deviation (mean/3)
6. Determine watercourse ammonia objective (RBMP cycle 3 objective or achieved class if this is better)
7. Run RQP to achieve ≤10% increase in mean and 90%ile river ammonia and stay within target class.
8. If resulting 95%ile limit <2mg/l, check if 2mg/l non-parametric quality would achieve target.
9. If resulting 95%ile limit < 1mg/l, set limit at 1 mg/l.

Table 28 sets out the changes to the enhanced ammonia permit resulting from the revised approach. We have updated table ADD19 with the revised values.

Our revised values are more accurate than the values in our original submission and should be more consistent with the approach taken by other water companies. We request that the assessment is revised per these revisions.

Table 30 - revised enhanced ammonia permits for three of our wastewater growth sites

Scheme Name	Cost Driver 8 (expected enhanced ammonia permit) Original Submission	Cost Driver 8 (expected enhanced ammonia permit) Revised Submission (ADD19)
Blunsdon STW - AMP8 Growth	6.1 mg/l	<3 mg/l
Chalgrove STW - AMP8 Growth	3.0 mg/l	<3 mg/l
Chipping Norton STW - AMP8 Growth	8.4 mg/l	<3 mg/l

Blunsdon

Our modelling indicates that a lowering of the ammonia permit limit from 8 to 3 mg/l would not ensure "no deterioration" at the point of discharge but should ensure High Status for ammonia is maintained at the downstream river monitoring point on the Share Ditch at Castle Eaton. However, we have low confidence in this conclusion because we have not yet been able to replicate the EA's indicative ammonia limits for other STWs where we have already proposed DWF increases. Further discussion with the EA would be needed to firm up our conclusions.

Chalgrove

Our modelling indicates that lowering the ammonia permit limit from 4 to 3 mg/l would not meet the EA's "≤10% deterioration" requirement at the point of discharge but should maintain Good Status for ammonia at the downstream monitoring point on the Warpsgrove Ditch. There is therefore a significant chance of a permit limit < 3 mg/l, and more discussion with the EA would be needed to clarify this.

Chipping Norton

Although the STW has a 95-percentile permit limit of 10 mg/l, it's performance over the last few years is approximately 0.5 mg/l. The river quality monitoring point 5 km downstream on the Cornwell Brook at Kingham is at High Status for ammonia. Discussion with the EA indicates that they would expect a permit variation for DWF increase to maintain High Status at the river

monitoring point, and at the point of discharge (assuming instantaneous mixing). Within High Status, up to 10% deterioration in modelled ammonia concentration would be permitted. Using the EA's modelling tools, we have concluded that a 95-percentile ammonia limit < 3 mg/l would be needed to meet the EA's requirements. However, we have low confidence in this conclusion because we have not yet been able to replicate the EA's indicative ammonia limits for other STWs where we have already proposed DWF increases. Further discussion with the EA would be needed to firm up our conclusions.

The econometric models

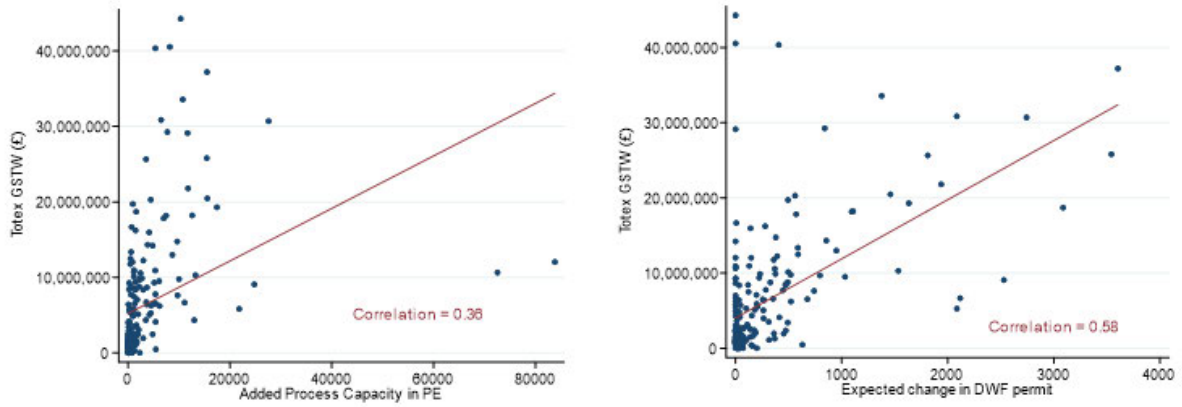
Ofwat proposes two econometric models to assess growth at sewage treatment works. The first model, GS1, uses three variables: (i) Added Process Capacity in PE, (ii) Expected change DWF permit, and (iii) a dummy for ammonia. The second GS2 also uses three variables with the first replaced by the expected change in PE. Ofwat uses Cook's Distance analysis to remove "outliers". Despite that, the models have a low R-squared of 0.40 and the range of efficiency scores is 1.36 on average. This is a wide range.

The process of eliminating outliers is a concern, as these outliers may contain useful information for a well specified model (which the current one does not appear to be).

Figure 8 provides correlations between growth at STWs cost and its primary cost drivers per Ofwat's proposed models after the Cook's Distance analysis is implemented. The figure suggests that after the first round of removing outliers more outliers exist. Applying the Cook's Distance analysis again would reduce the sample further, from 201 to 186 observations in model GS1. With the further reduction in outliers the model's fit improves from 0.41 to 0.65 and challenge to companies' changes materially (e.g., for Thames Water the challenge halves in percentage terms). We do not consider that removing further outliers and thereby (inevitably) improving the model's fit is the right thing to do. However, it highlights that the presence of multiple outliers means that somewhat arbitrary decisions need to be taken in relation to the data and models, and these have material (and arbitrary) implication for companies. If a better model cannot be found, a deep dive assessment must be used.

Figure 8 also raises concern on the spread of the data. The figure shows that there is a high concentration of 'near zero' values of the scale variables in the two models (Added Process Capacity and the Expected Change in DWF Permit), against a wide range of costs. The risk is that variations in the cost driver cannot explain variations in cost with any degree of accuracy. The additional variables in the model do not appear to provide significant additional explanatory power to the models.

Figure 8 - Correlation Totex Growth at Sewage Treatment Works with Added Process Capacity in PE and Expected Change in DWF permit



In light of the data, the quality of the proposed models, and the reliance on outliers removal, we consider that Ofwat should use a deep dive assessment to assess growth costs at sewage treatment works.

Deep dive assessment

Arborfield, Bicester, Didcot, Wantage and Thame were deep dived. The assessment has concluded that "The company does not provide evidence of benchmarking" and that for four out of the five schemes we "have not adequately shown why the costs are so significant compared with the outline scope".

In addition to the five schemes mentioned above we request that Ofwat deep-dive the additional three schemes; Chalgrove, Blunsdon and Stansted Mountfitchet due to the variance between submitted costs and the Ofwat triangulated allowance.

3.6.3 Summary of our request for FD

- Reassess the four excluded schemes as scenario 1.
- Update the ammonia permit limits for three sites assessed via the model.
- Reassess the five deep-dives schemes using additional justification we have provided
- Assess three modelled schemes that appear to be outliers as deep dive sites with the additional justification we have provided.

3.7 Industrial Emissions Directive (IED)

3.7.1 Brief outline of Ofwat's position

Ofwat recognises that the IED is a regulation that the industry must comply with. It states that we are to do everything possible to meet the compliance dates but accepts that funding may not have been provided in AMP7 and therefore have agreed an allowance for IED in AMP8.

Ofwat has given an allowance within the Draft Determination of £230m Totex against Thames Water's submission of £560m Totex. It has requested that a new data table (ADD14) is populated and returned as part of our representation. This data table is consistent with "Appendix A" returned as part of the December data request however following Query 205 (March 2024) the funds requested will reduce to £534m not £560m due to incorrect allocation of a cake barn line at Rye Meads.

Ofwat uses econometric models to assess costs for secondary containment and tank covering. The models have two cost drivers: bund wall length and surface area of tank covers.

A selection of our schemes was assessed in a Deep Dive exercise. In respect of these schemes, Ofwat was not satisfied with the granularity of costs we provided and evidence of solution efficiency, choosing instead to revert to the econometric assessment.

Ofwat proposes a PCD for a number of 'sites compliant with permit'.

3.7.2 Thames Water argument and supporting evidence

Our preferred solution is for Ofwat to carry out a Deep Dive assessment of our schemes. If this is not possible, Ofwat's econometric models need to be improved significantly before they can be used in cost assessment.

We also disagree with Ofwat's proposed PCD.

We explain each point in turn below.

3.7.2.1 Econometric models

The econometric models proposed by Ofwat for Tank Covering and Secondary Containment are not robust. For Tank Covering, the surface area of tank covers provided explains only 7% of the variation in tank covering costs between companies. This is a poor model and should not be used in efficient benchmarking of companies. In addition, this model has a wide range of efficiency scores (0.07 – 2.14), further indicating the unreliability of this model. We recommend the use of logarithmic transformation of both the dependent and independent variables as this significantly improves the performance of this model. Specifically, the R-square increases from 0.078 to 0.335 when the logarithmic transformation is used. To correct for the log bias, Ofwat can apply a log-bias adjustment as done in PR19. Similarly, the cost model proposed for Secondary Containment also has a low R-square and an even wider range of efficiency scores, making it unreliable as well.

In addition to the poor performance of the econometric models, we argue that these models do not accurately capture significant cost drivers:

1. The height of the wall is omitted. This driver is statistically significant when included in the models.
2. The number of tanks to be covered is omitted. Thames Water has 25 STWs in scope, compared to 16 for United Utilities and Southern Water, 12 for Yorkshire Water, 10 for Anglian Water, and 2 for Northumbrian Water.
3. The model mis-represents the scope of works required, which results in a cost under-estimate. The model simplistically relies on the size of the tank only. Instead, the variable should be the entire footprint of the scheme. This is because:
    - the secondary containment area may need to be concreted over, and appropriate drainage installed (at additional cost) to comply with the requirement to make the surface impermeable.
    - ancillary equipment compliant with COMAH and HAZOP legislation would be needed for storing increased volumes of methane. Where covered tanks do not

contain methane, emission handling systems would need to be installed e.g. odour control units. These costs are currently not captured in the model.

3.7.2.2 Deep dive

Our costs are efficient. They have been generated by Jacobs using our Engineering Estimating System and assured by Mott MacDonald. Since Draft Determinations, Arup have carried out a further external assurance of our costs for six sample sites. In order to support a Deep Dive exercise, we are sharing the detailed evidence on scope and costs for all our IED interventions. We are providing the engineering estimate templates (known as 'F909') which have been generated using our Engineering Estimating System (EES) as per Table 31 below.

Table 31 - Site Names and associated evidence

Site No	Site Name	F909 name
1	Aylesbury	P1008_S39554_Intervention for Aylesbury PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (3).xlsm
2	Banbury	P1008_S39556_Intervention for Banbury PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case Rev1.xlsm
3	Basingstoke	P1008_S39558_Intervention for Basingstoke PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (3).xlsm
4	Beckton	P1008_S39603_Intervention for Beckton PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
5	Beddington	P1008_ S39560_Intervention for Beddington PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case Rev 1 (2).xlsm
6	Bishops Stortford	P1008_S39562_Intervention for Bishops Stortford PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case Rev 1.xlsm
7	Bracknell	P1008_S39564_Intervention for Bracknell PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case Rev 1.xlsm
8	Camberley	P1008_S39566_Intervention for Camberley PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
9	Chertsey	P1008_S39568_Intervention for Chertsey PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
10	Crawley	P1008_ S39570_Intervention for Crawley PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case Rev 1.xlsm
11	Crossness	P1008_S39605_Intervention for Crossness PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
12	Deephams	P1008_ S39572_Intervention for Deephams PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (1).xlsm
13	Didcot	P1008_S39574_Intervention for Didcot PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (1) (1).xlsm
14	East Hyde	P1008_S39576_Intervention for East Hyde PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (1).xlsm
15	Hogsmill	P1008_S39578_Intervention for Hogsmill PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
16	Long Reach	P1008_S39580_Intervention for Long Reach PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
17	Maple Lodge	P1008_S39582_Intervention for Maple Lodge PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
18	Mogden	P1008_SS39585_Intervention for Mogden PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
19	Oxford	P1008_S39588_Intervention for Oxford PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
20	Reading	P1008_S39590_Intervention for Reading PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
21	Riverside	P1008_S39593_Intervention for Riverside PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
22	Rye Meads	P1008_S39595_Intervention for Rye Meads PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm
23	Slough	P1008_S39597_Intervention for Slough PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case Rev 1.xlsm
24	Swindon	P1008_S39599_Intervention for Swindon PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (1).xlsm
25	Wargrave	P1008_S39601_Intervention for Wargrave PR24 Industrial Emissions Directive (IED) Compliance for Enhancement Case (2).xlsm

Separately, we would like to respond to Ofwat's specific challenges on the design of our solutions:

Table 32 - Ofwat's specific challenges

Ofwat's challenge	Our response
Smaller containment area has not been considered	We are retrofitting the interventions onto existing sites. This means the efficient containment boundaries have already been determined.
Higher bund walls have not been considered	Our designs are in line with the construction industry guidance CIRIA C736: Containment systems for the prevention of pollution (secondary, tertiary and other measures for industrial and commercial premises)1. The guidance states that the walls should be no higher than 1.5m.

Ofwat's proposed PCD is simplistic and would drive perverse incentives.

Twenty-five of our tanks need to be covered to comply with the permit requirements. It is operationally impractical and inefficient to make these improvements all at once. Depending on

the existing capability of the tanks to take a cover, we may need to reconfigure our programme of works. Therefore, we have carefully developed a detailed outage plan to carry out the necessary works in a way that ensures the continuity of our treatment capabilities. We have also discussed our programme with the Environment Agency to ensure our approach maximises environmental benefit. Our proposed suite of three PCDs reflects these considerations:

- PCD1: Secondary Containment
- PCD2: Cover tanks with the most harmful emissions
- PCD3: Cover remaining tanks

In proposing a single PCD (sites compliant with permit) Ofwat is inadvertently incentivising us to select a less efficient route. Without the operational flexibility, we are also at risk of needed to return funds spent on capital interventions where sites fail permit requirements due to operational or procedural challenges.

3.7.3 Summary of our request for FD

- We would like Ofwat to carry out Deep Dives on all 25 of our STC's using the additional information we have provided.
- If this is not possible, Ofwat should make material improvements to its models to reflect the true extent of costs associated with providing the full scope of works required to comply with the IED permits.
- Revisit the single PCD design, with a view to accepting our proposal for a suite of three PCDs.

We would also like to flag the following developments, as they could have a material impact on our costs.

- At the time of writing, only three of our twenty-five sites have permits. At an Industry Task and Finish group meeting with the EA and representatives of the WASC's (held 24/7/24) the EA informed us that they had changed the Improvement Conditions (IC's). These changes have occurred not only after we have submitted our Business Plans, but also post-DD. This could impact the interventions required and the funding needed. Therefore, we feel that the full funding allowance is required.
- Whilst working with the EA to get clarity regarding the IC's and their timescales within the permits that have been issued, we have come under increased regulatory scrutiny and legal pressure to deliver interventions that we have not been funded for in the current AMP.

3.8 WINEP7 carry-over

We have created a new stand-alone Enhancement Case in response to Ofwat's Draft Determination to explain our position on WINEP7 carryover. Please refer to document TMS-DD-057 WINEP7 carryover.

3.9 Wastewater Asset Assurance Programme

Our October 2023 business plan submission forecast £677m of totex in AMP8 to invest in addressing discharge permit compliance risks at 157 sites, where there is a risk that FFT conditions may not be met before storm discharges occur. This investment case was set out in our Asset Health Deficit submission[18], although we acknowledge that improving the health of sewage treatment assets is not the underlying driver for this investment requirement.

Ofwat's Draft Determination did not include any enhancement totex to address any flow or new aspects of discharge permit compliance. Consequently, and as part of our response to the Draft Determination, we have chosen to submit a stand-alone Enhancement Case for WAAP. Please refer to document TMS-DD-056.

4 Beckton Sludge Powered Generator

In this section, we explain an additional £167m that has been added to base costs in the Bioresources price control, to progress a solution to replace the Sludge Powered Generator (SPG) at Beckton Sewage Treatment Works in AMP8. Additional costs will be required in AMP9 to complete the project. We would like to discuss with Ofwat passing this project through the Large Scheme Gated Allowance.

4.1 Background

The Beckton SPG was constructed and commissioned at the end of 1998 to stop disposing sewage sludge at sea. A study of suitable options at that time recommended the use of incineration with energy recovery, as it was felt that the availability of farmland for the agricultural recycling of the volume of sludge produced at the site (including Riverside STW, whose sludge was pumped to Beckton) was not reliably available.

A Thermal Hydrolysis Plant (THP) was installed at Riverside Sewage Treatment Works in AMP4 with further capacity delivered at Beckton in AMP5 through the Thames Tideway Quality Improvement (TTQI) project as the treatment choice for the additional volumes of sludge that would be produced through the introduction of new consents at these sites. At that point, we were confident that farmland was available for the agricultural recycling of the digested sludge. Through these upgrades, the sludge transfer from Riverside to Beckton was reversed.

The design life of the SPG was 20 years, with replacement originally anticipated in 2018 (Crossness SPG bult at the same time was decommissioned in 2017). The plan had been to continue extending the life of the Beckton SPG and run it under an enhanced maintenance regime until the end of AMP9, at which point it would be replaced by a new THP. By this time the SPG will be 36 years old.

It is now clear that the SPG can no longer be expected to continue in service for this long due to the increasing risk of age related failure. The Operational team has assessed that the SPG should not be retained in service beyond the end of AMP8.

4.2 Impact of failure

[18] TMS15 Asset Health Deficit. See Section 13 - AMP8 Priority - Sewage Treatment Works (Wastewater Asset Assurance Programme)

Beckton's forecast sludge make by the end of AMP8 is 280 tonnes dry solids/day (tds/d): 140tds/d is processed through the SPG, 90tds/d through the THP and the remaining 50tds/d pumped to Riverside for treatment.

Should the SPG fail, alternative outlets would have to be sought for the volume processed through this route.

An additional 10tds/d could be accommodated through Beckton's existing THP plant, however additional dewatering capacity would be required to enable this and the plant would have to run at full capacity for an extended period, this capacity would reduce through statutory shutdowns or asset failure.

Riverside could receive an additional 20tds/d; however, this would be dependent on additional reception silos being installed on site.

As a best case, this would leave a treatment capacity shortfall of 110tds/d, equating to 3,080 wet tonnes of sludge being hauled off site per week (154 vehicle movements), costing up to £462,000/week via restoration outlets (subject to availability @ £150 wet tonne). Annually this would cost £24m. If the available capacity at Beckton and Riverside THPs could not be realised, this would rise to £30.5m.

In addition, there would be a loss of the gas / generation potential and Thames Water would likely face complaints due to odour and vehicle movements at Beckton and potential restoration sites.

Some of the recycling costs may be mitigated by utilising other capacity within Thames Water or other neighbouring wastewater companies. However, like restoration outlets, we cannot rely on this capacity being available when we need it.

4.3 Forecast sludge production and future options

Sludge production forecasts for Beckton and Riverside are shown in the table below.

Table 33 – Forecast sludge production at Beckton and Riverside in AMP8 and AMP9

STW Name	AMP8				
	2025	2026	2027	2028	2029
Beckton	271.19	273.63	275.90	278.17	279.86
Riverside	29.29	29.53	29.66	29.78	29.91
Total	300.48	303.16	305.56	307.95	309.77

STW Name	AMP9				
	2030	2031	2032	2033	2034
Beckton	281.55	282.95	284.40	285.62	286.71
Riverside	30.01	30.10	30.16	30.22	30.27
Total	311.57	313.05	314.56	315.83	316.98

Assuming that Beckton's current THP continues to process 90tds/d and exports to Riverside continues at 50tds/d there will be a capacity shortfall without the SPG of 147tds/d by 2034. This capacity should be provided by THP in order to maximise the loading on the digesters and thus minimise the construction of new primary digesters or secondary liquid storage. Additonal dewatering capacity, liquor treatment, cake storage and gas utililisation plant (CHP or Gas 2 Grid) would also be required. Actual installed capacity will need to be greater than 147tds/d to allow for planned and reactive outages.

Processing this volume of sludge through THP would result in an additional 128,000 wet tonnes of sludge per annum being hauled off site for recycling, needing an additional 5,000 hectares of farmland and result in an additional 6,400 vehicle movements.

4.4 Cost and delivery options

Two solutions have been identified.

1. Providing a THP solution that delivers full treatment for all sludges at an estimated cost of £369m and

2. A THP solution for Surplus Activated Sludge (SAS) with the primary sludges being treated through conventional digestion with the sludges being blended after. This solution has an estimated cost of £277m (with £167m currently profiled in AMP8).

Both achieve the required compliance levels for continuing recycling sludge to land.

The plant will take 5-6 years to construct.

The preferred solution is the SAS only solution (Option 2), as it is the cheaper whole life solution as more of the gas generated can be used for combined heat and power or gas to grid, rather than being used for generating steam for the THP process.

We would like to discuss with Ofwat passing this project through the Large Scheme Gated Allowance as costs have yet to be market tested.

5 Climate change uplift

5.1 Brief outline of Ofwat's position

Ofwat propose an additional £64m expenditure allowance to improve resilience to climate change. For wastewater the allowance is £30.4m, for Water the allowance is £34.2m. The focus of this allowance is in particular resilience to power interruptions and flooding. Ofwat requested that Thames Water set out what schemes we will deliver for the additional uplift in funding in our representations. This should include details of the schemes and why these have been prioritised.

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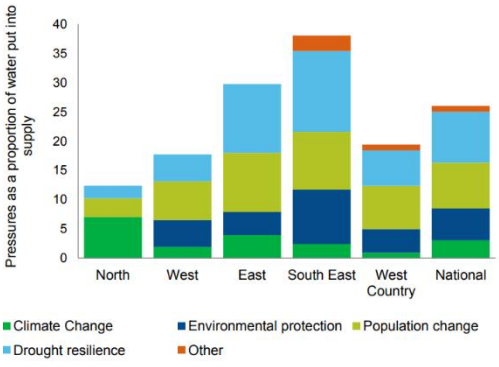
[redacted]	[redacted]  [redacted] [redacted]

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Solution	[redacted]
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5.3 Summary of our request for FD

Thames Water welcome the additional allowance for climate change resilience in the Draft Determination. We recognise there is an allocation in base cost models to mitigate climate change risks and this base allocation will be used to address surface water management schemes delivered by partnership working identified in DWMP. For the additional climate change uplift we have identified our high risk power resilience risks leading to supply interruptions or flooding which will be exasperated by climate change.

If a PCD is required for this additional funding we recommend is it a scheme completion PCD assured by external independent auditors.

Table 36 -Summary of climate change uplift DD allocation and Thames Water proposal

	Ofwat DD allocation	Thames Water Proposal
Water – Climate change resilience schemes	£34.2m	£32.8m
Wastewater – Climate change resilience schemes	£30.4m	£29.95m