PR24

NORTHUMBRIAN WATER living water | ESSEX&SUFFOLK WATER living water

COSTS

APPENDIX A3
NES04

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1. EXECUTIVE SUMMARY

Our vision is to be the leader in sustainable water and wastewater services and this plan builds on our strong track record of driving efficiency.

To achieve our vision, we not only need high performance against service metrics, but we also need to be efficient in their delivery. The essential nature of our services means that keeping bills affordable is extremely important.

We have a strong track record in delivering value for money and high levels of efficiency for our customers. At PR19, Ofwat's preferred base cost models positioned us at the upper quartile level across all of the price controls and we were the sector-leading company for bioresources.[1] As a result, our customers had bills that were £403m less than they otherwise would have been.[2] This efficient position has continued into the current period (AMP7). During the 2020-23 period, we have continued to drive efficiency improvements through initiatives aimed at reducing energy, chemicals and other operating costs, as well as smart capital delivery initiatives aimed at reducing capital costs. By 2025, we expect to have delivered around £260m of further efficiency improvements. This includes:

- £150m of opex savings from initiatives including: productivity improvements from headcount reductions and working pattern changes; greater use of automation and technology; changes to our pension scheme; and optimisation of our property portfolio.
- £110m of capex savings from improved risk management; greater efficiencies in project delivery; reductions in project overheads; and improved commercial terms in contracts.

This strong efficiency and service performance position is evident from that fact that we are the 2nd most efficient Water and Sewerage company based on Ofwat's proposed PR24 base cost models across the different price control areas. At the same time, we rank 3rd in our service performance across the 'common' Performance Commitments that Ofwat intends to set in PR24, based on data available for the last two years. This is shown in Figure 1 below.

[1] Ofwat (2019), Final determination feeder models for modelled base costs.
[2] Northumbrian Water PR19 CMA redetermination – Statement of Case, 2023, section 2.6, figure 6 highlights customer benefit from our efficiency.

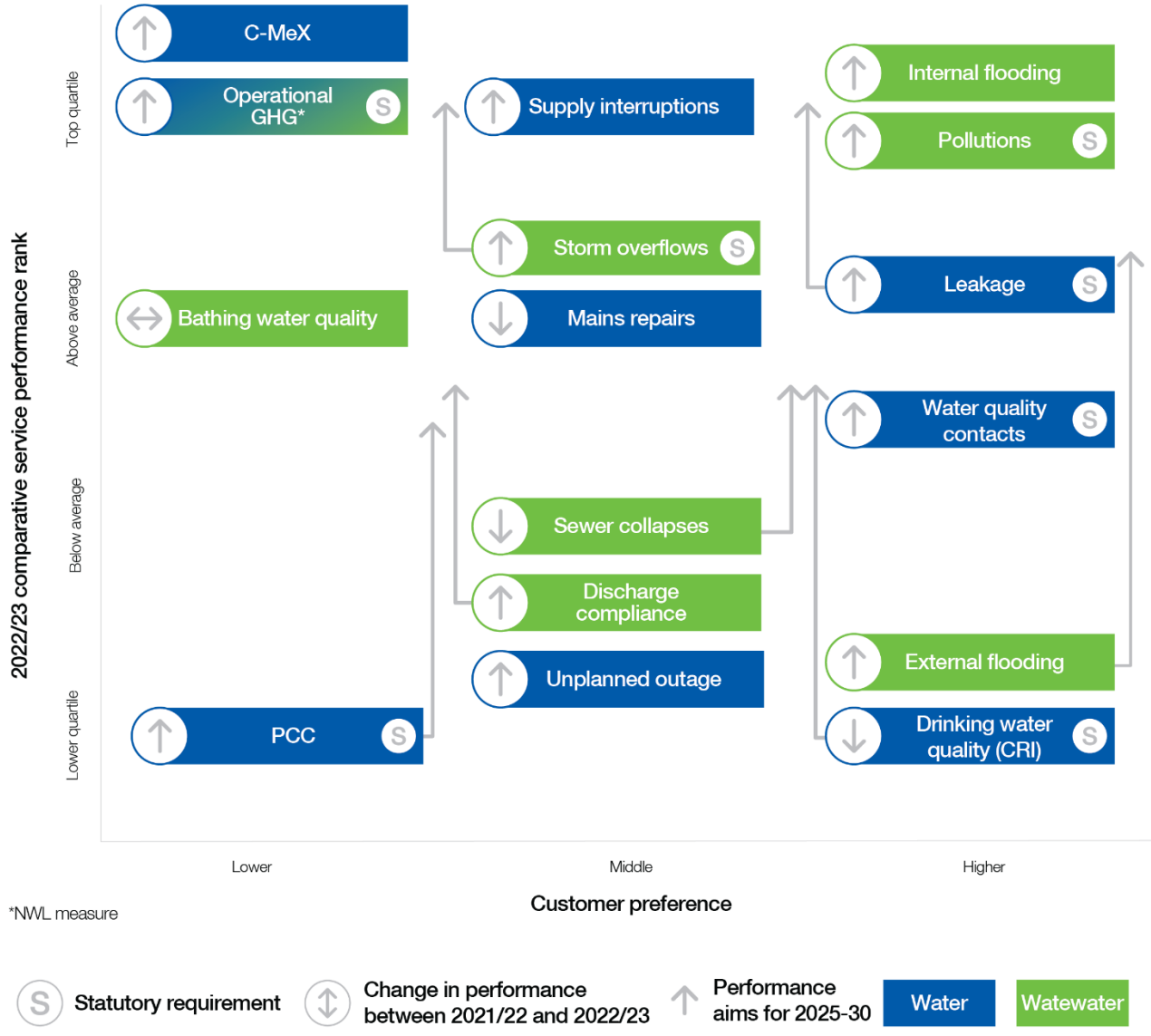
FIGURE 1: NWL COMPARATIVE SERVICE PERFORMANCE AND COST EFFICIENCY

Source: NWL analysis based on Ofwat's proposed PR24 base cost models and accompanying data published April 2023 and a comparison of the modelled 'efficient' costs versus the actual expenditure of NWL. Cost efficiency ranks are based on the efficiency score which captures the ratio of actual to modelled costs where a lower score denotes higher levels of efficiency. Service performance ranks use data from 2021-23, where historical comparative data is available for most of the measures, and take an average rank across this period, across all of Ofwat's PR24 common service performance metrics, giving each service an equal weighting. Biodiversity, BRMex and river water quality are excluded as comparative information is not yet available.

Our PR24 business plan seeks to continue to deliver stretching service improvements and efficiency savings for customers

At PR24, we aim to continue delivering value for money and high levels of efficiency for current and future customers by focussing improvements in areas that are the key priorities for customers. We describe these areas in greater detail in the Outcomes Appendix (NES05), but in Figure 2 below we summarise our current comparative performance (based on the most recent 2022/23 year of data), the service priorities of our customers (including lower, middle or higher priority service levels) and where we expect our comparative performance to improve by 2030 (based on the grey arrows).

FIGURE 2: CUSTOMER PRIORITIES, CURRENT COMPARATIVE PERFORMANCE (2022/23) AND FUTURE EXPECTED PERFORMANCE FROM OUR BUSINESS PLAN (2029/30)



Source: NWL. Small arrows in boxes indicate the change in performance between 2021/22 and 2022/23, while 'S' indicate those measures with statutory requirements. Larger arrows show the trajectory of relative performance under the plan to 2030.

However, to achieve these outcomes for our customers, it is imperative that we are allowed efficient costs to deliver the innovative capital delivery and operating efficiency improvements. In our plan, we have considered the following.

- **Efficient base costs**. We have relied on Ofwat's proposed PR24 models to estimate our efficient base costs. In particular, for each price control (water, wastewater, bioresources, and retail), we weight the models in Ofwat's proposed PR24 cost benchmarking modelling suite equally in estimating our efficient base costs, despite our concerns as to some of Ofwat's models within this suite, that we have previously expressed.[3] Following from our upper quartile performance at PR19, we aim to continue making efficiency improvements to our base costs at PR24. This consists of ambitious efficiency challenges for both catch-up and ongoing efficiency. The **catch-up efficiency challenge** we propose is based on the upper quartile levels of efficiency from Ofwat's proposed PR24 cost benchmarking modelling suite.[4] We have also put in place a stretching 0.8% per year **ongoing efficiency challenge** to make sure our costs remain efficient into the future through innovation and technological improvement. In our Outcomes Appendix (NES05), we summarise the plans we have to deliver each service improvement area. This challenge is more stretching than the likely range considered by an independent report at PR24.

- **Input cost pressure**. Our desire to be efficient comes with a backdrop of increasing input prices (relative to general inflation). We consider that, consistent with Ofwat's approach at PR19, both an RPE adjustment and a true-up mechanism for labour costs continue to be appropriate at PR24, for the same reasons as before (that is, there is evidence that evolution of labour costs materially deviates from inflation, and is outside of our management control). In addition, the shocks in energy, chemicals, and materials caused by recent global events have meant that we have also been exposed to these other cost pressures (relative to general inflation), like the rest of the market. These cost shocks will in fact have more than offset the savings we have achieved through efficiency gains, which mean we will spend more than our totex allowances in 2020-25, in line with almost every other company in the sector. We cannot beat the market and, therefore, these costs are outside of our control. In fact, the average extent of hedging into the future has meant that we are yet to see the full impact of these cost shocks thus far in PR19. Therefore, we need an uplift in allowances for energy costs to reflect the recent uplift in energy prices, which are not fully captured in the historical costs that Ofwat's cost benchmarking models are based on. Going into PR24, there is substantial uncertainty regarding how the prices for these inputs are likely to evolve, and independent analysts are split, this makes it extremely difficult to develop robust forecasts. Therefore, we believe that we need ex-post true-up mechanisms for nearly all of our cost categories. This will make sure that our customers benefit from lower prices if input prices fall and we are shielded from higher input costs if input prices rise. We propose basing these uncertainty mechanisms on independent benchmarks, instead of our actual costs, which will make sure we will still face strong incentives to drive more efficiency for our customers. Finally, we also include an inflation adjustment to non-labour retail costs, to reflect the fact that we expect these costs to increase in line with inflation over AMP8 (and Ofwat has stated it does not plan to index retail costs to inflation).

[3] Northumbrian Water (2023), Response to consultation on 'Econometric base cost models for PR24'.
[4] See https://www.ofwat.gov.uk/consultation/pr24-econometric-base-cost-models-consultation/.

The table below shows the breakdown of proposed modelled base costs for wholesale water, wastewater (wastewater network plus and bioresources), and retail, respectively. We provide further detail for each of these components in Section 3.

TABLE 1: MODELLED BASE COST ESTIMATES AT PR24 (£M, 2022/23 PRICES)

	WATER	WASTEWATER	BIORESOURCES	RETAIL
Predicted costs	1,428	847	182	367
Efficient predicted costs	1,419	840	163	332
Enhancement opex	2	18	0	0
Energy uplift	70	47	0	0
RPE/IPP[5]	-20	-12	-3	49
Frontier Shift	-58	-34	-6	-13
Total modelled base costs	**1,414**	**858**	**154**	**366[6]**

Source: NWL analysis based on Ofwat's proposed PR24 models. Note, total figures may not sum exactly because: (i) of rounding; and (ii) the 'Total modelled base costs' are calculated in a way that is consistent with the SUP11 table – that is, cumulating annual RPE/IPP and frontier shift *together*, rather than separately and then summing the two effects – whereas the 'RPE/IPP' and 'Frontier shift' rows of this table measure the approximate effect of each *separately* on total modelled base costs.

- **Cost adjustment claims.** We were one of the few companies in the sector to propose no cost adjustment claims. Instead, we have sought to focus on meeting and beating the benchmarks (as per Ofwat's proposed PR24 cost modelling suite) and setting ambitious efficiency targets against those. We do seek additional enhancement expenditure to meet a small number of PCLs and seek uplifts to base expenditure for asset health and climate change resilience.

- **Service improvements.** The vast majority of our service improvements for customers will be funded from base cost allowances without any requests for further investment. This reflects the customer research we carried out where, in general, customers were not willing to see bills rise to fund further service improvements.[7] However, at PR24, changes in statutory requirements mean that we must drive environmental improvements for the benefit of current and future

[5] As we detail below, we include IPP for non-labour retail costs that is equivalent to CPIH. As such, the figure for retail in this row is the sum of: (i) retail labour IPP; and (ii) non-labour retail IPP measured by CPIH.
[6] Note – retail total is in nominal price base because RPE/IPP is expressed in nominal.
[7] See A7 - Customer and Stakeholder engagement (NES08) and PR24 Customer Research - Common PCs Insight Summaries (NES42).

customers (as well as wider society). Again, in most instances, we intend to seek improvements from base cost allowances, with the exception of three instances: CSO spills, leakage and WISER requirements for pollutions. For CSO spills there are new Government targets in the Storm Overflow Discharge Reduction Plan (SODRP)[8] and a recognition that this will drive significant additional investment to meet those requirements.[9] For leakage, we have a long-term statutory requirement to reduce leakage by 50% by 2050 across our operating areas. While our service performance on leakage is already better than the sector average, to deliver this target, we will need to invest significantly more, particularly in our Essex and Suffolk operating areas where our performance is at the upper quartile for the sector. Reflecting on Ofwat's methodology and the CMA's decisions in 2019, we include £40m of additional funding to meet our leakage and water efficiency targets for 2030 (including reducing NHH demand). Similarly, WISER requirements for pollutions seek a 30% improvement in pollutions by 2030. We are currently among the most efficient wastewater companies in the sector and, last year, our pollutions performance was the second best in the sector. We cannot 'catch-up' to others because we are already amongst the best performers. At the same time new monitoring and reporting changes will likely increase numbers of reported pollutions across the sector meaning we will need to improve by more than 30% in practice, meaning improvement will reasonably require additional investment. Our plan includes £13.5m of additional funding to meet that service level.

- **Enhancement costs.** Our enhancement plan is heavily driven by enhancement expenditure to meet the new statutory requirements, particularly in wastewater. At PR19, Ofwat challenged us around the quality of our enhancement cases. So, for PR24, we have completely changed our approach to considering enhancement expenditure and brought on additional expert independent resource to better support us in the development of these cases as well as introducing new analytical tools and changes to our investment appraisal processes to better understand and reflect wider public value benefits. The enhancement cases have therefore been robustly developed through identifying needs, optioneering and cost assessment followed by cost-benefit assessment to select the best value solutions for customers, the environment and wider society. Our existing benchmark data provides a robust evidence base against which we can test our enhancement costs. We have also benchmarked samples of our proposed enhancement cases with other water companies' cost curves and/or through market testing to ensure efficiency for customers. We have then applied the same stretching 0.8% per year ongoing efficiency challenge to these costs as we have done for base costs. The two tables below summarise our enhancement totex for PR24 for wholesale water and wholesale wastewater respectively.

[8] See: https://www.gov.uk/government/publications/storm-overflows-discharge-reduction-plan.
[9] See: https://assets.publishing.service.gov.uk/media/651162052f404b0014c3d83c/Impact_Assessment_September_2023.pdf.

TABLE 2: OVERVIEW OF WHOLESALE WATER ENHANCEMENT EXPENDITURE (£M, 2022/23 PRICES)

Area	Five-year totex AMP8 (£m)	Table CW3 lines covered
WINEP – statutory items	49.6	CW3.1-40
WRMP supply options	386.1	CW3.41-43, 50-58
WRMP demand (metering, leakage, water efficiency)	165.4	CW3.44-49, 60-90,
Security	25.9	CW3.121-123,132-133
Climate change resilience	93.0	CW3.118-120
Lead replacement	46.8	CW3.106-117
Raw water deterioration	8.0	CW3.97-102
Reservoir safety	80.6	CW3.134-135
Asset health – civil structures	92.2	CW3.130-131
Total	**947.3**	**NA**

TABLE 3: OVERVIEW OF WHOLESALE WASTEWATER ENHANCEMENT EXPENDITURE (£M, 2022/23 PRICES)

Area	Totex AMP8 (£m)	Table CWW3 lines covered
WINEP – storm overflows	939.3	CWW3.22-24, 34-39, 43-48
WINEP – statutory items (chemicals, monitoring, and so on)	609.7	CWW3.19-21,55-57,70-72,85-87,88-90,109-111,121-123, 137-148
WINEP – Non-statutory items	66.4	CWW3.100-102
Growth at wastewater treatment works	54.2	CWW3.153-155,181-182
Climate change resilience	76.6	CWW3.168-170
S101a – first time sewerage	3.3	CWW3.159-161
Asset health – civil structures	94.4	CWW3.185-186
Pollutions incidents	13.5	CWW3.183-184
Wastewater security	13.3	CWW3.171-173
Total	**1,870.7**	**NA**

1.1. STRUCTURE OF THIS DOCUMENT

This document is structured as follows.

- In Section 3, we set out our approach for forecasting modelled base costs. These are costs associated with the day-to-day operation of our business, including in particular: the ongoing costs to operate our business (opex), such as the wages of staff, energy, and chemical inputs; and the costs associated with maintaining the existing asset base. In particular, we provide:
  1. An overview of our approach to estimating base costs, and our proposed allowances.
  2. The cost benchmarking models that we have used to assess base costs and our proposed method of forecasting cost drivers.
  3. The catch-up efficiency challenge we have set ourselves.
  4. The enhancement opex for a subset of enhancement lines where it is clear that costs represent ongoing running costs from new assets.
  5. The input price pressure, above general inflation, that we face which needs to be reflected in our cost allowances.
  6. The ongoing efficiency improvement, or 'frontier shift' challenge, we have set ourselves.
  7. The unmodelled base costs. These include costs for unmodelled items that are not common across all companies and which are outside of our management control – for example, business rates or abstraction charges.

- In Section 4 we set out our approach to enhancement costs. Enhancement costs are those associated with new investments that we need to make, for example, to accommodate new quality of service enhancements that are driven by statutory requirements; and investments that reduce risk associated with climate change. In particular, we set out,
  1. Our approach to developing our enhancement programme including how we established the need for investment, considered different options, costed them and optimised the plan, considering the costs and benefits of the alternatives.
  2. How our enhancement programme fits in with our long-term strategy.
  3. How we have challenged ourselves on the programme to make sure that the investment is new and does not overlap with other funding, and that the proposals are affordable and supported by customers.
  4. The approach to our PR24 enhancements costs to make sure that they are efficient.
  5. A summary of the benchmarking we have carried out of our enhancements to make sure that they represent efficient costs and value for money for customers.

- In Section 5, we discuss cost adjustment claims. We have not made any symmetrical cost adjustment claims at PR24, but we set key areas where we have requested additional costs which we do not think the cost models alone can capture.

- In Section 6, we set out our proposals on risk sharing at PR24. This includes three areas.
  1. Cost sharing rates – this covers areas of unmodelled costs where we have very limited to no control over the costs and do not consider the final methodology proposals to be appropriate. It also covers the Industrial Emissions Directive costs, where following the CMA decision after PR19 we are not requesting additional costs but given the delays to the definition of requirements at these sites we request that the cost sharing rate that the CMA introduced is extended into AMP8.
  2. Bespoke uncertainty mechanisms – there are three areas of our plan where we think bespoke mechanisms are required. One concerns the potential use of an adaptive pathway for potential need for the North Suffolk Winter Storage Reservoir, another is around potential changes to the solutions required in order to achieve nutrient neutrality requirements, and the final area relates to the CSO programme given its scale and novelty.
  3. Price control deliverables – as per the PR24 methodology we have included PCDs to ensure that we are clear over what will be delivered by enhancements, so that money is returned to customers if they are not delivered.

- Finally, Section 7 sets out our data/board assurance requirements.

2. INTRODUCTION

This appendix sets out the approach we have taken to setting efficient costs in our Business Plan. The Final Methodology for PR24 sets out some minimum requirements for costs as part of the Quality and Ambition Assessment[10]. Some of these are addressed in this document and others are covered in separate appendices. The table below sets out where these requirements are addressed.

FIGURE 3: MINIMUM EXPECTATIONS FOR COSTS IN PR24 BUSINESS PLANS

PR24 methodology minimum expectations	Where this is covered
The business plan sets out the benefits of the company's proposals, specifically: • the performance levels delivered through base for all performance commitments; • impacts of enhancement expenditure on performance commitments for 2025-30 and the longer term (that is, to at least 2050); • the primary benefits of its proposals. Wherever appropriate it reflects these benefits in performance commitments and price control deliverables; and • the additional benefits of its proposals. Wherever appropriate it reflects these benefits in performance commitments and price control deliverables.	Our performance levels delivered from base and enhancement expenditure are set out in **A4 – Outcomes** (NES05) in Section **3.2.3**. This outlines the benefits of our proposals delivered through performance commitments. Our approach to price control deliverables associated with our enhancements is set out in Section **6.3** of this document.
The business plan and long-term delivery strategy are consistent with the achievement of government targets and statutory requirements. In Wales, this includes demonstrating how companies have taken into account the outputs of the collaborative approach.	We summarise the link to the long-term strategy and why each of the enhancement cases are 'no regrets' in Section **4.2** of this document. Our **long-term strategy** (NES_LTDS) sets out our 25-year view of the targeted service levels we need to make by 2050 and how they are consistent with statutory obligations.

[10] Ofwat (2022), PR24 Final methodology, Appendix 12 quality and ambition assessment.

	Our Assurance appendix also highlights how the plan is consistent with our statutory obligations **A2 - Data, Information and Assurance** (NES03).
The business plan and long-term delivery strategy include investment options which are consistent with the company's finalised water resources management plan, final WINEP/NEP submission and, if applicable, drainage and wastewater management plan, having adequately addressed any feedback previously provided on these. We also expect compelling evidence on the need for variations from final plans, if relevant.	Our **long-term strategy** (NES_LTDS) reflects the finalised investments from our WRMP[11], DWMP[12] and WINEP. Those documents also respond to the feedback that was provided on previous drafts, including Ofwat's feedback.
The company proposes to use direct procurement for customers (DPC) to deliver eligible schemes.	We discuss the opportunities for DPC in **A6 – Deliverability** (NES07). Following independent advice and correspondence from Ofwat we do not propose to DPC any schemes in the plan.
The company provides sufficient and convincing evidence that the investment proposals within its PR24 business plan are deliverable. This should take into account delivery in the 2020-2025 period and any measures the company has put in place.	We are carrying out a company-wide transformation programme to make sure we are ready to deliver the scale of the AMP8 programme. We discuss this work in **A6 – Deliverability** (NES07).

In addition to these minimum requirements, Ofwat also set out a number of additional areas that would consider as part of the ambition assessment under 'stretch and efficiency'.[13] These are set out in the table below along with the references on where they are covered in our plan.

FIGURE 4: AMBITION ASSESSMENT CONSIDERATIONS

Ofwat consideration	Where this is covered
Companies propose to deliver stretching performance from base expenditure allowances.	Our **A4 – Outcomes** (NES05) sets out each of the Performance Commitment Levels (PCLs) that we propose for our business plan. It also includes an annex with

[11] See: https://www.nwg.co.uk/responsibility/environment/wrmp/nw-draft-water-resources-management-plan-2024-consultation/.
[12] See: https://www.nwl.co.uk/dwmp.
[13] 'Our final methodology for PR24', Ofwat (2022), page 159.

	forecasts for where the industry average and upper quartile positions could be by 2030 which we use to inform our ambition based on historical information. It also describes our 'national leader' assessment framework that we use to establish an ambitious benchmark for the service level targets in the business plan and how we have focussed improvements in the areas that are the greatest priority for customers.
Expenditure proposals are efficient and consistent with our stretching efficiency benchmarks, with any cost adjustments based on compelling evidence.	Section 5 of this document sets out why our costs are efficient. We use Ofwat's PR24 cost models to assess our base costs with an upper quartile catch-up efficiency challenge and a 0.8% ongoing efficiency improvement rate. We did not propose any cost adjustment claims.
Enhancement expenditure is well justified, based on adaptive plans, meets customer and environmental needs, and makes progress towards delivering relevant government targets.	Section 6 of this document and accompanying enhancement business cases set out the enhancement expenditure that we propose for the business plan. Section 4.2 explains how these cases link to our long-term strategy (NES_LTDS) which also sets out the adaptive plans that we have put in place and how we intend to meet the relevant Government targets.
Companies propose to deliver best value solutions, by considering wider environmental and social benefits, costs, risks, opportunities for third party funding and the affordability of customers' bills.	Section 6 of this document explains how we have developed our enhancement business cases including the cost benefit analysis we have carried out. The accompanying enhancement businesses cases each set out the associated cost benefit analysis as well as opportunities for third party funding. Our Appendix A1 – Affordability (NES02) sets out how we will seek to ensure the affordability of the business plan.

3. PR24 BASE COSTS

3.1. OVERVIEW

In this section, we set out our forecasts for efficient base costs at PR24 across our four business areas: wholesale water, wastewater network plus, bioresources and retail. Our base expenditure consists of the year-on-year costs we incur in the typical running of our business, as well as expenditure to (i) maintain the long-term capability of assets; (ii) improve efficiency; and (iii) comply with any existing legal obligations.

The table below sets out our modelled base cost projections across AMP8 (we set out our unmodelled costs at the end of this chapter).

TABLE 4: MODELLED BASE COST ESTIMATES AT PR24 (£M,2022/23 PRICES)

	Water	Wastewater	Bioresources	Retail
Predicted costs	1,428	847	182	367
Efficient predicted costs	1,419	840	163	332
Enhancement opex	2	18	0	0
Energy uplift	70	47	0	0
RPE/IPP[14]	-20	-12	-3	49
Frontier shift	-58	-34	-6	-13
Total modelled base costs	**1,414**	**858**	**154**	**366[15]**

Source: NWL analysis based on Ofwat's proposed PR24 models. Note, total figures may not sum exactly up because: (i) of rounding; and (ii) the 'Total modelled base costs' are calculated in a way that is consistent with the SUP11 table, that is, cumulating annual RPE/IPP and frontier shift *together*, rather than separately and then summing the two effects – whereas the 'RPE/IPP' and 'Frontier shift' rows of this table measure the approximate effect of each *separately* on total modelled base costs.

Our modelled base cost estimates consist of the following:

- **Predicted costs: we use Ofwat's proposed econometric models to predict our initial (unadjusted) modelled costs.** Specifically, we use Ofwat's proposed PR24 cost benchmarking modelling suite for wholesale, wastewater,

[14] As we detail below, we include IPP for non-labour retail costs that is equivalent to CPIH. As such, the figure for retail in this row is the sum of: (i) retail labour IPP; and (ii) non-labour retail IPP measured by CPIH.
[15] Note – retail total is in nominal price base because RPE/IPP is expressed in nominal.

bioresources and retail, to form the basis of our modelled expenditure forecasts.[16] We also account for the growth expenditure that we expect to incur, by developing forecasts using the cost drivers in Ofwat's PR24 base cost models. See Section 3.2 for further details.

- **Efficient predicted costs: we apply a stretching, but achievable, catch-up efficiency challenge to our modelled costs.** Specifically, we adjust our modelled costs using the upper quartile efficient firm for each price control, to set our catch-up efficiency challenge. See Section 3.3 for further details.

- **Enhancement opex: we include additional expenditure related to enhancement opex**. We include the ongoing running costs from our enhancement schemes that were carried out at AMP7.[17] This is necessary as the ongoing costs into AMP8 associated with these schemes will not fully be reflected in the historical costs used in Ofwat's models. See Section 3.4 for further details.

- **Energy uplift and RPE/IPP: we make adjustments to account for input price pressures**. We discuss this in detail in Section 3.5. In summary:
  - We include an adjustment of the 'starting point' of allowances to account for the uplift in energy costs we may face at AMP8.
  - We include an ex-ante RPE/IPP allowance for labour input price pressures. In addition, for the retail control, we include an ex-ante CPIH allowance for non-labour costs.
  - We also propose ex-post true-up mechanisms for all of our key input cost categories, that is, (i) labour (wholesale and retail); (ii) energy; (iii) chemicals; and (iv) MPE, to account for the uncertainty in the evolution of prices over the PR24 period.

- **Frontier shift: we set an ongoing efficiency challenge of 0.8%.** This reflects our stretching ambition to become more cost efficient over the price control, in terms of making efficiency improvements to reflect advances in technology and / or working practices over time. Frontier shift is applied to all the components of base costs above. See Section 3.6 for further details.

Finally, for costs which cannot be explained by the PR24 econometric models due to our unique circumstances ('**unmodelled costs**'), we use a bottom-up assessment to identify efficient costs. For example, both abstraction charges and business rates cannot be predicted using econometric modelling; and are outside of our management control. We, therefore, produce our own forecasts based on our detailed knowledge and understanding of how these costs are incurred. This is detailed in Section 3.7.

[16] https://www.ofwat.gov.uk/regulated-companies/price-review/2024-price-review/econometric-base-cost-models-for-pr24/.
[17] Appendix 9 – setting expenditure allowances, Ofwat, p.11.

3.2. PREDICTED COSTS

We use the econometric models in Ofwat's proposed PR24 cost benchmarking modelling suite to predict our initial (unadjusted) forecasted costs.[18] This involves the following steps, which are illustrated in Table 5 below.

TABLE 5: STEPS TO PREDICT FORECASTED COSTS

STEP	Method
A	Estimate coefficients on each cost driver from Ofwat's latest models as published in April 2023.[19]
B	Forecast cost drivers over the PR24 period (see Table 6 to Table 9 below).
C = A x B	Estimate predicted costs for each model by applying the coefficient to the forecast cost drivers.
D = average costs across all models[20]	Triangulate models in line with Ofwat's approach at PR19.

We consider this to be an impartial view and reflects our desire to be stretching in setting our allowances. This is despite our concerns with some of the models, which we have previously expressed in our reply[21] to the Ofwat consultation on them. In particular:

- **Average pumping head**: we do not think the data quality of this variable is sufficient for inclusion at PR24. Our position on this is unchanged since PR19 where we agreed with Ofwat and the CMA's determinations to exclude the variable. While some improvements in data quality have been made, we do not consider that the evidence has materially changed and is not enough to pass the high bar set by Ofwat for changes to the PR24 models. This aligns with the findings of the Turner and Townsend report for Ofwat.[22] Booster per km of mains remains a superior alternative and should continue to be used for PR24.
- **Urban rainfall**: we disagree with the inclusion of this driver on the grounds of poor engineering rationale. First, it does not capture the peakiness of rainfall, which is what the sewer system is designed to address, and therefore provides a poor link to costs. Second, pumping costs associated with larger sewer systems are already captured

[18] https://www.ofwat.gov.uk/regulated-companies/price-review/2024-price-review/econometric-base-cost-models-for-pr24/.
[19] This uses an updated dataset which uses Ofwat's published datasets (going up to 2021/22) but also incorporates the latest APR company data share for 2022/23.
[20] Note, retail models are triangulated with 75% top-down and 25% bottom-up weighting, consistent with Ofwat's PR19 methodology.
[21] NES-Consultation-Response-to-PR24-Econometric-models.pdf (ofwat.gov.uk).
[22] Turner & Townsend (2023), 'Average Pumping Head: data quality improvement'.

by the topography variable used in the sewage collection and wastewater network plus models, providing a more direct measure of pumping requirements.

We note that that the required growth expenditure is included in our modelled costs via our forecasts of the cost drivers. For example, if the number of connected properties increases, the method above would forecast higher predicted costs. The tables below show our forecast drivers for AMP8 for each price control area.

TABLE 6: OVERVIEW OF APPROACH TO FORECASTING WHOLESALE WATER COST DRIVERS

Cost driver	Forecasting approach
Connected properties	Edge Analytics forecasts based on ONS projections. These have been mapped onto our operating regions to derive independent growth estimates. NAVs are excluded.
Water treated at complexity levels 3 to 6 (%)	Forecast based on demand planning analysis.
Weighted average treatment complexity	Assumed to remain at 2021/22 levels.
Weighted average density variables	Assumed to grow in line with Edge Analytics forecasts for population growth.
Length of mains	Time trend with adjustment for Suffolk WRMP new main. This is because the Suffolk strategic network adds about 77km of mains in addition to the time trend.
Properties per length of main	Calculation based on the two extrapolated series on properties and length of main referenced above.
Booster pumping stations per length of mains	There are two growth schemes in AMP7 and AMP8 that will add four booster stations. The Suffolk scheme will also add two new booster stations in AMP8 which brings the total increase of six booster stations.

TABLE 7: OVERVIEW OF APPROACH TO FORECASTING WASTEWATER NETWORK PLUS COST DRIVERS

Cost driver	Forecasting approach
Population growth	Edge Analytics forecasts based on ONS projections. These have been mapped onto our operating regions to derive independent growth estimates.
Household growth	
Sewer length	Time trend

Pumping capacity	Forecast of pumping capacity is based on the true values of small pumping stations collected by the Operations team on an ongoing basis.
Pumping capacity per sewer length	Calculation based on the two extrapolated series on pumping capacity and sewer length referenced above.
Properties per sewer length	Calculation based on the two extrapolated series on properties and sewer length referenced above. Wastewater properties come from Edge Analytics forecasts with NAV growth deducted.
Weighted average density variables	Assumed to grow in line with Edge Analytics forecasts for population growth.
Urban rainfall per sewer length	Calculation based on the two extrapolated series on urban rainfall and sewer length referenced above. Forecast of urban rainfall is assumed to be the average of all historical data.
Load	Load is expected to grow with population. We have used Edge population growth including NAVs to make load forecasts. This reflects the average load received by STWs.
Load treated with ammonia permits <3mg/l	Assumed to remain at 2021/22 levels.
Load treated in size bands 1 to 3 (%)	Assumed to be the average of the last four years.
Weighted average treatment size	Assumed to be the average of the last four years.

TABLE 8: OVERVIEW OF APPROACH TO FORECASTING BIORESOURCES COST DRIVERS

Cost driver	Forecasting approach
Sludge produced	Assumed to grow in line with Edge Analytics forecasts for population growth and WINEP Phosphorus removal schemes.
Load treated in bands 1-3 (%)	Assumed to be the average of the last four years.
Weighted average density variables	Assumed to grow in line with Edge Analytics forecasts for population growth.
Number of STWs per property	Calculation based on the two extrapolated series on wastewater properties referenced above and number of STWs. Forecast of number of STWs is based on operational knowledge of future treatment works transfers.

TABLE 9: OVERVIEW OF APPROACH TO FORECASTING RETAIL COST DRIVERS

Cost driver	Forecasting approach
Revenue	Based on our PR24 Financial Model.
Total number of households	Based on forecast of new properties from demand planning analysis.
Average bill size (£ per household)	Calculation based on the two extrapolated series on total revenue and total number of households referenced above.
Equifax – Percentage of households with payment default	Assumed to remain at 2022/23 levels.
Equifax – Average number of Country Court Judgments/Partial Insight Accounts per household	Assumed to remain at 2022/23 levels.
ONS – Income deprivation score	Assumed to remain at 2022/23 levels.
Proportion of dual households	Assumed to remain at 2022/23 levels.

3.3. CATCH-UP EFFICIENCY CHALLENGE

Our ambition is to deliver industry-leading levels of cost efficiency and value for money for our customers. To achieve this, we apply a catch-up efficiency challenge to our modelled costs where there is potential to improve our efficiency relative to our peers. This ensures our customers will only pay for the efficient delivery of our services.

We use Ofwat's benchmarking models above and, for each price control area, set ourselves an upper quartile efficiency challenge, consistent with Ofwat's approach in previous price controls. We consider the upper quartile to be the most appropriate benchmark to derive our catch-up challenge for the following reasons.

- **The upper quartile represents an ambitious catch-up efficiency challenge.** Using the upper quartile requires three quarters of companies to make efficiency improvements within their allowances. This is an ambitious goal, especially since no single company currently achieves upper quartile cost efficiency across all price control areas. Therefore, this is consistent with our ambition of setting ourselves a stretching, but achievable, challenge.

- **The upper quartile balances a stretching efficiency challenge against modelling precision.** Econometric modelling can never perfectly distinguish the extent to which cost differences between companies are due to efficiency differences rather than modelling error/uncertainty. Therefore, to reflect model robustness and quality, Ofwat and the

CMA used the upper quartile as the efficiency benchmark in its PR19 price redeterminations in wholesale water and wastewater.[23]

We will carry out a number of activities to reach this efficiency target, we discuss our efficiency in Annex 1 to this document. For water and wastewater network plus, we are focusing on energy and chemicals usage, and optimising our planning and scheduling activities. These activities will complement our ongoing internal efficiency monitoring, which includes annual targets for efficiency improvements and targets for head count reduction. For bioresources, while we are currently spending below the upper quartile level, we still plan to target spend around the upper quartile level as we see upward pressures on these costs moving into AMP8. For example, we have identified issues with the condition of the digesters at our Bran Sands site, which may require a significant intervention; many of our dewatering and centrifuge assets are nearing the end-of-life and we are likely to see increasing maintenance spend pressures; there are also significant risks associated with the publication of the EA's Sludge Strategy (due in 2024) that may result in landbank restrictions, which would result in increased costs. Opportunities to trade sludge volumes with neighbours would provide potential benefits but no contracts have yet been established.

3.4. ADDITIONAL EXPENDITURE RELATED TO ENHANCEMENT OPEX

Enhancement expenditure consists of expenditure to provide our customers with a permanent increase (or step change) in the existing level of service to a new 'base' level. Our enhancement opex consists of expenditure related to previous projects we initiated during AMP7, such as our P-removal schemes which will largely be completed towards the end of AMP7, for which ongoing costs are not covered by Ofwat's models based on historical data.

This is because the PR24 cost models are unable to fully reflect enhancement opex when: (i) costs have not been incurred for the 'full' modelling period, that is, the five-year modelling period; or (ii) the forecasts of cost drivers do not capture all future relevant changes related to enhancement opex.

Our approach to estimating these efficient costs is consistent with Ofwat's latest position, which is to add enhancement opex to modelled base costs for a subset of enhancement lines, where it is clear that costs represent ongoing running costs from new assets.[24] Specifically, Ofwat lists the following AMP7 enhancement expenditure for which operating costs will be covered in enhancement opex: nitrogen removal; phosphorus removal; reduction of sanitary parameters; UV disinfection (wastewater); and chemical removal schemes.

We have reviewed our enhancement categories to consider whether an adjustment is appropriate. The table below sets out the types of AMP7 opex that we considered and whether or not an adjustment is required to ensure an efficient level of ongoing enhancement opex is included in our AMP8 projections.

[23] Final report (publishing.service.gov.uk). paragraph 4.494.
[24] https://www.ofwat.gov.uk/wp-content/uploads/2022/12/PR24_final_methodology_Appendix_9_Setting_Expenditure_Allowances.pdf, p.5.

TABLE 10: FRAMEWORK FOR CONSIDERING AMP7 ENHANCEMENT OPEX

Type of AMP7 enhancement opex expenditure	Adjustment required?
One-off opex, for example, investigations.	No, costs will not continue into AMP8.
Ongoing opex as part of long-established activity and no new requirements arising during AMP7 and is modelled as part of base costs, for example, base water efficiency expenditure.	No, long time series of data present in the historical data used in the benchmarking models.
New ongoing opex associated with a change in a cost driver in the models, for example, new water treatment processes captured by the weighted average treatment complexity cost driver.	No, opex requirement already captured by the relevant cost driver.
New ongoing enhancement opex from AMP7 projects that is not captured by a forecast change in a cost driver.	Yes, adjustment required as ongoing opex will only be reflected in (maximum) three years of the modelled data covering AMP7 to date.

For the new ongoing enhancement opex, that is, the final row of the table above, we calculate the adjustment for the relevant costs where Ofwat has indicated that enhancement opex will be allowed as follows:

1. Identify the final ongoing opex requirement for enhancement spend in PR19, that will persist into AMP8 and beyond from the PR19 business case, the PR19 Final Determination models, or our latest information (where this is more accurate).

2. Estimate the implicit allowance provided by the PR24 base cost models based on the assumption that 20% of the opex that has been incurred in any year will be reflected in the allowance.[25] At the time of submitting the plan, it is likely that these reported costs will be small, since most schemes have not been completed by the end of year three of AMP7 and therefore were not incurring the relevant opex.

3. Calculate the adjustment required based on the difference between steps 1 and 2 above. That is, the residual funding required to ensure an efficient level of funding for enhancement opex in AMP8.

[25] If the costs were present in all five years of the modelling period (the same five years used to calculate the efficiency score) then it would be fully funded. Each 20% therefore represents its inclusion in the five years used to calculate the efficiency score and predicted costs of the model.

The tables below summarise our required enhancement opex adjustment. This is £0.31m per year for wholesale water, and £3.6m per year for wastewater network plus (prior to applying frontier shift). We note that no adjustments are required for bioresources or retail as these did not have any AMP7 enhancements that created new ongoing opex requirements.

TABLE 11: ASSESSMENT OF WHOLESALE WATER ENHANCEMENT OPEX (£M, 2022/23 PRICES)

AMP7 enhancement driver	AMP8 annual opex	Implicit allowance	Adjustment required
DWPA	0.178	Nil	0.178
INNS	0.049	Nil	0.049
WFD	0.081	Nil	0.081
TOTAL	**0.308**	**Nil**	**0.308**

TABLE 12: ASSESSMENT OF WASTEWATER NETWORK PLUS ENHANCEMENT OPEX (£M, 2022/23 PRICES)

AMP7 enhancement driver	AMP8 annual opex	Implicit allowance	Adjustment required
EDM and flow monitoring	0.096	Nil	0.096
P-removal	3.044	0.028	3.016
FTFT	0.153	Nil	0.153
Chemical (IMP)	0.095	Nil	0.095
Sanitary parameters	0.190	Nil	0.190
TOTAL	**3.578**	**0.028**	**3.550**

3.5. REAL PRICE EFFECTS / INPUT PRICE PRESSURE

In its PR24 Final Methodology, Ofwat has stated:

- Wholesale costs at PR24 will be indexed to inflation (specifically CPIH).[26]
- It does not intend to index retail costs to CPIH.[27]

This means that, to the extent that wholesale input costs which are outside management control are in excess of (or, lower than) CPIH, customers risk underpaying (or, overpaying) over AMP8. Likewise, irrespective of inflationary changes, to the

[26] 'Creating tomorrow, together: Our final methodology for PR24 Appendix 9 Setting expenditure allowances.' Ofwat (December 2022); p. 38.
[27] 'Creating tomorrow, together: Our final methodology for PR24 Appendix 9 Setting expenditure allowances.' Ofwat (December 2022); p. 38.

extent that retail input costs which are outside management control increase (or, decrease), customers risk underpaying (or, overpaying) over AMP8.

Our key input costs are: (i) labour (both for wholesale and retail); (ii) energy; (iii) chemicals; and (iv) machinery, plant and equipment (MPE). These are very different to the basket of goods in the CPIH index, which is similar to CPI but includes housing costs.[28] This means that changes in CPIH are unlikely to adequately capture changes in our wholesale input costs at AMP8. Input cost rises lead to us experiencing input price pressure (IPP) in our day-to-day operations, and when wholesale IPP differs to CPIH, this constitutes a real price effect (RPE).

At PR19, Ofwat granted an RPE and true-up[29] for wholesale labour costs, but not for the other cost areas. In its Final Methodology for PR24, it has said that: *"It will consider whether a labour real price effect and accompanying true up remain appropriate in PR24"* and that it *"will also reconsider whether a real price effect is needed for other inputs (for example, energy and materials)."*[30] We agree that RPE adjustments and a true-up mechanism for labour costs are appropriate and should also be in place at PR24. Consistent with Ofwat's approach at PR19, we use OBR forecasts to calculate labour input price pressure. We calculate RPEs in a way that is consistent with Ofwat's guidance.[31] See Annex 2 – Real price effects for more detail.

TABLE 13: ESTIMATES OF LABOUR REAL PRICE EFFECT

	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
IPP (%) (OBR)	4.11%	1.66%	1.66%	2.06%	2.48%	3.49%	3.60%
CPIH (%)	6.30%	3.27%	1.85%	2.00%	2.00%	2.00%	2.00%
RPE (%)	-2.06%	-1.56%	-0.18%	0.06%	0.47%	1.46%	1.57%

In addition, we have been exposed to other cost pressures (relative to general inflation) that are outside of our control. These costs will in fact have more than offset the savings we have achieved through efficiency gains, which means we will spend more than our totex allowances in 2020-25, in line with almost every other company in the sector. Therefore, for our PR24 plan, in addition we propose the following for **wholesale allowances**:

[28] https://www.ons.gov.uk/datasets/cpih01/editions/time-series/versions/36#:~:text=CPIH%20is%20the%20most%20comprehensive,)%2C%20along%20with%20council%20tax.
[29] A true-up means that, at some point during or at the end of the price control, Ofwat corrects the additional allowed costs as part of the RPE to reflect actual changes in input price pressure over the period of the price control.
[30] Creating tomorrow, together: Our final methodology for PR24 Appendix 9 Setting expenditure allowances.' Ofwat (December 2022); p. 38.
[31] https://www.ofwat.gov.uk/wp-content/uploads/2023/05/PR24-BP-table-guidance-part-10-SupplementaryV4.pdf; page 33.

- **Correction for the starting point / allowances for AMP8 (energy uplift)**. We have used Ofwat's proposed PR24 base cost models to develop our base cost proposals. However, at the end of the modelling period, there has a sharp increase in energy costs, reflecting the change in macroeconomic environment following the start of the war in Ukraine. These energy costs are not expected to normalise by the start of PR24 and, therefore, it is necessary to correct the 'starting point' of our PR24 allowances to reflect these higher costs which are not fully reflected in the modelled allowances. Our estimates are shown in the table below. Overall, we require £23.4m in each year of AMP8 (£116.9m in totality). Our method for calculating this is detailed in **Annex 2**.

TABLE 13: ENERGY UPLIFT ESTIMATE PER YEAR (£M, 2022-23 PRICES)

Price control	Annual energy uplift
Wholesale water	14.0
Wastewater network plus	9.4
Total	23.4

- **Ex-post true-up mechanisms for each of the key input cost categories (including energy; chemicals; and MPE).** This is because there continues to be significant uncertainty around the expected changes in these costs over AMP8 and, therefore, there are inherent uncertainties around any RPE estimates. The benefit of true-up mechanisms is that they shield customers from overpaying if outturn costs are lower than expected, while also shielding companies from bearing the risk of outturn costs (which are outside management control) being lower than expected. Moreover, while we believe that these costs are largely outside company control, we propose true-up mechanisms which are based on independent indices, instead of suggesting straight cost pass-through mechanisms, to shield customers from inefficient cost management. We note, in this context, it is critical that the energy uplift correction should be made if a true-up mechanism is in place for energy costs. This is because, should energy prices ultimately fall over AMP8, it is important that the starting point at AMP8 reflects the initial uplift in prices. Otherwise, our cost allowances will fall when energy prices fall, but the initial uplift is unaccounted for – and we will be materially underfunded in totality.

In relation to **retail allowances**, at PR19 it was assumed that input price inflation and ongoing efficiency assumptions would cancel each other out. However, high inflation during AMP7 has shown that to have been an unachievable assumption. Therefore, we propose separate assumptions for ongoing efficiency and input price pressures. Specifically, to reflect the IPP, we propose:

- **RPE and ex-post true-up mechanisms for labour-related IPP.** We believe that this reflects the same pressures we face around wholesale labour costs, for which Ofwat considered an RPE and true-up mechanism at PR19. As shown in Table 13 above, OBR forecasts of IPP are positive and material.

- **CPIH indexation for other retail costs.** Aside from labour, bad debt costs are the most significant cost category in our retail cost base. Given that bills are primarily made up of wholesale costs, they likely rise with inflation – meaning that bad debt costs (that is, the bills that companies cannot recover) will also rise with inflation. This is likely further exacerbated with the cost-of-living crisis and associated high inflation.

Table 14 summarises the energy uplift and our RPE estimates for AMP8.

TABLE 14: IMPACT OF ENERGY UPLIFT, LABOUR RPE/IPP AND NON-LABOUR RPE/IPP ON BASE COSTS (£M, 2022/23 PRICES)

Price control area	Energy uplift	Labour RPE/IPP	Non-labour RPE/IPP
Wholesale water	70	-20	N/A
Wastewater Network Plus	47	-12	N/A
Bioresources	N/A	-3	N/A
Retail	N/A	27	20

Note, the sum of the two 'retail' figures in this table may not sum exactly to the total 'RPE/IPP' effect for 'retail' shown in earlier tables. This is because the two separate annual retail IPP estimates (labour and non-labour) are combined and cumulated on an annual basis to calculate the figures in earlier tables, whereas here the two effects are separated.

In Annex 2 we provide more detail on each of these estimates.

3.6. ONGOING EFFICIENCY IMPROVEMENT (FRONTIER SHIFT)

Ongoing efficiency improvements are gains in productivity that an efficient water company is expected to achieve, due to technological improvements and innovation. We apply frontier shift to all of our base costs above, including enhancement opex, RPEs, and the energy uplift.[32]

In considering the scope for ongoing efficiency improvements over PR24, we have considered a number of different issues:

- A report from Economic Insight on 'Productivity and Frontier Shift at PR24' which sets out evidence as to the appropriate range of frontier shift estimates for water companies at PR24; and
- Regulatory precedent from previous price controls (in water and other regulated industries).

The Economic Insight report considers productivity improvements made by comparator sectors over a number of different time periods. Its conclusions are summarised in the table below.

FIGURE 5: SUMMARY OF ECONOMIC INSIGHT ONGOING EFFICIENCY ESTIMATES

	Plausible range		PR24 focused range		Sensitivity analysis range	
	Low	High	Low	High	Low	High
Frontier shift estimate	0.3%	0.8%	0.3%	0.7%	0.1%	1.1%
Time period	2010-2019	1970-2007	2010-2019	Weighted average of: 1970-2007; and 1995-2019	2010-2019	1970-2007
Comparators	Preferred set	Preferred set	Preferred set	Preferred set	**Sensitivity 1**[7]	**Sensitivity 3**[8]

Source: Economic Insight analysis of EU KLEMS data

The report suggests that a reasonable range for ongoing efficiency improvements expected over PR24 is between 0.3% and 0.7% per annum. The lower end of the range is determined by more recent productivity trends, which have worsened

[32] The only cost category we exclude from the calculation of frontier shift is service charges, which in practice applies only to the frontier shift for wastewater network plus. We also exclude this cost category from the calculation of real price effects.

since the financial crisis in 2008. The upper end of the range takes into account longer term productivity trends before the crisis.

The figures in this report are below recent regulatory precedent, where regulators and the CMA have converged around expected ongoing efficiency improvement of 1% per annum. This has been the outcome for:

- CMA's PR19 redetermination.[33]
- CMA's decision on the RIIO-GD2 and T2 price control appeals.[34]
- Ofgem's RIIO-ED2 decision.[35]
- CAA's decision for the Heathrow H7 price control.[36]

These 1% assumptions were typically at the upper end of the productivity ranges from external datasets.

Ofgem's original RIIO-GD2 and T2 decision included a 0.2% per year uplift to account for the innovation funding provided by the price control.[37] This was overturned by the CMA at appeal and removed in its entirety as it was not well justified,[38] for example companies had already taken into account the impact of innovation in their plans. Ofgem did not include a similar uplift for RIIO-ED2. We agree that no additional uplift is required as these figures are already at the upper end of the ranges observed in other sectors who also carry out their own R&D activity. Moreover, much of the innovation projects that have been undertaken are focused on improving wider externalities such as environmental outcomes and would not be expected to deliver a totex efficiency.

Having considered this evidence and precedent we have decided to target a 0.8% per annum ongoing efficiency improvement in our business plan for base costs and enhancement costs.[39] This is above the range suggested by Economic Insight at PR24 and reflects our ambition to deliver leading levels of efficiency in the sector and providing affordable services for customers, especially in light of the large capex programme detailed elsewhere in this document. It also reflects challenge we received from the Water Forum and consideration of the previous efficiencies that the business has been able to achieve in the context of a larger investment programme.

3.7. UNMODELLED COSTS

Some costs have large variations between companies that cannot be explained by cost drivers in the models. As an example, abstraction charges are set by the Environment Agency on a regional basis – however, in our case the Kielder

[33] Final report (publishing.service.gov.uk), paragraph 4.650.
[34] Volume 2B (publishing.service.gov.uk), paragraph 7.801.
[35] https://www.ofgem.gov.uk/sites/default/files/2022-11/RIIO-ED2%20Final%20Determinations%20Overview%20document.pdf paragraph 4.16.
[36] Economic regulation of Heathrow Airport - H7 Final Proposals Section 2 - Building Blocks (caa.co.uk) paragraph 4.12.
[37] https://www.ofgem.gov.uk/sites/default/files/docs/2020/12/final_determinations_-_core_document.pdf Para A3.15.
[38] Volume 2B (publishing.service.gov.uk) paragraph 7.807.
[39] We do not apply this assumption to unmodelled costs such as abstraction charges and business rates as they are uncontrollable, they are not an 'input' to our business which we can use less of, and therefore an efficiency improvement is not possible. This aligns with the CMA's PR19 redetermination.

Transfer scheme makes these costs materially higher for us than for similarly sized water companies. We have therefore considered these costs separately.

The tables below summarise our unmodelled costs by price control area.

- The largest two items in this area are abstraction charges and business rates. We have forecasted these using our knowledge of the processes/methodologies driving these costs as they are dependent on our own circumstances (for example, abstraction charges are heavily dependent on necessary investments at Kielder). We provide the detail of our consideration in these areas in Sections 6.1.1 and 6.1.2.
- We were provided an allowance for our pension deficit payments at PR14[40] and provides recovery up to 2031/32. We have assumed recovery in line with these allowances uplifted for CPIH inflation.
- Other areas of unmodelled costs we broadly expect to be a continuation of the past. We have therefore used a simple time trend analysis to forecast these costs.

TABLE 15: WATER UNMODELLED COSTS POST FS AND RPE (2022/23 PRICES)

	2025/26 (£m)	2026/27 (£m)	2027/28 (£m)	2028/29 (£m)	2029/30 (£m)	Total AMP8 (£m)
Traffic Management Act	0.45	0.47	0.49	0.51	0.53	2.45
Non s-185 diversion costs	0.57	0.57	0.57	0.57	0.57	2.84
Third party services cost	82.88	16.16	16.53	16.93	18.01	150.51
Other cash items	0.00	0.00	0.00	0.00	0.00	0.00
Pension deficit recovery payments	6.10	6.10	6.10	6.10	6.10	30.49
Abstraction charges	47.56	47.56	47.56	47.56	47.56	237.82
Local authority and cumulo rates	20.8	40.45	40.45	40.45	62.26	204.42
Total	158.637	111.31	111.70	112.20	135.04	628.54

[40] Information note 13/17, Treatment of companies' pension deficit repair costs at the 2014 price review.

TABLE 16: WASTEWWATER UNMODELLED COSTS POST FS AND RPE (2022/23 PRICES)

	2025/26 (£m)	2026/27 (£m)	2027/28 (£m)	2028/29 (£m)	2029/30 (£m)	Total AMP8 (£m)
Traffic Management Act	0.02	0.02	0.02	0.02	0.02	0.10
Non s-185 diversion costs	0.00	0.00	0.00	0.00	0.00	0.00
Third party services cost	0.40	0.40	0.39	0.39	0.39	1.98
Other cash items	0.00	0.00	0.00	0.00	0.00	0.00
Pension deficit recovery payments	2.35	2.35	2.35	2.35	2.35	11.73
Industrial Emission Directives	0.00	0.00	0.00	0.00	0.00	0.00
Local authority and cumulo rates	7.80	7.80	7.80	7.80	7.80	38.99
Total	10.56	10.56	10.56	10.56	10.56	52.80

TABLE 17: BIORESOURCES UNMODELLED COSTS POST FS AND RPE (2022/23 PRICES)

	2025/26 (£m)	2026/27 (£m)	2027/28 (£m)	2028/29 (£m)	2029/30 (£m)	Total AMP8 (£m)
Third party services cost	0.00	0.00	0.00	0.00	0.00	0.00
Pension deficit recovery payments	0.32	0.32	0.32	0.32	0.32	1.58
Local authority and cumulo rates	1.63	1.63	1.63	1.63	1.63	8.16
Total	1.95	1.95	1.95	1.95	1.95	9.76

4. OUR PR24 ENHANCEMENT PROGRAMME

Our enhancement programme for PR24 is much larger than at previous price reviews and is the main driver for our proposed increase in water bills during 2020-25. Our long-term delivery strategy shows that we do not expect this to reduce again in future reviews. This reflects three key external pressures:

- **Increased statutory obligations –** the expectations from the government and regulators have changed dramatically since PR19, with new requirements on water companies to address storm overflows and tackle nutrients in wastewater and in the catchment. In addition to this, the revised WISER has created greater expectations for resilient water supplies, including the need to reduce many of our abstractions - and the Government's 25 Year Environment Plan has created further expectations and actions on leakage, water demand reduction, and other areas.
- **Increased customer expectations –** we cautiously welcomed the increase in statutory obligations, as we are keen to see investment both in reducing our impact on the environment and in doing our part to improve the wider environment for local communities. We were concerned that customers had not been fully consulted, and although we knew that customers matched our ambition, we did not know if customers would accept increases in bills to pay for this investment. Our customer engagement for PR24 shows that most customers are willing to pay more to meet increasing expectations, with 74% accepting our plans – but around half of those customers said they would find it difficult to afford, this reinforces the need to make sure that our enhancement programme is well planned and efficient, delivers the benefits customers value, and provides protection to customers if we fail to meet their expectations.
- **Growing pressure on our networks –** our long-term delivery strategy shows our concerns about growing pressure on our assets for two main reasons. Firstly, there is growing evidence that historic capital maintenance allowances will not be sufficient to maintain good asset health in future. Secondly, climate change is beginning to have an impact on the operation of our networks – we know that these impacts are still unpredictable and will likely increase in the future.

Our enhancement programme addresses these statutory obligations, with additional resilience investment included to tackle the increasing risks of these growing pressures on our networks. We only include investment that is either critical now, or where our customers support investment now to reduce the risks of service failure or potentially avoid higher costs in the future.

The tables overleaf summarise our enhancement programme. Each line in this table is supported by an enhancement business case, which we reference below.

4.1. SUMMARY OF OUR ENHANCEMENT PROGRAMME

Our enhancement programme allows us to invest **£2.8bn** to improve services, resilience, and the environment. Tables 18 and 19 summarise our enhancement investment programme.

TABLES 18: WHOLESALE WATER ENHANCEMENT EXPENDITURE (£M,2022/23 PRICES)

Area	Totex (£m)	Description
A3-01 Water supplies	386.1	WRMP - improvements to water supply resilience in Essex and Suffolk to address a supply deficit created by reductions in abstraction limits and the impact of climate change.
A3-02 WRMP demand management	153.0	Investment in leakage, metering and water efficiency measures to ensure water supply resilience in our Essex and Suffolk region, and to meet government targets to reduce leakage and PCC.
A3-22 WRMP NHH demand	12.4	Investment in metering and water efficiency for non-households.
A3-04 WINEP long-term ED	2.0	Investigations to support the long-term Environmental Destination in Essex and Suffolk, understanding future potential abstraction reductions.
A3-05 WINEP protected areas/biodiversity	25.9	Investigations and interventions under WINEP for DWPA, biodiversity, European Sites, SSSIs, INNS, and Eels regulations.
A3-06 WINEP WFD	12.4	Investigations and interventions under WINEP for hydrological regime, artificial/modified water bodies, groundwater pressures, and WFD physical habitats.
A3-16 WNIEP Monitoring	1.5	Meeting our obligations on monitoring trade effluent discharge
A3-15 WINEP 25 Year Environment Plan	7.8	Meeting the Government's 25 Year Environment Plan – through the Northumbria Integrated Drainage Partnership (NIDP), Bluespaces programme, and other projects.
A3-07 Lead replacement	46.8	Replacement of lead pipes to meet DWI and customer requirements.
A3-08 Raw water deterioration (Geosmin)	8.0	Investment to mitigate water quality challenges arising from raw water quality trends.
A3-09 Security including cyber	25.9	Additional investment to install enhanced physical security at critical water sites to ensure compliance with critical national infrastructure requirements, as well as cyber security improvements to meet the new e-CAF standards (no enhancement investment to meet existing standards).
A3-10 Climate change resilience (process enhancements)	80.7	Improvements to mitigate increasing temperatures for slow sand filters, protecting chemicals, and filters.
A3-11 climate change resilience (flooding and power)	12.3	Protection for key sites from increased risk of disruption from flooding and power interruptions arising from climate change.
A3-21 Asset health	92.2	Targeted investment to improve asset health of critical civils structures at water treatment works and targeted additional water mains renewal.
A3-24 Reservoir drawdown capacity	80.6	Investment to improve reservoir drawdown to allow us to better respond to emergency situations.
Total	**947.3**	

TABLE 19: WHOLESALE WASTEWATER ENHANCEMENT EXPENDITURE

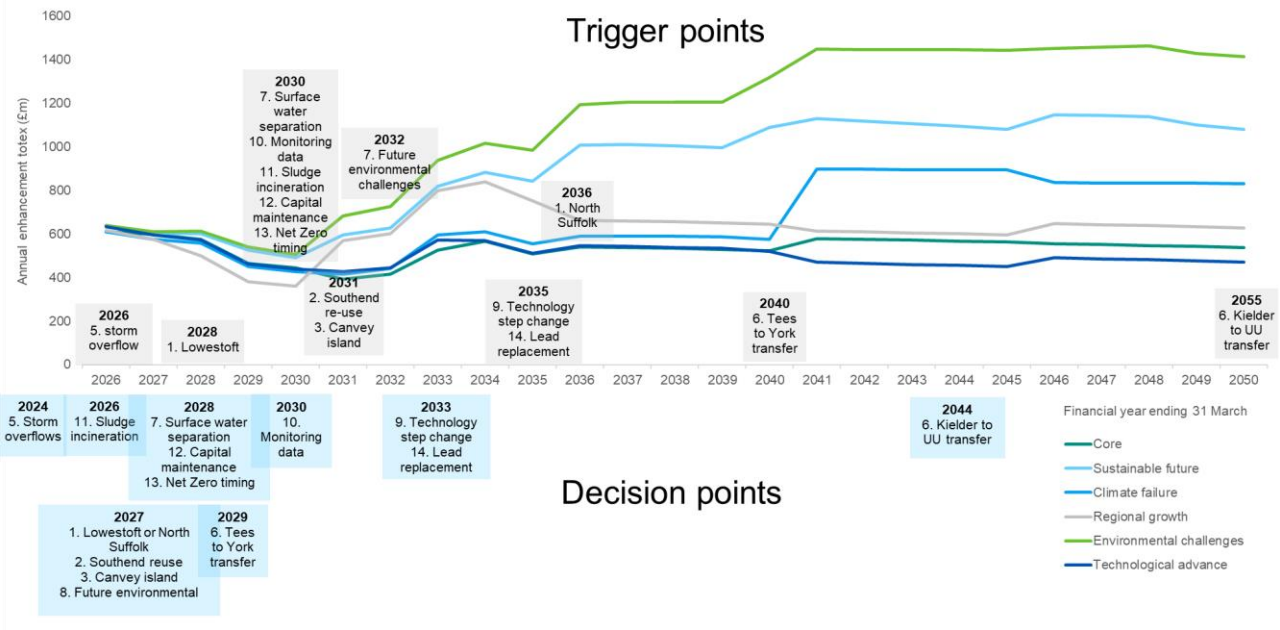
Area	Totex (£m)	Description
A3-12 Growth at wastewater treatment works	54.2	Investment to upgrade five wastewater treatment works as a result of growth in customer numbers and to provide monitoring at six wastewater treatment works to better understand the impact of future growth.
A3-13 WINEP – Storm overflows	939.3	Investment to meet statutory requirements to improve all overflows discharging into or near every designated bathing water; and improve 75% of overflows discharging to high priority sites by 2035.
A3-14 WINEP - protected areas/ Water Framework Directive	221.4	Meeting our obligations on removing phosphorus and nitrogen from wastewater discharges and the environment.
A3-15 WINEP - 25 Year Environment Plan	66.4	Meeting the Government's 25 Year Environment Plan – through the Northumbria Integrated Drainage Partnership (NIDP), Bluespaces programme, and other projects.
A3-16 WINEP - monitoring	257.4	Meeting our obligations on monitoring at emergency overflows and river water quality monitoring.
A3-17 WINEP - septic tanks	46.3	Meeting our legal obligations for additional treatment at septic tanks.
A3-11 Flooding and power resilience	76.6	Protection for key sites from increased risk of disruption from flooding and power interruptions arising from climate change.
A3-19 – S101A - First time sewerage	3.3	Connection of properties to our sewer system to replace their domestic sewerage systems that are not connected to the public network.
A3-20 WINEP - sludge	84.6	Meeting our legal obligations on sludge, including storage for 90 days.
A3-22 – asset health	94.4	Targeted investment to improve asset health of critical civils structures at wastewater treatment works.
A3-23 Pollution incidents	13.5	Investment to meet new obligations on monitoring pollution incidents, and to mitigate the immediate impacts created by increased monitoring.
A3-09 Security	13.3	Investment to meet COMAH obligations under SEMD 2023.
Total	**1,870.7**	

These tables include our enhancement expenditure before adjustments for efficiency and RPEs, and so are consistent with Tables CW3 and CWW3 in our business plan tables (but grouped according to the enhancement cases). The totex figures include transition and accelerated expenditure from 2023/24 and 2024/25, as these are part of our enhancement cases.

4.2. LINK TO LONG TERM DELIVERY STRATEGY

Our business plan for PR24 delivers the first five years of our **long-term strategy** (NES_LTDS). While PR24 will require a step change increase in investment for our business compared to previous business plans, our scenario analysis shows that this increased level of expenditure is likely to be maintained until at least 2050. We will need continued investment to address challenges on water supplies, protecting the local environment including through the elimination of harm from storm overflows, ensuring resilience in the face of climate change induced extreme weather, delivering net zero and eliminating the harm from lead. This is the case across a broad range of plausible futures. The resulting ramp up in totex across future scenarios is shown in Figure 6 from our **long-term strategy** (NES_LTDS).

FIGURE 6: TOTEX INVESTMENT OVER THE LONG-TERM UNDER PLAUSIBLE SCENARIOS



This scenario analysis enables us to consider what investment is needed now to deliver our long-term goals under a range of plausible futures. Doing so can help us avoid investing in assets that may become stranded – that is, not be needed in future – and identify enabling investment that will keep our options open and so facilitate us investing in the most efficient solutions over the long term.

The insight from our examination of future scenarios highlights the importance of the following.

Profiling investments for the long-term

We don't know exactly where and when we will need to invest in future, but our analysis does show that even under low investment scenarios, we will be delivering significantly more investment than historically up to 2050. We therefore need to make sure that we plan our investment to take account of the current affordability crisis, but also do not push too much investment that is needed today down the road. Even more investment will be needed in the future, which would increase

pressure on bills in future periods and may increase costs overall as fixing some issue now is likely to be cheaper than waiting until later. In '**Shaping our future: developing our long-term strategy 2025-50**' we described pathways for alternative profiles including 2025-30. We considered accelerating investment to deliver storm overflow discharge reductions ten years earlier and examined the impact of delaying investment from 2025-30 to later years to reduce bills in the short term. In our updated long-term strategy, we have matched our 2025-30 investment to this business plan.

For most areas we concluded we should not delay needed investment as this would have reduced the benefits to the environment in the short term while increasing bill volatility and hence potentially increasing affordability concerns in the future. We have made some minor changes to the WINEP programme for AMP8 recognising the scale of the current cost of living crisis and in response to a formal request to do so from the Environment Agency[41]. In line with customer feedback, we have not included enhancement expenditure in our 2025-30 plan for net zero and will deliver improvements through base funding.

We have also not accelerated investment in storm overflow discharge reduction beyond our preferred pathway as set out in our **DWMP**. In our pre-acceptability research customers did not want to see these investments accelerated. In our qualitative acceptability and affordability testing there was more appetite for acceleration but also significant concerns about affordability. We also have concerns around the deliverability of the programme. We did agree to carry out additional investment in some more marginally expensive nature-based solutions rather than more traditional ones. We have not been required to increase the speed of delivery through guidance from government or regulators.

Best value investments

Enabling best value solutions that solve multiple problems together can be more efficient in the long term as they avoid the need to invest in the same areas multiple times to solve issues individually. For example, investing in surface water separation as a solution to storm overflow discharge reduction also delivers flooding benefits, which will increase in the future as climate change increases flood risk. Prioritising the investments that deliver the best value across wider environmental outcomes, including carbon emissions, will enable us to deliver in the most cost-effective way over the long term. Our approach to enhancement options development and cost benefit analysis takes account of these points.

Transition funding

Funding to enable us to start projects early will improve deliverability of the 2025-30 plan by enabling us to ramp up investment in a manageable way. In particular, transitional expenditure to invest in wetland sites to build our knowledge of catchment and nature-based solutions will enable us to gather information early enough to inform our use of these potentially cheaper and more environmentally beneficial approaches beyond 2030. Early investment will also better

[41] See **Letter to the EA on phasing** (NES65).

enable us to undertake early design and development of more complex WRMP supply and network investments so we are better able to deliver what will be a very large AMP8 programme.

Innovation to find alternative solutions

Investing today in innovation to identify opportunities to solve problems tomorrow more efficiently is identified as one of the key enablers we need in place to deliver over the long term. The scale of the investment challenge over the next 25 years means technological and operational innovation is going to have an even more important role in reducing costs and finding solutions to environmental issues, like antimicrobial resistance and persistent organic pollutants, that we currently do not have cost effective treatments for. Innovation may also help find new treatment approaches that maintain high treatment standards while materially reducing emissions and enable us to reduce CSO spills more efficiently, for example through smart network control.

Partnership working

Many of the long-term challenges we face can only be solved efficiently in collaboration with others. We have a strong track record of developing effective partnerships, for example the NIDP and our work to develop the PR24 WINEP with The Rivers Trust. Our long-term strategy highlights the increasing importance of partnership working and co-funding of projects as a means of delivering more for customers while leveraging alternative funding sources, ultimately saving money for customers.

Enhancement expenditure

The development of the business cases we have included for enhancement expenditure has been informed by the insight gained from our long-term strategy. All of these business cases are needed now to support delivery in the long term. We have identified these investments as either being 'low or no regret' or being 'enabling' investment required to keep future options open and so have included them in our core pathway for 2025-30. We have assessed the business cases against the following criteria to determine if they fit into one of these two categories and therefore being needed now to support delivery in the long term. At least one of these criteria must apply. These criteria are derived from Ofwat's guidance: '**PR24 and beyond: Final guidance on long term delivery strategies**', April 2022.

To qualify as low or no regrets, the investment must be needed:

- to meet statutory requirements in the short term;
- under both the benign and adverse Ofwat common reference scenarios for one or more of climate change, water demand, technology or abstraction reduction;
- to meet Ofwat's high common reference scenario for water demand;
- only under the adverse Ofwat common reference scenario for climate change, water demand, technology and/or abstraction reduction but construction must start during 2025-30 for it to be completed in time and there is no efficient option to keep alternative future options open instead, or

- across a wide range of plausible scenarios considered in our long-term strategy.

To qualify as enabling, the investment must be needed:

- to keep options needed to meet more adverse future scenarios open, or
- to make sure future options do not become significantly more expensive.

In addition, where we are not legally obliged to deliver investment by 2030, the phasing of the investment needs to support deliverability and affordability over the long term for us to consider it to be consistent with our long-term strategy.

For each of the investment areas in our long-term strategy the table below summarises some of the key challenges and highlights the ‘no regret’ investments needed during 2025-30 that are reflected as ‘enhancement’ cases in our business plan and why.

FIGURE 7: Our no-regret investments for PR24

Investment areas	The challenges	Customer and environmental benefits	Case no
Water resources £530m to reduce leakage, roll out smart meters, promote behaviour change and invest in new supplies	• Essex and Suffolk are seriously water stressed areas, driven by climate change, sustainability legislation and increasing demand for water. • We already have a temporary suspension on new commercial water requests in Suffolk. • Environmental legislation is changing, and standards are increasing. • Investment is needed to improve on our already leading leakage position in Essex and Suffolk	• Reducing demand means we won't have to take so much water from the environment, or treat as much water, which will reduce the amount of energy and chemicals we use too. • Customers can reduce their water use (and usually their bills too) thanks to our water efficiency advice campaigns and smart meters (these will be compulsory in Essex and Suffolk). • Customers would have enough water supplies to meet forecasted demand over the next 25 years and beyond, even in the most extreme of droughts. • We work hard to provide the best balance between protecting the natural environment and securing water supplies for the future, while maintaining affordable bills for customers. • Customers consistently receive drinking water that is clean, clear and tastes good. • Leakage reductions in line with long-term targets	Demand management (NES15, NES 36) Water supply investments (NES14) RWD (geosmin) (NES21)
Environment c.£1.7bn to reduce combined sewer overflow (CSO) spills and meet strict environmental targets	• The Water Industry National Environment Programme (WINEP) sets out the requirements we need to meet over the next five-year period and is prescribed by the Environment Agency (EA). • We need to upgrade five wastewater treatment works and provide extra monitoring at six more, to cope with growing demand. • We need sludge storage until the EA farming rules for water strategy is complete. • We need to reduce wastewater spills. • To eliminate the impact of our operations we need to get better at monitoring and improving river water quality.	• Long-term improvements to river water and bathing water quality, reducing pollution incidents, enhancing biodiversity and reducing flooding. • Catchment and nature-based solutions deliver cost-effective, sustainable solutions for the environment and protect biodiversity. • Improvements at wastewater treatment works will enable growth in our region, allowing our wastewater system to cope with new major development and help protect local rivers and seas. • Improved resilience to the supply chain of sludge to agricultural land. • A reduction in SO spills. This is informed by our DWMP which has been tested against different future scenarios.	WINEP programme (NES17, NES18, NES19, NES28, NES29, NES30, NES31, NES13, NES39) Storm overflows (NES27) Growth and WWTWs (NES26) First-time sewerage (NES33) WINEP Bioresources (NES34) Pollutions (NES37)
Resilience	• Long-term targets in relation to asset health and service resilience.	• Customers will get greater protection against the risk of flooding and loss of service.	Flooding and power resilience (NES32) Asset health

c.£400m to safeguard our network and invest in our assets in the future, especially those deemed too critical to fail	• Extreme weather events and becoming more frequent severe. • Climate change. • Need to improve security at Critical National Infrastructure sites.	• Reduced risk of climate change weather related impacts to service. • Critical infrastructure will be properly maintained, in good condition, performing effectively and safely. • Lower risk of security and cyber attack breaches.	(NES35) CCR process enhancements (NES24) Security and cyber security (NES23)
Net Zero Continue to reduce our emissions	• Long-term targets to become Net Zero on all emissions by 2050.	• Helping to significantly reduce the amount of harmful emissions that contribute to global warming. • We are already ranked as the second-best for water and fifth for wastewater in relation to market-based emissions and have taken significant steps to date to reduce emissions. • Our programme of continued investment includes renewable opportunities across our estate, taking steps to decarbonise our fleet, exploring innovations to reduce process emissions and working to improve measurement and reporting of scope 3 emissions. • All our enhancement cases take greenhouse gas emissions into account through the options assessment process.	We are funding these investments from our base funding allowances and are not seeking further enhancement funding in 2025-30.
Other/Lead £47m to increase lead pipe removal schemes	• Long-term targets to remove lead by 2050.	• Reduced risk of harm from lead pipes. • Customers strongly support the removal of lead pipes but the rate of removal is still below what will be needed to meet out 2050 target and we will need to go further in future periods to catch-up. Customers did not support a larger programme given the current cost of living pressures.	Lead replacement case (NES20)

4.3. CREATING OUR ENHANCEMENT PROGRAMME

Ofwat's assessment of our enhancement business cases at PR19 showed that these did not sufficiently meet the criteria (with a rating of 'minor concerns'). It noted that some of our evidence was not high quality, and, in some cases, there was no convincing evidence that enhancement expenditure was needed. The subsequent reinstatement of some of these investments by the CMA we believe showed that this was not necessarily about whether or not these investments were the right ones, but about weaknesses in our ability to demonstrate the evidence supporting them.

We have taken these concerns seriously and changed our approach since PR19. This has meant introducing a new operating model and service planning framework, making our operational teams responsible for making sure that plans are robust, and costs are efficient, realistic and deliverable. For PR24, we appointed a delivery partner (Mott MacDonald and Stantec) to help us broaden the options for addressing investment needs across our areas, assess and challenge costs (including benchmarking with other sectors and companies using proprietary data that they hold), develop the evidence, and support on the development of our enhancement business cases. This has provided us with greater confidence that we have been able to demonstrate why these enhancements are needed, and that we have challenged ourselves on the scope, options and efficient costs.

In addition to this, we wanted to make sure that operational teams were closely involved in designing customer research questions and managing relationships with stakeholders, and we wanted to make sure that it was clear how this evidence had been weighed up alongside other constraints and evidence. We developed our approach to research and planning triangulation, with methods established for weighting evidence sources and dealing with tensions and conflicting evidence or priorities. Our line-of-sight reports, written by operational teams along with our customer research team, show the evidence we have considered and the rationale for our decisions in key areas of the plan. Section 5 of **A7 – Customer and Stakeholder Engagement** (NES08) explains how we did this and provides links to these line-of-sight reports.

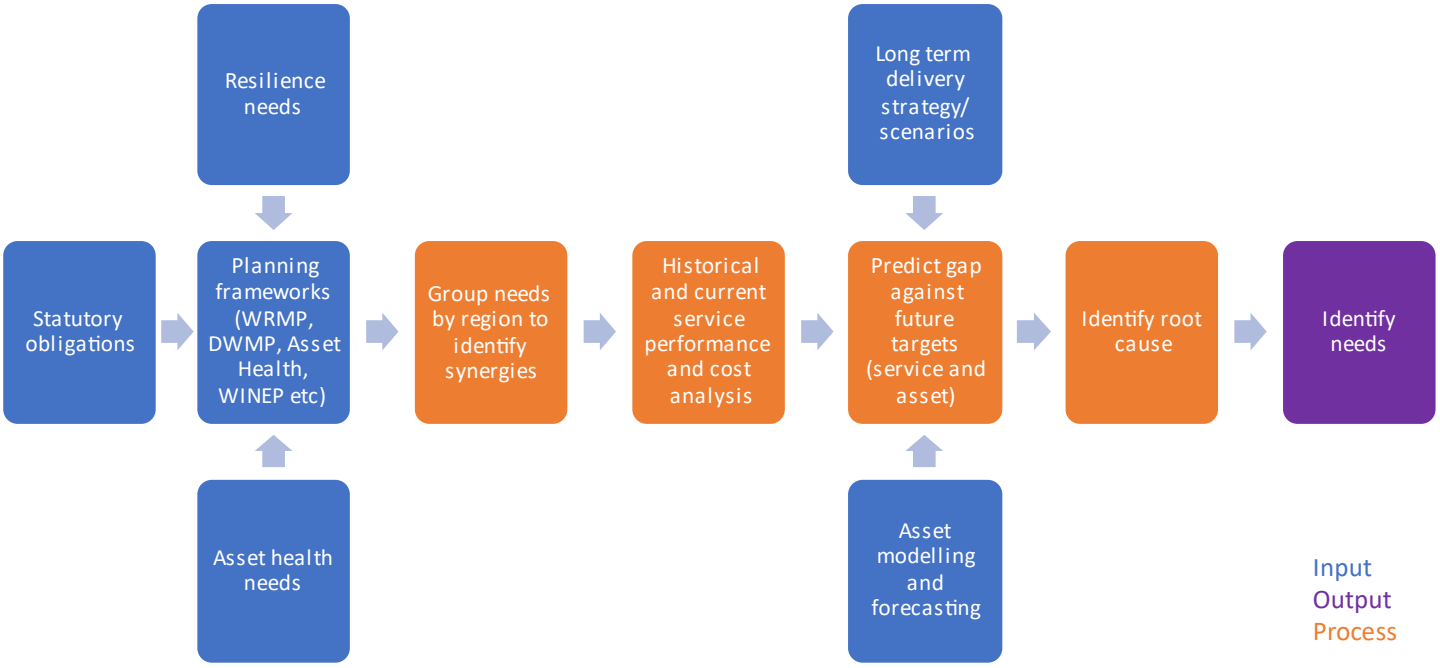
We approached our planning across all areas in four stages:

1. Establishing the **need for investment**.
2. **Assessing the options** for tackling these needs.
3. **Costing the options**, including assessing the benefits.
4. **Optimising** across the whole plan to understand the least cost and best value options.

4.3.1. Establishing the need for investment

We have gone through a detailed process to identify the needs that must be addressed in our PR24 plan. This is summarised in the diagram below.

FIGURE 8: OVERVIEW OF PROCESS TO IDENTIFY NEEDS



We discuss below the key steps key steps outlined as part of this process:

- **Planning frameworks**: We identify risks and needs from the statutory and non-statutory planning processes. Statutory planning processes, which are the key driver of much of our AMP8 enhancement programme, include WRMP, WINEP, DWMP, river basin management plans, flood risk management plan and shoreline plans. While some of these plans are produced by the Environment Agency and third parties, for example, flood risk management plans, we actively contribute to them through partnership working. Risks are also identified from other frameworks such as drinking water safety plans, distribution operational maintenance strategies and asset health information. These planning frameworks will by their nature group risks by programme or sub-service.
- **Group risks by region to identify synergies**: We organised risks by zone/catchment so that needs could be grouped to identify geographical synergies. This allowed us to identify all potential drivers in a system and facilitates the identification of integrated solutions, for example a WRMP option may improve operational resilience as well as security of supply. For water, risks were grouped by the seven zones – Essex, Suffolk, Berwick, Tyneside, Central, Northumberland and Tees. For wastewater, risks were grouped by the seven Drainage waste management strategic planning areas - Northumberland, Rural Tyne, Tyneside, Wearside, Wear, Teesdale and Teeside. The remaining stages for needs identification and collation process were applied using these regions.
- **Needs collation**: This comprised a number of components:

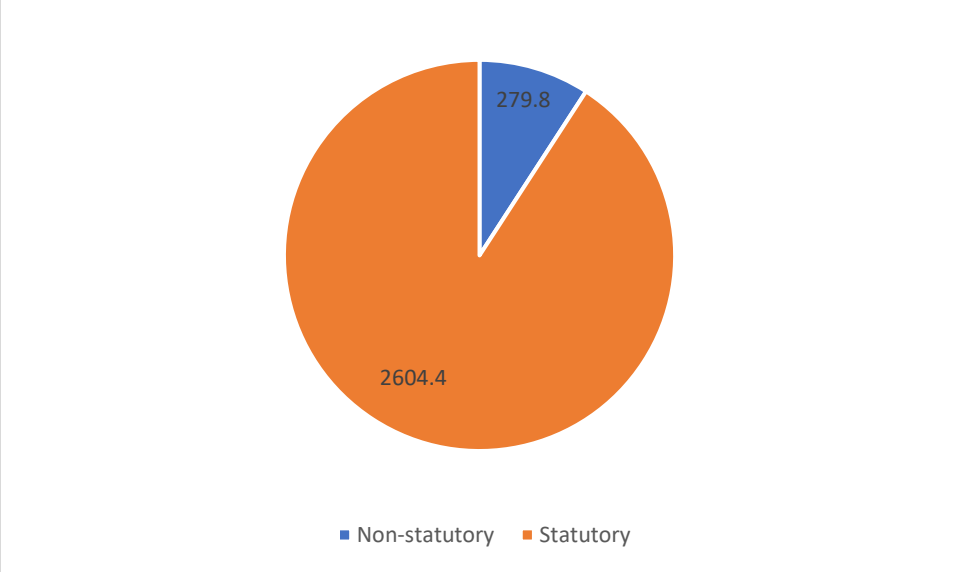
  - **Analysis of current and historical performance and costs** for the region (where regional information available) to understand the 'as is' position. This allowed us to identify areas where improvements were required.
  - **Predict gap against future targets** (service and performance) to allow us to understand the 'to be' position and how the current gap will change over time.
  - **Identify root cause of the gap** which allowed the needs to be specified appropriately.
- **Identify needs**: in this step we specified the 'to be' position in terms of service level and asset performance levels. This then allowed options to be explored that would address these needs.

The key drivers for the majority of our investment programme stem from legal requirements. As a provider of an essential service that is critical to maintain public health and can have large environmental impacts, we operate in a heavily regulated sector. This means that we must be mindful of longstanding requirements such as making sure that we provide high quality and resilient water supplies. These requirements can create investment needs where there are changes in the external environment, for example, climate change can implications for raw water quality which we may need to address and growth in our customer base can require upgrade to treatment works to manage the additional load.

However, it is new statutory requirements that are the main driver of our investment programme, particularly those aimed at improving the environment. These new requirements arise primarily through the water industry national environment programme (WINEP) which is developed jointly by the Environment Agency, Defra and Ofwat. Due to large new requirements in areas such as storm overflows and monitoring, our PR24 plan includes a large increase in WINEP expenditure. At PR19 we got an overall WINEP allowance of £152m whereas this time at PR24 we are looking at £1.7bn of expenditure being required with roughly £1bn of that to address storm overflows.

The chart below highlights the proportion of our overall enhancement plan that is made up of statutory versus non-statutory investment where it can be seen that the vast majority (c.90%) is driven by statutory requirements.

FIGURE 9: STATUTORY VERSUS NON-STATUTORY ENHANCEMENT INVESTMENT IN OUR PLAN (£M, 2022/23 PRICES)



We have also considered non-statutory investment where it is in customers' and the environment's interests to make enhancements. For example, we have included enhancement cases to address future climate changes risks as they impact on resilience of power supplies and flooding which can interrupt the operation of our sites affecting both customers and the environment.

In considering the needs for investment we have used a range of techniques:

- **Modelling for long-term planning frameworks**. Our WRMP and DWMP have looked at the likely changes over time from demand, population growth, and climate change – and we have modelled the investments needed, looking at how we might meet these demands in practice. We also used this modelling to estimate the impacts of growth on wastewater treatment works, looking at local scenarios and known developments (using third parties to advise on the best local forecasts to use).
- **Zonal studies**. In our PR19 business plan and long-term water quality plan, we committed to carrying out zonal studies for each of our regions, which we have now completed. These provide a holistic review of supply areas, looking at the entire operational system from raw water catchment to each district metered area. We carried out hydraulic modelling and combined this data with information about customer contacts, asset failures, and water quality failures. We used this information to draw together annotated geospatial plots which show modelled and actual network performance – bringing together asset health and performance. We used this information alongside WRMP modelling to identify potential options.
- **Catchment modelling**. We have the used the EA's standard modelling tools (SAGIS model) to look at the cumulative impact of phosphorous on freshwater catchments. We have adjusted this analysis for future growth. For nitrogen we have looked at combination of the EA's standard tools again alongside other analysis on marine modelling and an EA

investigation in 2018. This has allowed us to identify the sources of pollution to catchments and allowed us to look at different options to address the issue.

- **Climate change modelling**. As part of our approach to climate change adaptation, we commissioned research into the likely impacts of climate change up to 2050 on our supply areas. The research is included as supplementary evidence to support our **power and flooding resilience** enhancement case (NES32) and is discussed further in Appendix **A8 - Resilience** (NES09). It shows that the key risks to our assets that were likely to develop in the short-term were windstorms and flooding. We carried out modelling based on criticality and the likely extent and depth of problems at our assets, using innovative techniques to assess where investment would be most effective.
- **Asset intelligence**. We have continued to develop our asset management capability throughout AMP7 and have made strong improvements in our Asset Management Maturity against Ofwat's 'AMMA' framework and repeated the assessment that was undertaken in 2021. Independent analysis confirms that we are better than 'competent' and 'optimising' in some areas placing us amongst the best asset managers in the sector according to Ofwat's 2021 assessment. As part of our asset health strategy, we have carried out condition assessments for our civil and MEICA assets at our water and wastewater treatment assets as these are critical to the resilience of our services. This allowed us to assess where investment is needed – whether that is immediately; in the 2025-30 period; or beyond. We also assessed criticality of each asset and combined this data with our condition assessments to identify where the biggest risks to our assets were. This allowed us to assess which assets were the priority for investment. This is a major improvement on our previous approach of modelling asset condition and criticality, and we are continuing our work to apply this to other asset classes.

These techniques helped us to build a comprehensive picture of needs across our networks, including both base and enhancement expenditure. This did not include any work that customers had already funded – as we specifically excluded those needs.

Our water and wastewater resilience enhancement allowances at PR19 did include some investment to protect assets from flooding: in practice, many of these were not built and we return funds to customers at PR24 through our ODI. This is because when we carried out further work to investigate the sites, we found that some of these were not necessary, and some were not appropriate solutions to tackling flooding – so we did not carry out the work in these circumstances and returned this to customers instead. For PR24, we have learned from this experience and carried out much more advanced modelling before carrying out site visits to test and validate our findings.

Our allowances at PR19 did include investments in security at water and wastewater sites. Our enhancement case at PR24 does not overlap with these needs, as the PR24 case relates to a large increase in sites designated as critical national infrastructure.

Next, we moved on to develop a range of options for tackling these needs.

4.3.2. Assessing the options for tackling these needs

We then looked at options for tackling these needs. Our approach considered a broad range of options following our totex hierarchy. As you work down the hierarchy of option types, the totex costs increase making it preferable to adopt solutions further up in the hierarchy where possible. This is shown in the table below.

TABLE 20: TOTEX HIERARCHY

Category	Description
Eliminate	Identification of processes and practices that can be stopped possibly by Stakeholder management or other, and by challenging the need existence.
Collaborate	Collaboration with other stakeholders to re-assign the issue or co-fund.
Operate	Improved operational management practices to enhance existing capacity.
Invigorate	Invest in the existing infrastructure to improve performance.
Fabricate	Build of either traditional or sustainable green (including nature based) solutions to augment or replace existing assets.

For example, in our assessment of options for our DWMP the following options formed part of the consideration as set out in the table below.

TABLE 21: DWMP OPTIONS CONSIDERED

Category	Examples of options considered
Eliminate	Indirect options: • Further investigation and monitoring to eliminate needs • Influencing policy • Modify consents or permits
Collaborate	Customer behaviour options • Water efficient appliances • Water efficiency measures • Rainwater harvesting • Greywater treatment and reuse • Blackwater treatment and reuse • Collaboration with other customers and catchment stakeholders Cross catchment strategic options • Cross boundary flow transfer • Internal transfer
Operate	Smart network options • Intelligent operation

	• Enhanced operational maintenance regimes • Active management of surface water • Rationalisation of overflows
Invigorate	Multi programmed or partnership options • Surface water source control measures • Surface water pathway measures
Fabricate	Sustainable green options • Nature based solutions • Surface water separation and removal • SuDS storage • Strategic blue green corridors Traditional or grey options • Increase sewer capacity • Underground storage • Mitigation

Considering options in this way allowed us to identify a wide range of options. These options were then screened to arrive at only options that would address the underlying need and provide a reasonable number for cost benefit analysis. This was done in two stages. Primary screening was used to remove options which:

- do not meet all or part of the need, for example, they are unachievable in the statutory timescale or do not meet regulatory requirements; and/or
- are technically not feasible, for example, cannot be built or implemented or the land is unavailable/unsuitable to implement the solution.

For example, in the case of our septic tanks business case we discarded options at primary screen for:

- Tanker flows to another wastewater treatment works as we did not think it would comply with statutory guidance to provide secondary treatment.
- Evapotranspiration as it is an unproven technology in this configuration and would require a significant land requirement per each population equivalent which would be unlikely to be achievable.

If there were still too many options, secondary screening was used to reduce the number to a more reasonable number for option development and costing. This took account of the benefits and costs of the different options to make sure that the most relevant options were taken forward for cost benefit analysis. For example, where two options provided the same benefits, but one was more expensive on cost and carbon, that more expensive option was screened out. This was the case for instance in our septic tanks enhancement case where options at Gunnerton wastewater treatment works were discarded as they were higher cost than an alternative that delivered the same benefits.

Developing a wide range of options at this stage provides the opportunity for selecting the best value options for customers during the options appraisal stages and helps us to make sure that we carry out a proper appraisal of the options. For some needs, we also examined these strategically through workshops where we reviewed new and innovative ways we might tackle them – this led to some major shifts in our thinking, including:

- The ability to deploy optimisation solutions for storm overflows, working with international partners to assess our systems and understand how this might be done now and developed in the future.
- The ability to use catchment-based solutions to tackle nutrient neutrality, leading to relatively inexpensive and more effective solutions, even if they are riskier.
- The scope for deriving further benefits from smart metering by deploying a wider smart network, improving our asset understanding and control.

4.3.3. Appraising the options

We assessed the whole life costs and the benefits for each option – both aligned with Ofwat's common performance commitments, and with wider benefits (such as impacts from carbon emissions). We explain in Section 4.5 - how we assessed the costs, challenging ourselves by comparing these with other water companies cost curves, industry datasets, and other available benchmarks such as estimates from the supply chain. We were able to score every option, accessing expertise from our delivery partner to do so.

This work aligned with our WRMP, DWMP, and WINEP planning processes, providing the most up-to-date information at each stage. We recognise that this process will continue after we have published our business plan, with further refinements required to prepare schemes for delivery.

As part of this appraisal, we built a 'bottom up' base expenditure plan for each of water and wastewater. This looked at implied historical allowances and actual expenditure, including investments already funded through our base expenditure in AMP7, for each asset class. This also considered future expenditure needs identified for each asset class.

Comparing these bottom-up base expenditure plans to top-down econometric models showed us where there were growing pressures on base expenditure which were not included in historic allowances (and so would not be included within PR24 allowances). In summary, these are:

- Our **water quality** programme, which aims to improve our CRI score, requires significantly more expenditure than in previous periods. This is particularly the case at water treatment works, where there are also additional pressures from climate change, and in the need to replace unlined iron mains.
- **Asset health**, where increased proactive replacement of poor condition civil assets (compared to historic allowances) and targeted mains renewal is necessary to maintain existing service levels including stable asset health.
- **Sewer flooding**, where improved performance levels for external sewer flooding had not been funded in historic base allowances or enhancement expenditure, but where our customers and stakeholders still want us to be ambitious.

- **Telemetry and smart networks**, where we do not include any additional expenditure in our plan as we consider this to be an investment in our network to drive greater efficiency in future.

This analysis also helped us to understand the components of tackling storm overflows that were included in base expenditure (largely screening and addressing unconsented CSOs).

Having appraised these options, we discussed the least cost and emerging best value options with our Board and Water Forum. We discussed these options through our customer engagement, to understand customer priorities and ambition.

4.3.4. Optimising

We also sought to examine the benefits of each option in the most holistic sense, supporting Ofwat's strategic objective of driving 'wider public value' at PR24. Being able to make investment decisions based on a wider range of benefits will also support our business purpose, vision and values so this is not just something that was driven by the regulator. To do this we have carried out a transformation of our service planning teams and introduced new decision support tools, including the Copperleaf system, to be able to appraise and optimise different options based on wider benefits (for example, including carbon, biodiversity and other areas). We were conscious that many of these valuations do not have market prices that can be inferred from trading in those benefits and instead valuations need to be inferred from stated or revealed preference analysis or hedonic pricing. We asked Frontier Economics to support us in creating a robust set of value models underpinned by the best possible evidence to make sure that our assessments are robust as possible.

We derived customer valuations of each benefit from our customer research, along with recognised valuations where these existed (such as carbon). Unlike at PR19, these were not primarily for deriving outcome delivery incentives – instead, we used these customer valuations to optimise our plan for the best value. We were unable to use the Ofwat marginal benefit assessments as they arrived too late in the development of our plans.[42]

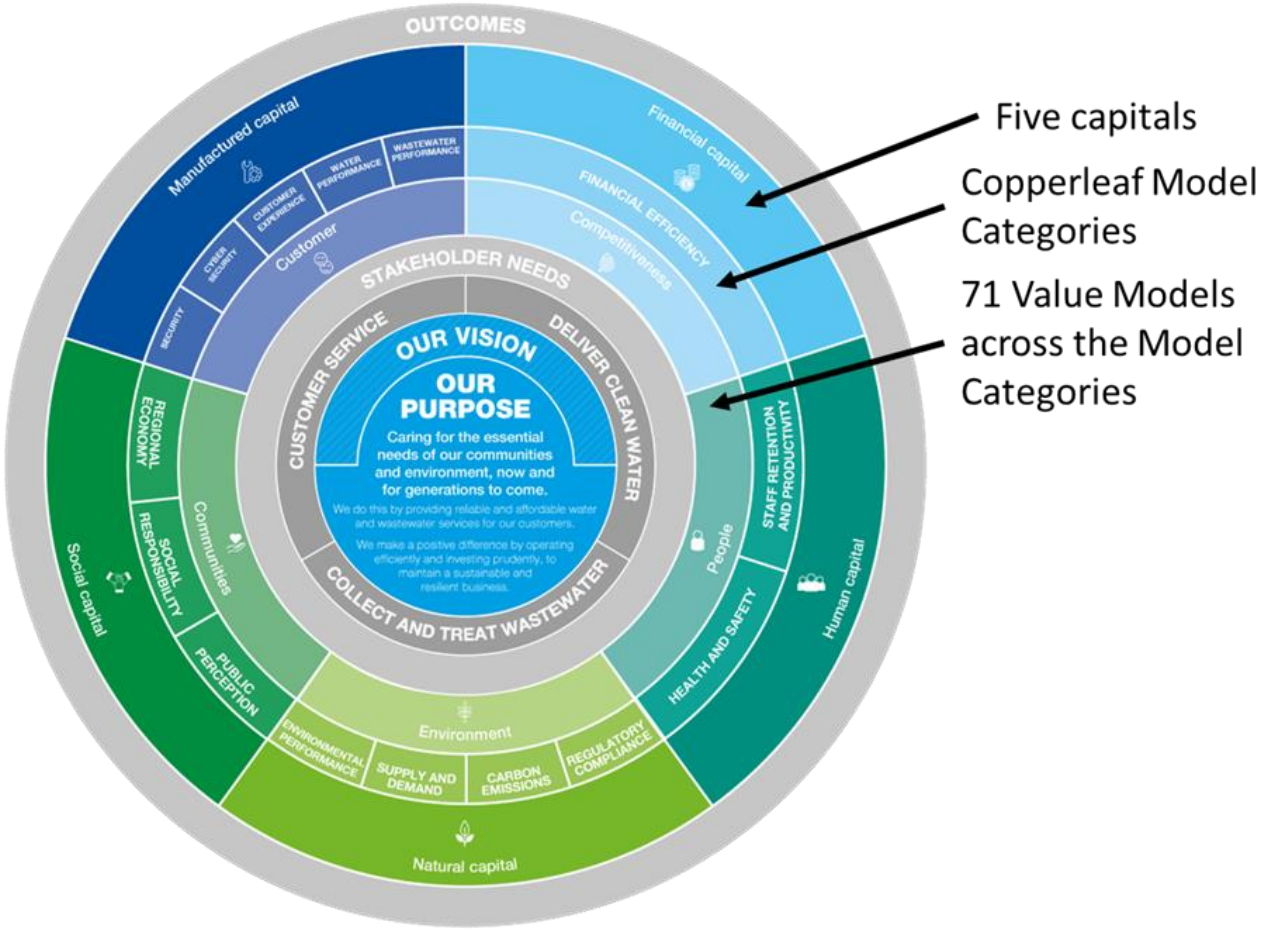
We used the Copperleaf planning software to load the different options and the associated costs and benefits. To make sure that Copperleaf does this effectively, we commissioned Frontier Economics to review the approach to valuing wider costs and benefits – see box below. Copperleaf allows us to optimise using constraints (such as required minimum service levels and mandatory investment) to find the best value plan, including delivering the outcomes that customers value as well as wider benefits.

[42] We received the full set of indicative ODI rates from Ofwat on 27 June 2023.

BOX 1: COPPERLEAF VALUE FRAMEWORK

The Copperleaf decision support tool enables us to optimise the choice of options across a portfolio of projects by comparing the costs and benefits as assessed against our 'value framework'.

The value framework implements our five capitals approach to allow us to assess options in a consistent way across different types of project. The value framework currently consists of 15 model categories containing 71 Value Models. Of these, 34 are quantify societal and private benefits, 19 are partially quantitative and 18 allow a qualitative assessment of costs and benefits. For each new investment option, some value models must be completed as standard, such as those relating to cost and carbon emissions, and then additional value models can be used where relevant, for example relating to business demand reduction, or reducing water poverty.



The Value Framework

Source: NWL.

To make sure that the value framework was set up to best capture the costs and benefits of options, we commissioned Frontier Economics to review our value framework. In particular they assessed:

- Scope – whether we had the right value models in the framework to capture the full range of relevant impacts, including the wider environmental outcomes as specified by the Environment Agency in the WINEP methodology.
- Model specification – whether the value models specified in the right way to capture relevant information and calculate costs and benefits appropriately, taking account of best practice.
- Valuations – whether the valuations (for example, for the value of biodiversity units and a tonne of CO2 equivalent emissions) reflected best available data – ideally externally verified, and if not then supported by internal evidence.

This multistage review identified a number of areas where the framework met best practice, but also areas where we could improve it. We have implemented changes to the framework following the review.

We expect to continue to develop and evolve the value framework and have implemented an annual review cycle to ensure that Copperleaf continues to provide the most up to date assessment to support our investment decisions in future.

This means we can make sure that we have selected the best options for customers on the plan as a whole. We summarise below in Table 22 our approach to valuing benefits as part of assessing the different options.

TABLE 22: SUMMARY OF APPROACH TO VALUING BENEFITS

Issue	Approach
Approach to valuing benefits	We have used the Value Models as implemented through Copperleaf to value benefits. In the case of our flooding and power resilience enhancement case we have modelled interruption benefits separately as the interruptions value model had not been fully implemented.
Discounting approach	We have discounted items using the following approaches: • For capex we have used the Spackman approach which converts the capital spend into a revenue stream using the assumed asset life and WACC, and then discounts this to present values using the Social Time Preference Rate (STPR) of 3.5%. • Opex and benefit valuations have been discounted using the STPR of 3.5%.
Assumed asset life	We have assumed an asset life of 30 years for capital investments consistent with the 30-year valuation horizon.
Cost of capital assumption	We have used the early view WACC of 3.85% and have not updated this for market movements.

Benefit valuation rates	Our value models rely on the assumptions provided by Frontier Economics based on the best available information. For PC metrics this used PR19 customer valuations from our own research as the PR24 rates were not available from Ofwat in time for this analysis. The only exception to this is for our flooding and power resilience enhancement case where we used the PR24 marginal benefit rate for interruptions as the value model had not fully implemented the impact of interruptions.

We then carried out planning triangulation, balancing the best value option with legal constraints and customer and stakeholder views. We explain this in our **line-of-sight report** (NES45).

As part of the optimisation process, we also examined the scope to use alternative delivery models including Direct Procurement for Customers (DPC). We asked KPMG to carry out an **independent assessment** (NES38) of our draft business plan to identify investments that might be suitable for DPC (under the size test or the separability test). They then took all three aspects of the business plan that passed these tests through a full value for money assessment. Ultimately correspondence from Ofwat led us to drop any DPC opportunities from the plan. We explain more about this work in our appendix **A6 – Deliverability** (NES07).

4.4. CHALLENGING OURSELVES ON OUR PLANS

Our Appendix **A2 – Data, Information and Assurance** (NES03) sets out how we challenged ourselves on the need for investment, explored options for reducing costs, and how we made sure that we worked closely with our Board and Water Forum to challenge the plan throughout. Our Appendix **A7 – Customer and Stakeholder Engagement** (NES08) shows how we made sure that our customer engagement was closely linked to our planning.

4.4.1. Are all the needs for enhancement investment new?

We have tested that all the needs for enhancement investment are new. In particular:

- We have completed - or will complete - all of our WINEP schemes for 2020-25. We report on this metric each year in our Annual Performance Report, as a performance commitment with a reputational incentive (PR19NES_BES31). Our 2025-30 WINEP includes only new schemes, reflecting new requirements and standards.
- We are broadly on track to deliver our water resilience enhancement programme, where we have a financial ODI to protect customers (PR19NES_BES84). This sets out the specific schemes at PR19, which were focused on addressing single points of failure by adding new mains and supplies, as well as mitigating specific water quality risks at treatment works and other sites. Our PR24 business plan includes some similar schemes in Suffolk, but rather than focusing on resilience in the existing system (as the North Suffolk resilience project does), these focus on tackling the

new risk of supply/demand deficits identified in WRMP. We do not include any other projects of this type in our PR24 business plan – instead focusing on climate change adaptation and asset health.

- Our wastewater resilience programme at PR19 included improvements to reduce flooding risk at 141 sewage treatment works and sewage pumping stations, with an ODI to protect customers in the event of non-delivery (PR19NES_BES27). As we explain in Section 7.1.
- Our wastewater resilience programme also included enhancement at Howden treatment works, with an ODI to return money to customers if this was not completed (PR19NES_BES29). This is on track to be completed by 2025 and is not duplicated in our base or enhancement expenditure at PR24.
- Our metering and lead programmes will continue into PR24. These are long-term programmes where we will deliver our interim milestones set for 2025. Customers are protected under bespoke ODIs (PR19NES_BES26 and PR19NES_BES25) so there is no risk of them paying twice for this investment.
- We propose an additional investment for cyber resilience to meet new 'enhanced' CAF standards. This is different to the investment at PR19 to meet the original CAF standards, and we do not ask for any further funding to meet these standards as we can continue to deliver this through base expenditure.

We have also tested that our bottom-up base plans are not influenced by non-compliance or non-delivery. This includes testing that our enhancement case for asset health does not include work that was previously scheduled to be completed within base expenditure and ensures that the claim only covers the incremental amount above our normal levels of spend on the civils assets covered; and

4.4.2. Are our plans affordable? Do they increase bills by more than necessary? Do they reflect customer views, and do customers support them?

We created our initial package of costs and outcomes in December 2022, based on our early view of WRMP, DWMP and WINEP, and discussed this with our Board and Water Forum. We developed these costs and outcomes based on statutory requirements, priorities from customer engagement, and an early view of regulatory expectations.

We then carried out 'pre-acceptability' testing with customers in January 2023, discussing possible packages of 'must do' statutory investments and more optional investments (such as resilience and net zero). Most customers said that they would prefer the largest and most ambitious package – but the deliberative groups provided a more nuanced explanation of this view, with some customers noting that if they could not afford the projected bill increases due to statutory requirements, then they might as well pay a little more for large additional benefits.

We worked hard to reduce these potential bill increases, looking at where we could reduce the costs of statutory programmes. This included the development of an 'advanced WINEP' rather than meeting the requirements for 'technically achievable limits' for nitrogen at our treatment works – removing more than £300m from our business plan compared to the December 2022 plan. We reviewed where we could increase our challenge on efficiency, including

reducing some of our enhancement cases by doing more within base expenditure. We challenged the phasing of some of our plans, pushing back some planned work on raw water deterioration.

We also engaged with customers during February 2023 to discuss the more optional investments. Customers had supported these within the context of wider packages of investments, but we wanted to discuss the scope for pushing back some of these individual investments – and the risks of doing so. We also discussed phasing of statutory investments, particularly the balance of storm overflows investment between AMP8 and AMP9 (where the first targets are set for 2035). Customers said that, for example:

- Although they supported doing more than the minimum on storm overflows, the 'must do' plan would already be difficult to afford. They asked us to look at a range of alternative options where we might meet the statutory requirements by either reducing costs or delaying investments until 2030-35.
- We should develop a 'hybrid, middle ground' option for asset health, focusing on where we know exactly where work is necessary now, and where this has an immediate impact on service. This would be more affordable now, without taking too much risk on problems escalating in future years.
- We should invest in climate change adaptation where there is a high likelihood that climate change will have an impact on our services in the short or medium time, and where this is likely to have an immediate impact on services.
- They did not want to invest in electric vehicles and were not willing to pay for net zero improvements during 2025-30.

For our final plan, we challenged ourselves further and developed more options for phasing on storm overflows and asset health in particular. In our affordability and acceptability testing, customers discussed these phasing options (as well as for some statutory investments such as water supply and demand) and supported the options which are now in our final plan. There was a high acceptance of our preferred plan across both our qualitative research and quantitative survey.

We provide more detail about how we used this customer engagement alongside key statutory, regulatory and stakeholder insights to develop our enhancement investments in our **line-of-sight report** (NES45).

However, customers remained concerned about affordability – particularly with statutory investments driving bill increases. We engaged with Defra and the Environment Agency to suggest investments in WINEP which could be reduced or phased into 2030-35, (see our **line-of-sight report**, NES45). Our business plan includes some uncertainty from these discussions:

- Our business plan reflects our Advanced WINEP plans that we are currently discussing with the Environment Agency and Defra. If we need to instead use traditional 'end of pipe' solutions, this will be more expensive. We have estimated the impact of this in our enhancement case (**NES28**) and have provided separate tables to Ofwat alongside our business plan to show the costs of doing so.
- Our business plan reflects our programme to comply with guidance on river water quality monitoring and septic tanks as included in our final WINEP submission. However, the EA has issued new guidance which would reduce this requirement. We have estimated the impact of this in our enhancement cases (**NES30** and **NES31**) and have

provided separate tables to Ofwat alongside our business plan to show the reduced costs of meeting new requirements.

- We expect further changes in requirements for monitoring at sewage treatment works.

4.5. APPROACH TO OUR PR24 ENHANCEMENT COSTS

We have engaged a Mott Macdonald and Stantec consortium as our delivery partner to help us develop our PR24 enhancement cases. As part of this they have developed our costing methodology and carried out benchmarking analysis on the input data to that methodology to make sure that the estimates being provided are robust and efficient. Documents setting our costing methodology and the results on the benchmarking plan are appended to this plan (**NES63**) (unpublished).

In the sub-section below, we summarise the approach that has been followed for costing our PR24 enhancement programme, show the results of the benchmarking exercise that was completed, and outline where we have carried out even more detailed assessment of cost elements going beyond the estimates held by our estimating tool.

4.5.1. Summary of our approach to cost PR24 enhancements

The primary tool used to cost our PR24 enhancement programme is iMOD which is our cost estimating system for delivering capital schemes. It comprises a suite of engineering models and a cost database which allows it to provide a detailed capex, opex and whole life cost set out outputs for a project. The cost database reflects feeding iMOD is based on works that have been subjected to competitive tender and have been subject to strong efficiency incentives in delivery – this makes sure that the database reflects efficient costs.

Our iMOD system has also been complemented by other costing tools and models where required. This is particularly the case for repetitive costing activities that either do not have costing information in iMOD or the scale of the costing exercise is too large to be efficiently costed individually through iMOD. These costing tools and models are:

- Nature-based costing tool – This is a costing tool to estimate range of grey/green interventions. As nature-based solutions have not previously been implemented at scale or covered by cost models, this tool was created using sector cost data to supplement our cost data.
- DWMP cost model – A series of cost models and unit rates were used for the DWMP to cost the circa 20 potential intervention options that were assessed as part of preferred solution development. These costs are based on our cost models, but due to the quantity of scenarios modelled a standalone costing tool was developed for expedience.
- WRMP Costing – Cost models were created to model adaptive planning scenarios and technical solutions primarily based on our costing data.

Finally, these tools were also supplemented with ‘traditional’ estimating where unit cost build ups have been carried out for enhancement areas where the iMOD system does not have model coverage or cost data. In this approach, traditional

bills of quantities have been produced and costed using unit cost rates. Unit cost rates have been sourced from the following:

- Actual historical costs from our delivery.
- Framework rates from agreed competitively tendered delivery frameworks.
- Industry Data – published cost information and sector databases.
- Market testing – supplier quotations.

The MM 'PR24 Cost Assurance Report' provides further details of the approach to costing enhancements.

Our costing methodology involves a three-stage process as set out in the table below.

TABLE 23: KEY STAGES TO OUR ENHANCEMENT COSTING METHODOLOGY

Stage	Description
Stage 1: Pre-estimate assurance	This stage is designed to make sure that our approach builds on the lessons we learnt at PR19 and ensure that the data being used within our costing tool (iMOD) is comprehensive and represents efficient costs compared to other companies. It includes: • A legacy cost review: this included a review of the best-in-class approaches at PR19 and identifying the improvements we can make to our PR24 approach. This led the development of an industry leading approach that is consistent and aligns with the principles of the Infrastructure Projects Authority (IPA) which is widely recognised as an authority in this space. • Normalisation approach: to make sure that historical costs can be brought into line current prices and reflect inflationary pressures over the intervening period. • Pre-costing benchmarking: Motts carried out benchmarking on the input data to our costing tool to make sure that it was represented efficiency costs and value for money to customers. This covered both direct and indirect costs. We present in the section below further detail of the results of this analysis which shows.

Stage 2: Costing 'do'	This covers the application of the methodology using tried and tested cost estimating practices. It includes:
	• Scoping levels: This involves tailoring the detail of the costing estimate to the cost area in question (reflecting its risk and materiality etc) which will produce estimates with different levels of costing uncertainty around them. The three main levels we have considered are:
	  • Level 1: iMOD express costing tool which involves use of more high-level information and unit cost tools to derive estimates.
	  • Level 2: Detailed iMOD estimation which involves a more detail breakdown of the scope of works with individual costing for each item therein.

- Level 3: Bottom-up estimating using Mott Macdonald Systems for complex schemes requiring further detail and additional data to estimate.
- For enhancement costs Motts triaged costs using Level 1 estimating, producing detailed top-down Level 2 estimates for the schemes taken forward. For complex schemes we carried out detailed Level 3 bottom-up estimating.

- Scope receipt and reflection: prior to costing it was made sure that each scope received had been signed off by the engineering function carrying out the optioneering discussed in Section 4.3. To promote accuracy in the costing, the scopes were reviewed to identify any discrepancies from normal specifications (that is where the costing tool might not have the information needed), and make sure that it was identified where items were to be refurbished, replaced, and so on, to make sure that the appropriate interventions were being costed.
- Estimation of capex, opex costs, carbon emissions, and application of risk and uncertainty adjustments:
    - The capex costs (direct and indirect works) and opex costs were estimated using the costing tool procedures.
    - Mott Macdonald used and amended its carbon models to estimate capital carbon from the different solutions. It also estimated operational carbon which incorporated aspects such as the emissions from power usage following BEIS Green Book data tables.
    - Risk and uncertainty: We are making costing estimates at an early stage of the project life-cycle, and before we have detailed scope of works that we be tendered or tendered costs for these solutions. It is inevitable that between now and project delivery there will be new items of scope that will need to be delivered in order to facilitate the works which cannot be known now and that risks will materialise during delivery. It is therefore appropriate to include adjustments for risk and estimating uncertainty due to these factors. These adjustments are in line with the recommendations from the AACE (American Association of Cost Engineers) with regards to their application. Benchmarking of this element are also covered in the section below on pre-costing benchmarking.

Stage 3: Governance	This involved a three-stage process by Mott Macdonald: • Check: All solution estimates were checked by a peer estimator before distributing. • Benchmark: Where feasible (driven by availability of benchmark and significance), further benchmarking of solutions or elements thereof was carried out as part of the approval process to deliver further confidence in efficiency.

- Approve: All PR24 estimates were reviewed and approved by the Motts Estimating Lead or another senior estimator.

In addition to the Motts governance process, there was a further layer of assurance whereby costing estimates were presented to a Northumbrian Water scrutiny panel incorporating operation and engineering experts in the areas to further sense-check the cost estimates being arrived at for different solutions.

4.6. SUMMARY OF THE BENCHMARKING OF OUR COSTING DATABASE

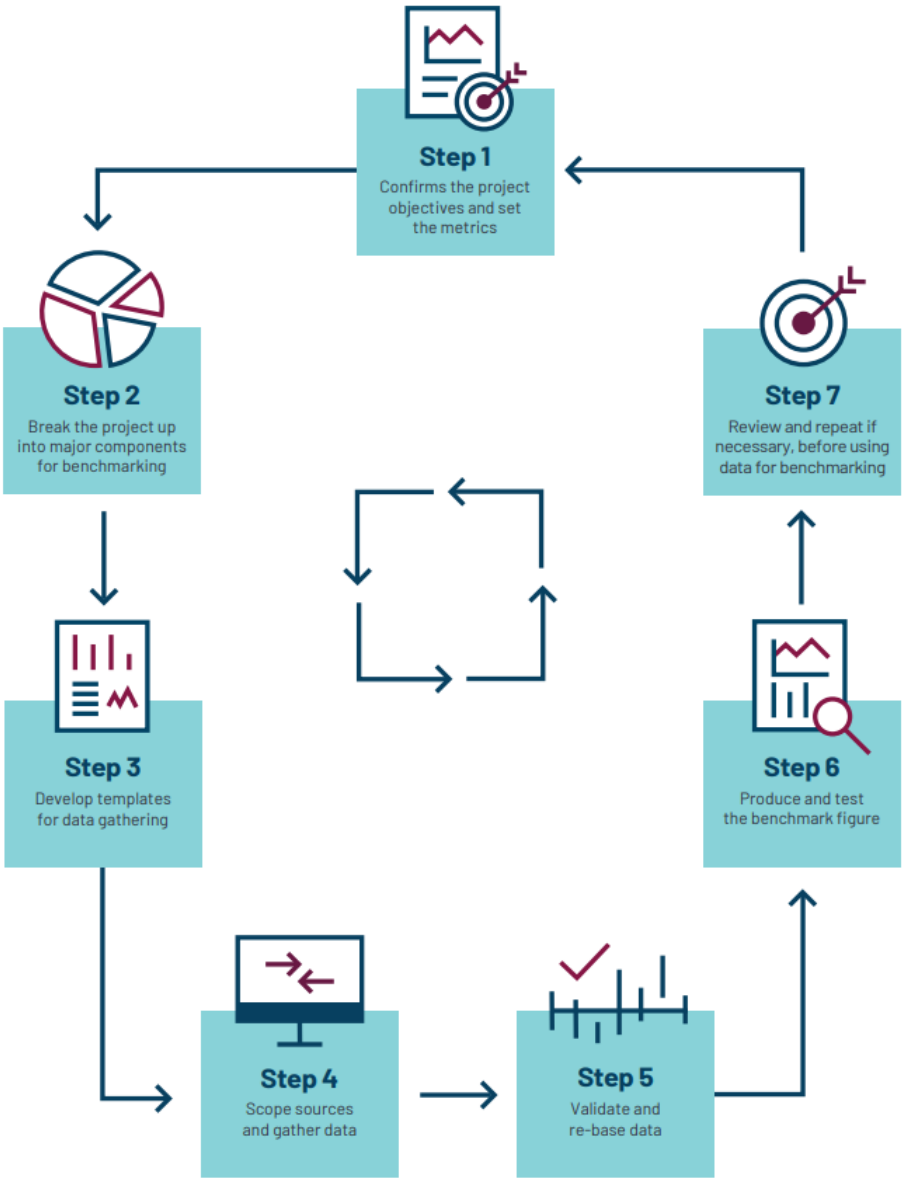
Our costing tool iMod, as outlined above, uses historical cost data, and applies adjustments for risk and estimating uncertainty to estimate the cost of future projects. As part of the costing methodology development Mott Macdonald carried out a benchmarking exercise of these costs to make sure that the plan was based on robust efficient costs that would ensure value for money for customers and also deliverability for our firm and making certain future financial resilience.

The data used for the benchmarking focused on costs at the 'award' gateway and the associated client and contractor risk allowances from award to completion. This makes sure that the data being compared is consistent across the companies examined. The report considers indirect and direct costs as separate components and makes an overall assessment combining both areas. This is because different contracting strategies can insource certain activities meaning higher indirects and lower indirect costs than a strategy that outsources a greater scope of the works to be carried out.

For indirect costs, the study followed the seven step best practice approach as set out within the IPA Best Practice in Benchmarking Report.[43] This is summarised in Figure 10.

[43] Best Practice in Benchmarking (publishing.service.gov.uk).

FIGURE 10: IPA'S RECOMMENDATIONS FOR TOP-DOWN BENCHMARKING



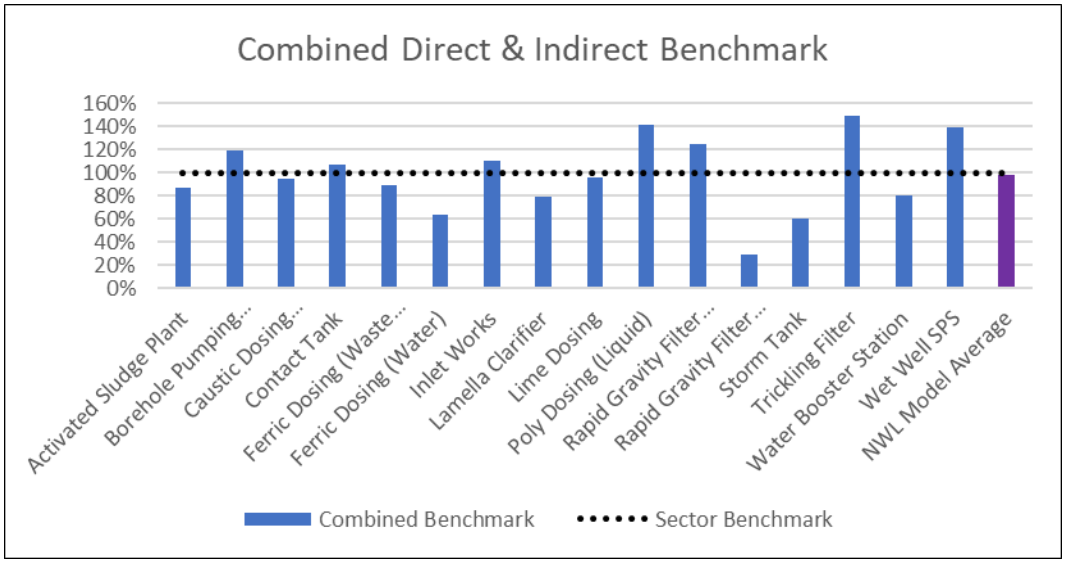
Source: Figure 1, page 11, Best Practice in Benchmarking (publishing.service.gov.uk).

This involved benchmarking the percentage uplift to a common £1 of direct works performance against three comparator WaSCs for which Mott Macdonald were able to make comparisons. The details of this along each of the steps are set out in the benchmarking report (NES63) (unpublished).

Direct costs were benchmarked for key assets which cover the vast majority of historical spend. Mott Macdonald compared the direct costs held by our iMod system against actual cost data for eight comparable large water and sewage companies which it considered comparable to us in scale, structure, and operating deliver model.

The benchmarking indicates that our indirect costs are in line with or under the sector averages, while the direct costs are over sector averages. However, when both indirect and direct costs are combined to give a holistic view, our costs are at 98% of the average or 2% under the expected costs as show in the chart below.

FIGURE 11: PRE-ESTIMATION BENCHMARKING OF DIRECT AND INDIRECT COSTS



Source: Mott Macdonald pre-estimation benchmarking report.

4.7. OTHER ENHANCEMENT COST BENCHMARKING

The benchmarking discussed above was carried out pre-estimation by comparing our cost curves to other companies without focussing on the specifics of individual projects. To complement this, we carried out further benchmarking of the costs coming out of the estimation process for our specific enhancement schemes and programmes. This included:

- Benchmarking of projects against the independent cost curves of other WaSCs – this tested whether the specific points on the cost curves being utilised in our plans matched well against comparator costs. Different sized projects and different technologies were selected within areas to provide an assessment representative of our programme. This overcomes an issue with the pre-estimation benchmarking where the results could be skewed by portions of our cost curve which are not actually utilised in practice as we do not have any projects of that size or type.
- Supply chain estimates for large programmes – for the two largest programmes in our storm overflows plan within the DWMP (Marske and Berwick) we asked two supply chain partners to estimate the cost of delivery based on the specification of works we had used to cost our plan. This provided an independent cross-check of the costs of these numbers from parties active in this space.
- Econometric and other modelling of programme/project costs against industry data – this was used to compare our costs in a way that Ofwat might carry out at PR24. For example, at PR19 Ofwat used econometrics to assess P-

removal costs. We asked MM to replicate these approaches using more up to date data, for example, from the APR or DWMP published data.

We focused the deployment of these approaches on the largest and most complex areas of our PR24 enhancement programme to be proportionate and get most value from the exercise. The table below sets out the benchmarking we have carried out in each area.

TABLE 24: AREAS AND SAMPLES FOR BENCHMARKING OF SPECIFIC ENHANCEMENT CASES

Top Case	Case	Overall enhancement cost	Type of benchmarking
DWMP	DWF	£53.1m	• Six projects against independent cost curves
WINEP	WINEP - storm overflows	£939.3m	• Twelve projects against independent cost curves • Econometric benchmarking against PR19 models
WINEP	*DWMP Marske*	*£330.2m*	• Programme benchmarking against two supply chain estimates
WINEP	*DWMP Berwick*	*£164.8m*	• Programme benchmarking against two supply chain estimates
WINEP	WINEP – WFD P-removal	£134.2m	• Six projects against independent cost curves • Econometric benchmarking against PR19 models • Cost comparisons against AMP7 data
WINEP	WINEP - sludge	£84.6m	• Sludge storage shed estimate against independent cost curves
WINEP	WINEP - monitoring	£257.4m	• Five monitor installations against independent cost curves
WINEP	WINEP - septic tanks	£46.3m	• Six projects against independent cost curves
Water quality	Lead	£46.8m	• Unit costs
Resilience	Raw water (Geosmin)	£8.1m	• Six projects against independent cost curves
Asset health and WRMP demand management	Mains renewal	£74.4m	• Unit costs
WRMP demand management	Metering	£120.3	• Unit costs
WRMP supply options	WRMP	£386.1m	• Project benchmarking
Reservoir safety	Reservoir safety	£80.6m	• Project benchmarking
Climate change resilience	Process enhancements	£12.3m	• Project benchmarking
Total		£2.2bn, 80% of total enhancement spend	

We discuss this benchmarking in more detail in the sections below.

4.7.1. Enhancement cost benchmarking with other WaSCs

We asked MM to carry out specific additional benchmarking of our enhancement case estimates against other WaSCs costing tools to see how our estimates compared to these benchmarks.

The sample size for each area was based on selecting a representative sample of projects across the enhancement case. The projects identified range from low to high in terms of cost range within the business cases. To complete the exercise Mott Macdonald compared the cost estimates from each of our enhancement cases against what costs would have been estimated using the data and cost curves associated with six comparable water and wastewater companies from England and Wales where they hold data. While this benchmarks our costs against six comparable companies for each company the associated cost curves are likely to contain hundreds or thousands of datapoints for the associated elements. A mean average of these companies has been used as the benchmark with a 25% percentile and 75% percentile provided as a suitable range.

The costs comparisons have been calculated using each company's latest cost curve database. This should provide a suitable comparison with these datasets having been used to build up each company's PR24 submission May 2023 to date. The costs generated by each cost curve are based on the sizing information included in each NWG estimate to generate costs applicable to the interventions being proposed within the business cases. The results of the benchmarking studies are summarised in the table below. The table and underlying reports confirm that our enhancement cost estimates are efficient in comparison to the benchmarked estimates.

TABLE 25: AREAS AND SAMPLES FOR BENCHMARKING OF SPECIFIC ENHANCEMENT CASES

Case	NWL's cost	Benchmark cost	Delta	Commentary
DWF	£23,898,715	£26,807,042	-11%	• The DWF business case is 11% below the industry benchmark when including Indirects for the project sample analysed. Some 28 different interventions have been benchmarked against comparable industry organisations with over 48,000 data points underpinning the curves and data used to generate benchmark comparison costs. • No projects have been removed from the sample base and most items assessed. Only a small number of exclusions to the benchmark analysis was experienced across the projects, as seen in section 2.8 of this report. •
WINEP - storm overflows	£6,799,196	£7,540,622	-10%	• The storage tanks and CSOs we have are currently 10% below the industry benchmark for the sample range of projects analyses once including indirect percentages. This is with the assumption that Seaton Carew has been removed from the analysis because of the large yardstick/project value being outside the reasonable range of benchmark curves, resulting in benchmark comparisons not being accurate. • CSOs are currently low against the industry benchmark at the lower end of the cost range. Upon review, this it appears is due to the Wet Chamber asset within the model. When the Wet Chamber is a large size the CSOs for Northumbrian match up well to the benchmark, as per project 2.6 – Cattle Market B SSO, however a similar sized yardstick CSO – 2.5 Brandywell has a smaller Wet Chamber, resulting in a -32% variance to the benchmark. It is concluded that the benchmark samples have a large Wet Chamber as standard and as a result the Northumbrian curve is well matched against the higher yardstick CSO's. The benchmark figures do not consider the smaller chamber size necessary and as result the estimates generated by Northumbrian Water are more precise to the final cost of a CSO. • With a wide range of project values reviewed and a robust sample base for benchmarking there is confidence that we are currently showing as efficient against industry comparators used within this analysis.
DWMP Marske and Berwick	£495,082,818	£514,436,939	-4%	• This comparison uses market testing and supply chain estimates to benchmark costs from two suppliers. • For the priority programmes at Marske and Berwick we are currently estimating programme costs as being 4% less than the position of the supply chain. This direct comparison against contractors provides robustness to the costing exercise undertaken for these drainage community programmes.

WINEP - WFD	£34,242,272	£36,227,650	-5%	• DWF is 5% below the industry benchmark when including Indirects. With many items benchmarked, most with three or more company comparators, there is confidence that the items identified have been analysed robustly.
WINEP - sludge	£27,438,345	£20,689,234	33%	• Northumbrian Water are above the industry benchmark generated by MM but are close the 75th percentile. • MM acknowledge the difficulties in benchmarking this area because single sites will have differences in physical location (urban vs rural) and linear volumetric capacity of the barns will be difficult to use as a linear comparison. • NWL's estimate includes more detailed scope than some of the comparable estimates used to comprise the benchmark position, particularly in the areas of odour control, power and lighting as MM have costed these using a bottom-up method – compared with benchmark costs. This means NWL will have a lower uncertainty factor due to scope.
WINEP - Monitoring	£741,142	£857,761	-14%	• Monitoring costs are currently 13.6% below the industry benchmark. Indirect costs 10% below the industry comparison suggests costing profiles Northumbrian Water identify more costs within the 'direct' aspect than their comparators. • Monitoring benchmarking proved challenging due to the number of 'small value' items that could not be benchmarked, however these are not believed to be significant in the bigger picture of the business case, i.e Concrete Channel in Chamber - £260 or Field Display at £117. The significant aspects of costing within the projects have been captured within this analysis. • Due to the low value of the projects within the business case the % variance is more volatile than the other business cases within the PR24 programme.
WINEP - Septic Tanks	£2,085,782	£2,679,861	-22%	• Septic tank estimates are currently 22% below the industry benchmark. • The key driver for a variance from the benchmark figure is project 6.3 – Whickhope. Upon interrogation of this project and its scope we can see an extremely low yardstick for the intervention (0.06l/s). This is below the range of some of the curves used within the scope, Humus tank for an example, which looks to generate costs for scopes requiring between 1-100l/s. When carrying out the cost curve benchmarking process the Humus Tank curve was identified as one much higher than the benchmark total and indicates that the comparator data has a larger initial outlay for a Humus Tank which doesn't increase much depending on the yardstick, whereas the Humus Tank curve for Northumbrian Water starts much smaller but increases in value a lot quicker along the length of the total range. • The pattern detailed above is similar for both the Trickling Filter and Primary Tanks identified within the Whickhope scope. Both, like the Humus Tank, have been utilised below their normal range and have been identified as above

				their comparators. If the variances from these three items are removed from this analysis the delta for total direct costs reduces from £326,773 to £77,144, indicating these three items are having a significant impact in the overall analysis of the business case sample.
Lead	£3,095 per replacement	£3,291 per replacement	-6%	• These are unit cost values. • Currently Northumbrian Water is 6% below the benchmark comprised of two industry comparators per unit rate implementation. • Indirect costs have not been included in this benchmark analysis as they have been applied at a 'programmatic' level with some indirect costs reduced to account for this.
Raw Water (Nitrates, Geosmin)	£58,872,896	£61,049,352	-4%	• Currently Northumbrian Water is 4% below the benchmark. • The raw water sample is being driven primarily from the EDR plants, with these items taking up as significant amount of the spend across the business case. The prices for these items come from a supplier/manufacturer quote from Veolia in November 2022 and as such represent a high level of confidence in the costings. • Items excluding the EDR plants also benchmark close to comparators, albeit with a low number of items benchmarked across the project scopes. Projects 5.2 and 5.3 indicate Northumbrian Water is more expensive at the lower end of the cost curve range for Powder Activated Carbon Dosing. This is highlighted with Warkworth at 43 ML/d as the driver being 25% over the benchmark and Broken Scar 22% under the benchmark at a 143 ML/d yardstick.
Mains Renewal	£150/m (Berwick, Kielder) £200/m (Hartismere, Blyth, Northern Central, Essex)	£212/m to £219/m	-41% to -9%	• NWL has two different unit rates which are dependent on location and the conditions in each. • Both of the unit costs are below the industry benchmarks based on PR24 information available to MM: by 41% in Berwick and Kielder, and by 9% in Hartismere, Blyth, Northern Central, Essex • MM indicate that some cost elements such as supervision and management may be underrepresented in the NWL figures but are robust enough for the degree of scope definition. They also suggest that the mains renewal rates are reviewed and validated with reference to the market as some of the NWL estimates appear low compared to the comparators.
Metering	£34.7m for internal first policy £88.7m for external first policy	£38.2m to £69.4m based on APR data		• The internal first policy is likely to be seen as efficient whereas the external first policy may seem high cost when benchmarked against different policies. • MM recommend further exploration of econometric models at PR24 that consider the split of internals versus externals given the different unit costs.

WRMP	£93,538269	£114,377,975	-18%	• Northumbrian Water is 18% below the benchmark set by other companies' cost curves. • A large portion of the variance is driven by the Reverse Osmosis item with the Lowestoft project which is £5.1 million below the benchmark for direct costs. This assessment could be skewed by the type of Reverse osmosis being carried out and it is not possible to tell whether the same process is being benchmarked by other companies on the information available to MM.
Reservoir drawdown	£9,677,693	£13,625,459	-27%	• Northumbrian Water is 27% below the benchmark cost from other companies. The analysis was limited by the number of items to benchmark for each project. • Pipework costs were the main driver in making NWL's costs lower than the benchmark.
Climate change resilience (water)	£5,922,555	£6,853,174	-14%	• Northumbrian Water is 14% below the benchmark set by other companies' costs. • The main driver of variance at a programme level is the project at Whittle Dene. The Gaseous Chlorine Dosing element of the comparison accounts for most of this variance. With only 1 industry comparator curve to assess against Northumbrian Water's position it is difficult to determine if this variance is accurate against the wider industry.

4.7.2. Programme level and econometric benchmarking

We also asked MM to carry out further benchmarking of two areas of our enhancement costs for P-removal and storm overflows.

P-removal was a significant area of WINEP at PR19 and was assessed using econometric models by both Ofwat and the CMA. We asked MM to review:

- how our PR24 costs compared against these PR19 models and benchmarks
- consider the inclusion of AMP7 data collected by Ofwat as part of the APR process, and any PR24 programme data available to MM on an anonymised basis, and
- explore alternative benchmarks based on the scope of schemes being proposed for PR24.

This analysis found that the econometric models used at PR19 do not appear to be a good fit for the types of schemes being required in AMP8. This is for two reasons:

- In general, PR19 considered P-removal schemes at the larger works whereas the PR24 programmes are more focussed on the smaller works. The unit costs for these different sizes of works vary significantly as smaller works have much higher unit costs across the sector and simple lines of best fit approaches do not capture this dimension to the economies of scale.
- The levels of consent are much more stringent that the previous enhanced consents considered by the models. At PR19 0.5mg/l was used as part of Ofwat's 'model 2' threshold to determine the proportion of each companies works that were complex and more expensive. In our case at PR24, all 13 of our P-removal schemes fall into the most expensive <0.25mg/l category.

This meant that the econometric PR19 econometric models generally showed our costs (£93.4m) to be high to the benchmarks as shown by the table below. Model 1 does not control for the complexity of the schemes at all (it just considers the PE and number of sites) whereas model 2 does include a complexity cost driver based on the proportion of schemes <0.5mg/l in the Ofwat models. It can be seen that when this threshold is increased to 1mg/l the modelled allowance decreases and where it is reduced to 0.25mg/l it increases significantly.

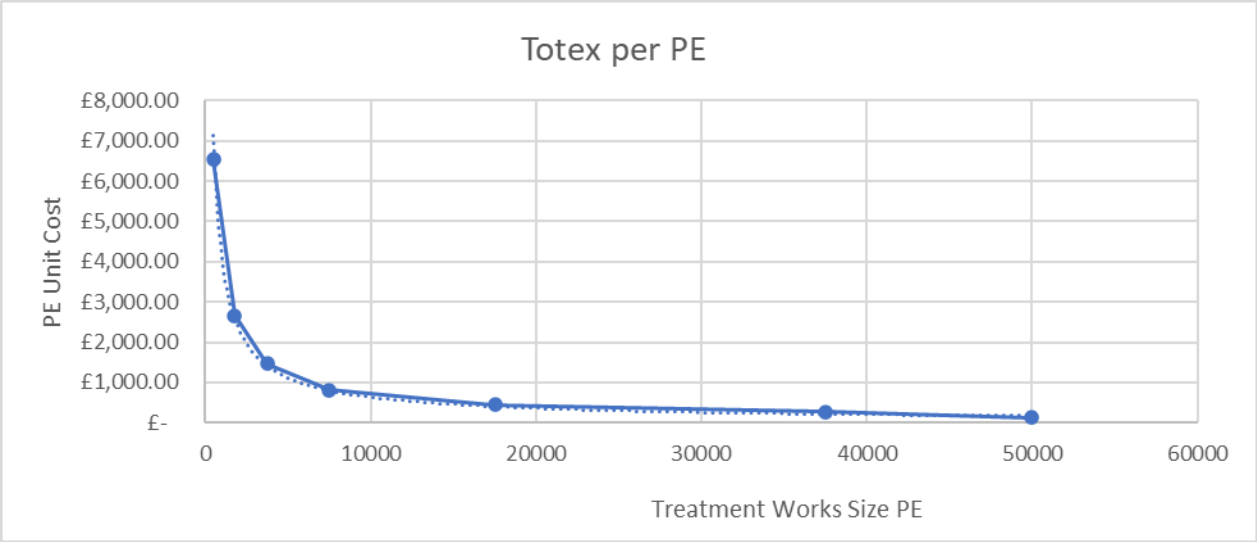
TABLE 26: MODELED ALOWANCES FOR NWL P-REMOVAL COSTS

Model dataset	Model 1	Model 2	Predicted cost
PR19 Programme	£87.39m	£96.29m	£91.84m
AMP7 Programme	£75.24m	£93.18m	£84.21m
PR19, AMP7, PR24 Blended Programme	£75.72m	£93.74m	£84.73m

AMP7, PR24 Blended CMA <= 1 mg/L	£62.92m	£79.58m	£71.25m
AMP7, PR24 Blended CMA <= 0.25 mg/L	£62.92m	£194.18m	£128.55m
NWL PR24 costs	£93.4m	£93.4m	£93.4m

As stated above neither of these models account for the small sized nature of the works involved at PR24 where the unit costs are much higher as demonstrated by the chart below based on the AMP7 APR data.

FIGURE 12: P-REMOVAL UNIT COSTS BASED ON PE OF WORKS



When benchmarked against this curve our costs (£93.4m) are in line with the benchmark for the sectors' costs (£92.6m).

MM also carried out a similar exercise to work out the difference in unit costs between different consent levels. This is shown in the table below.

TABLE 27: CONSENT DEPENDENT COST FACTORS

Consent	Cost Factor
All Consent	100%
Below 0.25 mg/l	157%
0.25 to 0.5 mg/l	99%
0.5 to 1.0 mg/l	90%
Above 1.0 mg/l	91%

This shows how the unit costs (per PE) for schemes below 0.25 mg/l are 57% more expensive than the AMP7 average whereas the schemes above are 9% less than the average. When benchmarked on this basis, our costs (£93.4m) are well below the industry benchmark (£132.7m).

This evidence shows our costs do appear to be efficient once the two critical factors are properly taken into account:

- the higher unit costs of smaller works as per the analysis shown in Figure ; and
- the increased tightness of the consent levels seen at PR24 where all our schemes have much tighter consents than the thresholds considered at PR19. This could be considered through a tighter threshold in an econometric model or through the consent dependent cost factor analysis shown above in **Error! Reference source not found.**.

The second area where we have conducted further benchmarking is on works to reduce spills from storm overflows. As part of this MM carried out benchmarking in three areas:

- Storm storage at treatment works.
- Network storage solutions.
- Blue/green solution benchmarking of storage at treatment works and network storage.

For storm storage at treatment work and network storage solutions, MM ran the PR19 models developed by Ofwat using different datasets (PR19 dataset, PR19 and PR24 blended where PR24 data available, and the DWMP dataset) to compare our PR24 costs against.

For storm storage at treatment works where we have PR24 costs of £2.4m, MM found that:

- As at PR19 models 1 and 2 developed by Ofwat at PR19 performed best with the data and were used for the benchmarking assessment. Models 3 and 4 which were linear models did not fit the data well and resulted in several negative cost predictions which is implausible.
- Our costs were below the benchmarks set by models 1 and 2 for each of the benchmarks indicating that our costs are efficient compared to these comparators.

This is shown in the table below.

TABLE 28: BECHMARKS FOR STORM STORAGE AT TREATMENT WORKS

Data Set	Model 1	Model 2	Model 3	Model 4	1 & 2 Tri.
PR19	2.98	2.92	1.13	-2.23	2.93
PR19 and PR24 blended	2.90	2.85	0.51	-2.81	2.86
DWMP	3.91	3.74	9.96	9.96	3.79
NWL PR24 costs	2.4	2.4	2.4	2.4	2.4

For network storage, where our PR24 costs are £383m, MM found that:

- The size of the programmes at PR24 massively exceed those seen at PR19 and therefore it is important that the PR24 data is used to set allowances for AMP8. PR24 costs appear to be higher than those seen at PR19 and therefore could underfund PR24 programmes if used exclusively.
- All of the four models tested at PR19 seemed reasonable based on the sign of the coefficients. However, model 1 from PR19 which was a linear model with storage capacity and number of sites as cost drivers provided the highest explanatory power of the models and therefore might be most applicable for PR24. MM also suggested Model 2 for consideration as it also had strong explanatory power.
- Our costs were efficient when compared against the DWMP dataset but were slightly above the costs implied the models using the PR19 and limited PR24 data available to MM.

This is shown in the table below.

TABLE 3: BENCHMARKS FOR NETWORK STORAGE

Data Set	Model 1	Model 2
PR19	276.27	277.84
PR19 and PR24 blended	373.59	376.58
DWMP	389.21	480.37
NWL PR24 costs	383	383

These results align with the results of the benchmarking against other companies cost curves which found our PR24 costs to be 10% below the industry benchmark for direct and indirect costs.

4.8. ADJUSTMENTS FOR ONGOING EFFICIENCY IMPROVEMENT AND INPUT PRICE INFLATION

In Section 3.6, we set a target for ongoing improvements in the efficiency frontier of 0.8% per annum and in Section 3.5 we set out our approach to input price inflation. We apply a similar ongoing efficiency target to enhancement costs as we do to our base costs and our forecasts costs already reflect input price pressures. The table below shows the impact of ongoing efficiency and RPEs on our enhancement costs presented above.

TABLE 4: IMPACT OF ONGOING EFFICIENCY IMPROVEMENT AND RPES ON ENHANCEMENT COST ESTIMATES (£M, 2022/23 PRICES)

	Wholesale water	Wastewater network plus
Enhancement cost estimates pre-frontier shift	947.3	1870.7
Impact of 0.8% ongoing efficiency improvement	-33.7	-70.7
Impact of RPEs	-17.0	-34.2
Enhancement cost estimates post frontier shift	896.7	1765.8

5. COST ADJUSTMENT CLAIMS

We were one of the few companies not to make a symmetrical cost adjustment claim at PR24 and we similarly raised no claims at PR19. On a backward-looking basis, we think the cost models capture the main factors driving different cost levels between companies. We recognise the issue of information asymmetry between companies and the regulator and that individual companies may benefit from some factors excluded from Ofwat's cost models just as they experience disbenefit from others, but they are only likely to raise concerns about the latter category. We have therefore sought to focus on meeting and beating the benchmarks provided by the cost models and setting ambitious efficiency targets against those in the first instance.

However, there are some areas where we have requested additional costs where we do not think the cost models alone provide a good guide to efficient expenditure requirements in the future and these are likely to apply more generally to the sector than to us alone:

- Asset health: we have included proposals for additional spend to maintain our asset health where think future requirements will be in excess of those funded by the base cost requirements.
- Leakage: we have included a business case for spend to reduce leakage as the base cost models do not fund the level of leakage reduction required to meet our WRMP targets on leakage.
- Power costs: we have included an adjustment for power costs as the models do not fully reflect the steep increase in power costs experienced in 2021 and 2022. This is combined with proposals for a true-up so that if power prices did fall, the money would be returned to customers. Conversely if they increased, we would be able to recover this increase in our efficient costs.

6. UNCERTAINTY

There are many risks that can arise during a price control period that can cause costs to rise or fall. Some of these risks are more controllable than others – for these we should be more strongly incentivised to manage them, for example, through cost sharing rates. However, some risks are beyond our control, and we have considered whether different arrangements should apply, for example, through the introduction of a reopener to manage particular identifiable risks if they arise.

This section sets out our proposals on risk sharing within the PR24 price control in five areas:

- **Cost sharing rates** - this covers areas of unmodelled costs where we have very limited to no control over the costs and do not consider the final methodology proposals to be appropriate. In addition, we also propose the continuation of the cost sharing arrangements adopted by the CMA for our Industrial Emissions Directive expenditure.
- **Input price mechanisms** - we propose that there is an end of period true-up to account for the difference between assumed levels of input price inflation and actual input price inflation. The efficient price of inputs is outside our control and therefore these mechanisms would ensure we are able to recover our efficient costs and avoids potential for there to windfall gains and losses which would not be in customers' interests.
- **Bespoke uncertainty mechanisms** - there are three areas of our plan where we think bespoke mechanisms are required. One concerns the potential use of an adaptive pathway for potential need for the North Suffolk Winter Storage Reservoir, another is around potential changes to the solutions required in order to achieve nutrient neutrality requirements and the final area relates to the CSO programme given its scale and novelty.
- **Price control deliverables** - as per the PR24 methodology we have included PCDs to ensure that we are clear over what will be delivered by enhancements and so that money is returned to customers if they are not delivered.

6.1. COST SHARING RATES

For the vast majority of costs in our plan, we agree with the proposed cost sharing rates in the PR24 methodology which allows for predominantly 50:50 sharing with some exceptions for some categories of unmodelled costs. We propose different cost sharing rates for business rates and abstraction charges (both unmodelled costs) as the degree of uncertainty and controllability mean that the PR24 rates are not appropriate. We also propose the continuation of the cost sharing arrangements adopted by the CMA for our Industrial Emissions Directive expenditure as these works have been delayed due to agreement over permits not being reached. We discuss these areas in turn below.

6.1.1. Business rates

In the methodology, Ofwat proposes to use a 25:25 cost sharing rate for business rates across the three controls. In its 2021 price determination, the CMA examined the appropriate rates to use and considered that 10:10 was the appropriate rate to use. This would incentivise companies to minimise costs to the extent it can, while limiting companies' exposure to costs which are largely beyond their influence. The CMA noted that these are treated as pass-through (0:0) in

some other regulated sectors, and that there are not sufficiently compelling arguments that companies could routinely make large savings by influencing their business rates[44].

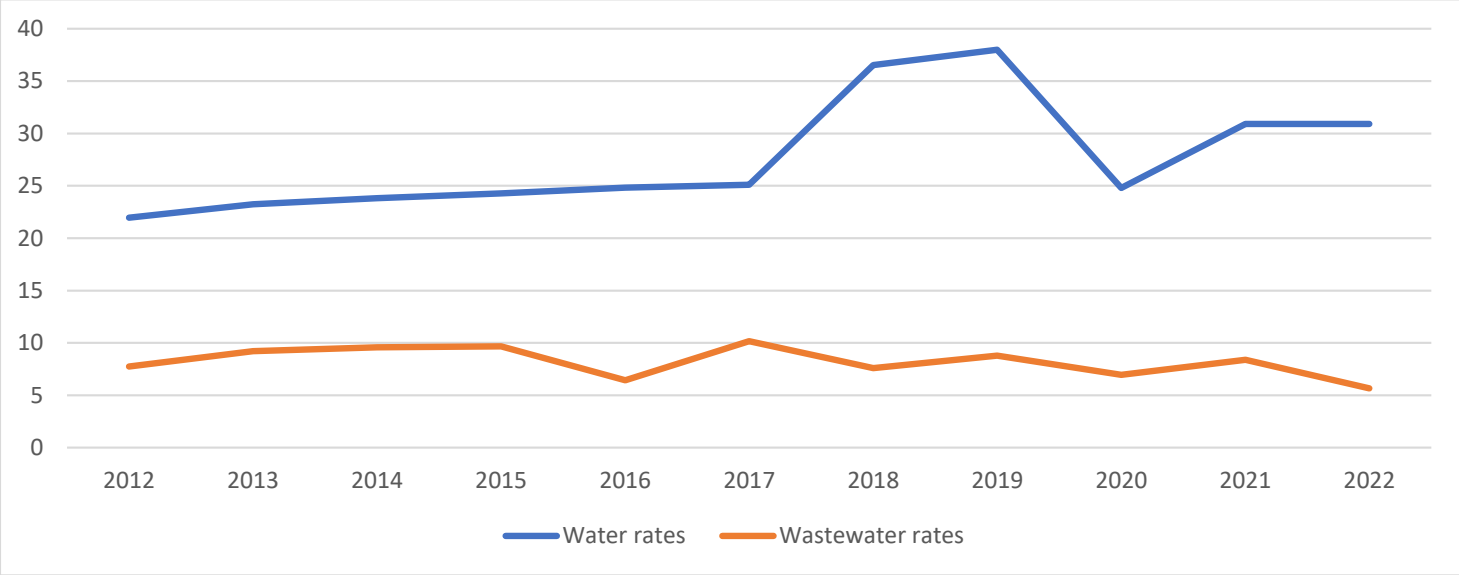
We propose a rate of **10:10** in our business plan, consistent with the CMA determinations. As we said in our response to the Ofwat methodology, Ofwat did not consider or reflect the CMA decisions in the methodology consultation or explain why the CMA evidence should be disregarded. Ofwat has not provided further evidence or examples of companies successfully challenging their rateable values and receiving significant rebates or explained why a 25:25 cost sharing rate is now appropriate. It has provided no direct feedback on our response to the methodology.

While the previous two rating cycles have covered seven and six years respectively, the government has decided to increase the frequency of revaluations to every three years in future. The current rating list came into effect in April 2023, with future revaluations expected to take effect in April 2026 and April 2029. This means that we only have clear visibility of one year of the AMP8 price review period. For the remaining four years there is uncertainty over outcomes of the 2026 and 2029 revaluations and the charges that we will need to pay. Setting a fixed allowance with a stronger cost sharing rate will just give rise to windfalls gains or losses and place unnecessary risk on companies – these impacts are not in customers' interests. We consider that the rates set by the CMA are more appropriate given our lack of control over them.

The chart below shows the historical volatility in our business rates which shows that the changes can be significant resulting from revaluations and could give rise to windfall gains/losses which are outside of our control if the cost sharing rate is not altered. For example, in 2017/18 when a revaluation took effect, there was an £11m or 45% increase in our water rates.

[44] CMA (2021), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, Final report, para 4.1076.

FIGURE 13: HISTORICAL BUSINESS RATES



The rateable values at the 2023 revaluation reduced significantly by 19%, reflecting the significant reduction in the PR19 cost of capital. This contrasted with a 15% increase for companies on the standard list.

It is likely that business rates rateable values will increase at future revaluations in 2026 and 2029, as a consequence of increasing input costs and an increasing asset base. In respect of our cumulo rates, we have assumed that the VOA will apply the same methodology and model used for the 2023 valuation in the future revaluations in 2026 and 2029. The combined impact of increased revenue and growth in RCV are therefore expected to increase the cumulo Rateable Value by 90% in 2026 and a further 53% in 2029. This is a mechanistic application of the formula and does not involve any subjective judgement.

TABLE 31: LOCAL AUTHORITY AND CUMULO RATES

£m 2022/23 prices	2022/23	2023/24 forecast	2024/25 forecast	2025/26 forecast	2026/27 forecast	2027/28 forecast	2028/29 forecast	2029/30 forecast
Water	31.163	20.805	20.805	20.805	40.452	40.452	40.452	62.263
Wastewater	9.332	9.430	9.430	9.430	9.430	9.430	9.430	9.430
Total	40.495	30.235	30.235	30.235	49.882	49.882	49.882	71.693

It is also likely that the non-domestic rates valuations will increase at a similar rate to that experienced in 2023.

Based on this evidence we propose a **10:10** cost sharing rate proposed in our business plan for the following reasons:

- There has been historical volatility in our rates stemming from revaluations.
- There are two revaluations due to take effect during the AMP8 period in 2026 and 2029.
- Based on the current formulae, we are already projecting a 77% increase in our rates between 2022/23 and 2029/30 but there is significant uncertainty around this.
- We have limited control over the approach to revaluations and how cumulo rates are set.
- A 10:10 cost sharing rate better reflects this limited control and the uncertainty that exists but still provides us a proportionate incentive to engage effectively and ensure that customers pay no more business rates than is appropriate.

6.1.2. Abstraction charges

Ofwat proposed to use standard cost sharing rates (50:50) for abstraction charges at PR24 – not because Ofwat thinks these are in management control, but because they are not aware of any further changes to abstraction licence changes in the period 2025-30.

Abstraction charges are a particularly acute issue for Northumbrian Water as we have the highest normalised charges in England and Wales at around 4 times the sector average. We propose an enhanced cost sharing rate of 25:25 for abstraction charges. Water companies have no control over these charges, and it is likely that the EA will review charges at least once during 2025-30. If there are no changes to abstraction charges, customers will be unaffected (as there will be no difference in costs to share). However, if there is a review then this enhanced cost sharing rate would protect both customers and company – as Ofwat considered appropriate in the PR19 review.

We also propose a 'pass-through' mechanism for atypical abstraction costs associated with the Kielder Transfer Scheme, recognising that these costs are determined in accordance with a binding contractual arrangement (that is, 0:0). This is consistent with the decision reached by the CMA for our 2020-25 price control which have a pass-through for the Kielder costs. Ultimately, we are unable to control these charges – which are not volume related and cannot be reduced by encouraging customers to reduce consumption or by increasing supply from other sources.

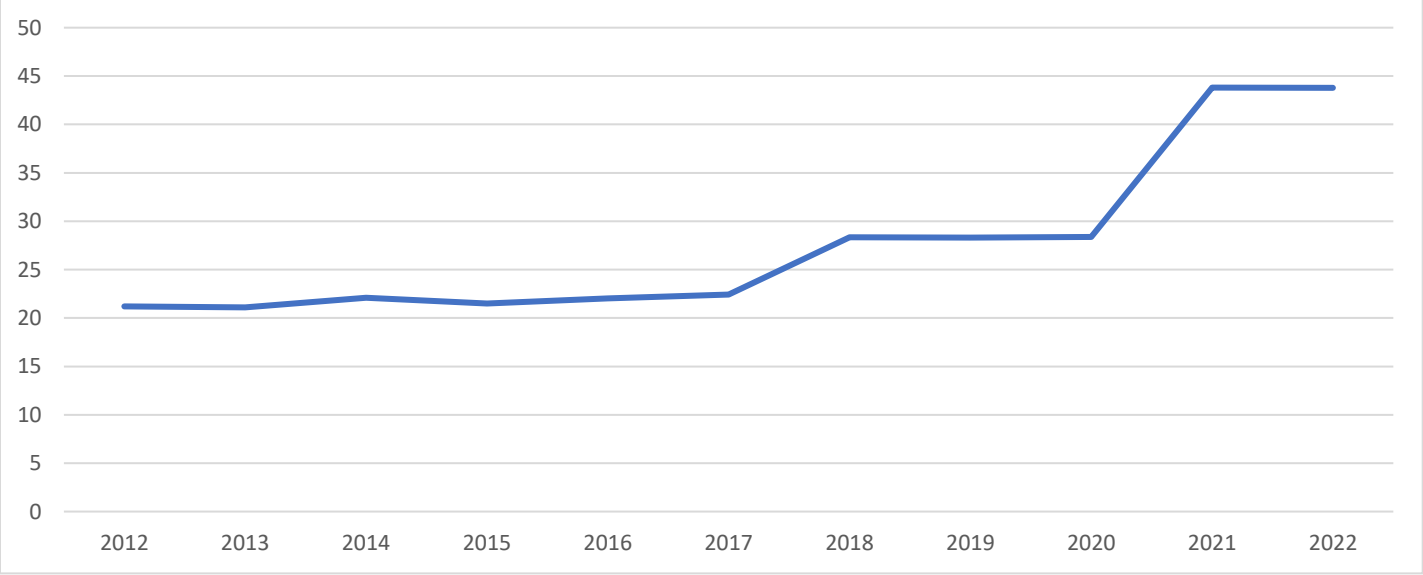
The Environment Agency has informed us that it is intending to consult on an increase in our Kielder Supported Source Supplementary Charge during the summer of 2023, with a potential charge increase being implemented from April 2024. This charge **increase** is required to make sure that the Environment Agency fully recovers its costs in relation to the Water Resource Operating Agreement for the Kielder Transfer Scheme, increased asset financing charges following a correction to its Fixed Asset Register required by the National Audit Office, and the costs to comply with the improved health and safety standards for the draw-down of Kielder Reservoir under the Reservoirs Act (1975). We expect costs to increase by [£12m] per annum as a result of this consultation and have included this cost in our forecasts as set out in the table below.

TABLE 32: FORECASTS OF ABSTRACTION CHARGES

£m 2022/23 prices	2022/23	2023/24 forecast	2024/25 forecast	2025/26 forecast	2026/27 forecast	2027/28 forecast	2028/29 forecast	2029/30 forecast
Water	39.883	38.234	47.564	47.564	47.564	47.564	47.564	47.564

The chart below shows the evolution of our abstraction charges since 2012 and highlights how they have increased significantly and in an unpredictable manner driven by the Kielder Transfer Scheme. In 2021 our charges increased by £15m per year which was a 54% increase over the previous year. Given future increases expected driven for example by reservoir safety requirements at Kielder, a standard cost sharing rate is just not appropriate as it exposes to significant risks of large windfall gains or losses which are outside our control.

FIGURE 14: ABSTRACTION CHARGES, £M



This volatility in charges outside our control which cannot be forecasted robustly demonstrates why an alternative cost sharing arrangement (pass-through) is appropriate for charges relates to the Kielder Transfer Scheme.

6.1.3. Industrial emission directive expenditure

We received funding of £12m for IED compliance from the Competition and Markets Authority (CMA) in its redetermination of the 2019 Price Review (PR19). The CMA also applied a different sharing rate to these costs of 75:25 (customer : company) reflecting the uncertainty in them.[45] As set out in our recent letter to Ofwat,[46] we have recently received a Schedule 5 Notice for Howdon which has significantly increased the scope of the required works. This implies a significant increase in expected costs and a potential delay to the timelines.

The determination from the CMA is clear that for AMP7 the expectation was that not only the allowed costs would cover the compliance cost but also that the enhanced cost sharing rate should address the risk. We therefore are not requesting additional enhancement funding for PR24 and instead seek to meet the requirement during the current period as far as possible. Should the work to meet the IED requirement extend into AMP8 then we request that the cost sharing rate applied by the CMA is likewise extended reflecting the continued uncertainty up to this point around the requirements.

6.2. INPUT PRICE MECHANISMS

As set out in Section 3.5 and in Annex 2, we propose ex-post true-up mechanisms for each of the key input cost categories (including energy; chemicals; and MPE). This is because there continues to be significant uncertainty around the expected changes in these costs over AMP8 and, therefore, there are inherent uncertainties around any RPE estimates. The benefit of true-up mechanisms is that they shield customers from overpaying if outturn costs are lower than expected, while also shielding companies from bearing the risk of outturn costs (which are outside management control) being lower than expected. Moreover, while we believe that these costs are largely outside company control, we propose true-up mechanisms which are based on independent indices, instead of suggesting straight cost pass-through mechanisms, to shield customers from inefficient cost management.

We propose that these true-ups would operate in the same way that the labour cost true-up for PR19 has operated. This means that:

- they would take place at the end of the AMP once all outturn data for the price indices is available; and
- the adjustment would be based on the difference in allowances between the assumptions used to the set the PR24 settlement, and the allowances implied by the outturn data (adjusting time value of money differences).

For wholesale and retail activities we propose the following indices are used for this purpose as set in the tables below.

[45] CMA (2021) PR19 appeals, Final Report, page 386.
[46] Letter from Andrew Beaver to Ofwat (August 2023), 'Re: Industrial Emissions Directive (IED) (England)'.

TABLE 34: PROPOSED PRICE INDICES FOR WHOLESALE INPUT PRICE TRUEUPS

Input	Proposed price indices
Labour	ASHE all employees, mean manufacturing hourly wages, including overtime
Energy	Department for Energy Security and Net Zero electricity price[47] paid by industrial customers
Chemicals	ONS PPI index - C2013 Other inorganic basic chemicals
Materials, plant and equipment	Department for Business and Trade 'Construction materials price index' ONS 'Machinery and equipment n.e.c'. PPI index

TABLE 35: PROPOSED PRICE INDICES FOR RETAIL INPUT PRICE TRUE-UPS

Input	Proposed price indices
Labour	ASHE all employees, mean private sector hourly wages, including overtime
All other inputs	CPIH

6.3. BESPOKE UNCERTAINTY MECHANISMS

6.3.1. North Suffolk strategic reservoir

Our Essex & Suffolk Water WRMP explains that our final WRMP includes the Lowestoft Water Reuse scheme, rather than the North Suffolk Reservoir. We have chosen this water reuse scheme because it can be delivered more quickly than the reservoir, and so minimises the duration of our moratorium on new non-domestic water supplies in our Hartismere water resource zone. However, we would prefer to deliver the North Suffolk Reservoir instead because it has lower energy and carbon costs and has significant potential to build in environmental gain.

In its determinations for accelerated expenditure, Ofwat allowed PR24 accelerated spend to undertake detailed engineering design for the North Suffolk Reservoir. This has started in autumn 2023 and will develop the scheme so that it is 'shovel ready' by 2026/27. If, at that point, we conclude that the reservoir would provide better value than Lowestoft Water Reuse scheme, and it can be delivered as quickly, then we would move to the North Suffolk Reservoir adaptive

[47] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1166291/table_331.xlsx (Table 3.3.2).

pathway. We will need to review in 2024 following the outcomes of EA Habitats regulation investigations and decide by 2027 once we have completed detailed designs of the options. The decision and trigger point for this scheme is discussed further in our **long-term strategy** (NES_LTDS).

Following this decision point, if we proceed with the reservoir as the preferred option, we would require a change to our price controls for 2025-30, removing the remaining costs for the Lowestoft Water Reuse scheme and instead including the remaining costs for the North Suffolk Reservoir.

We propose that Ofwat should include a bespoke uncertainty mechanism to make this change, in the form of a targeted reopener looking solely at this issue rather than a wider reopening of price controls. This targeted reopening of price controls if required would be by mutual consent between Ofwat and Northumbrian Water. We envisage this mechanism would operate similar to decisions for the inclusion of DPC schemes outside/inside price controls, as value-for-money assessments change in practice. We expect that other water companies will propose similar decision points for switching to adaptive pathways, and a common approach should be applied.

6.3.2. Nutrient Neutrality

Our proposed catchment-based programme for tackling nutrient neutrality is now reasonably certain. There is still a residual risk that we could be expected to deliver improvements at wastewater treatment works, which we estimate would cost c.£350m+ rather than the c.£50m from our catchment-based programme.

We have engaged with the Government to make sure that this risk is minimised, but this residual risk is substantial and could not be managed within cost sharing. We engaged with our customers on their views about a catchment-based approach, explaining the risk that we might still be expected to deliver improvements at wastewater treatment works – and they supported this strongly. Further to that research, we asked customers about their appetite for sharing this risk with us, and they still strongly supported this approach with an uncertainty mechanism.

This uncertainty mechanism would be required in the event that we are unable to pursue the proposed nature-based solutions and must pursue an alternative option. We hope that the decision over what option must be pursued can be resolved with the PR24 process and the mechanism is not required.

In the event that we are unable to finalise the solution and associated cost allowances with the PR24 process, we propose that Ofwat should set a **notified item** for nutrient neutrality, specifically relating to:

- expenditure to deliver improvements at wastewater treatment works to tackle nitrogen that has not been included in their determinations (our enhancement case on nutrient neutrality shows specifically what has been included); and
- that the determination would be changed if this legal requirement for technically achievable limits for nitrogen at some of our treatment works were to be applied (reflecting that, at the moment, this is not expected).

We would also like Ofwat to set out their view on whether or not they regard our catchment-based programme to be 'prudent management action'. We have explained in our enhancement case how we have considered the obligation and worked with Government, stakeholders, and customers to develop the best value approach that delivers the most benefits without unnecessary costs for customers.

6.3.3. CSO programme

The CSO programme emerging from the DWMP represents just under £1bn of investment. This along with other statutory enhancements has significantly altered the balance between base and enhancement expenditure within the price control:

- At PR19, enhancement totex accounted for 17% of the allowances at the final determination.
- In our PR24 business plan, enhancement totex comprises 57% of net wholesale totex.

This large increase enhancement cost element is in an area where companies have far less flexibility since the enhancement costs are generally covered by statutory requirements and regulatory 'Price Control Deliverables' which specify what must be delivered, by when and at what cost. So there is greater risk on these elements.

At the same time the scale and novelty of the programme creates a significant risk that the outturn position could be either well above or well below the estimated costs which could drive significant financeability challenges for companies at one extreme and windfall gains at another.

In addition to these underlying cost challenges, there is a also a government review of Storm Overflow policy[48] that may result in changes into what we must deliver to meet long term objectives in this area. Given these issues we consider that there is a strong case for an uncertainty mechanism to protect customers. Given the materiality of the cost area, and the consequential potential impact on financeability and customers, we think that a targeted reopener is the best way to manage this known and material risk. We propose that this would take place after the government 2027 review and would operate by mutual consent between Ofwat and Northumbrian Water. We do not think that that cost sharing is appropriate for a potential risk of this magnitude and therefore that a reopener is necessary.

[48] See: https://assets.publishing.service.gov.uk/media/6511674abf7c1a0011bb465f/Revised_Storm_Overflows_Discharge_Reduction_Plan.pdf section 2.3 p.15

6.4. PRICE CONTROL DELIVERABLES

Section 7 sets out our enhancement programme, and we show how the benefits of these investments applies to performance commitments. In some cases, where investment is material and the outcome cannot be easily or directly linked to a performance commitment of investment protected by an ODI, we have set out **price control deliverables**. These help to make sure that customers do not lose out if improvements are not delivered.

We assessed these areas of enhancement using Ofwat's four principles:

1. Benefits of the investment not linked to or fully protected by PCs.
2. PCDs should be used to protect customers for material enhancement investments.
3. Outcomes over outputs/inputs.
4. Level of aggregation – PCDs could be set at a scheme, programme, or benefit level (companies should set PCDs at the highest level possible).

Ofwat also expects PCDs to be used where the delivery is for a quantity of a certain output, such as volume of wastewater storage or volume of water to deliver, or for the delivery of named schemes.

In this section, we explain our approach to assessing the use of PCDs and how we will measure these at an aggregate level. We explain our proposed PCD for each item of enhancement expenditure within our individual enhancement business cases (under the customer protection section), as well as how we will measure individual outputs and benefits.

We developed a process to follow for determining whether or not a PCD is appropriate, and how we should set the measure and level of aggregation. This tests against Ofwat's principles, asking the following questions:

1. Are the benefits of the investment linked to or fully protected by **performance commitments**?
2. Is the enhancement **material**? If not, can it be aggregated to a material amount – or should there be additional customer protection? For this purpose, we define 'material' as greater than or equal to 0.5% of totex, as set out by Ofwat in their workshops on PCDs in May and June 2023. Ofwat also said that we 'should also consider additional PCDs where there is likely to be no/limited oversight of project delivery from other regulators (EA/DWI)'.
3. Are there outcomes for the enhancement expenditure which can be easily observed or measured? Does this investment just impact a single outcome? If not, we should use output measures.
4. Can we aggregate with other PCDs for flexibility or efficiency?

6.4.1. Assessing against the principles

Table 35 shows our assessment against the questions set out above. Some of our investments are linked directly to delivering increase service levels (such as leakage, per capita consumption, and phosphorus). Similarly, some of our investments (for example, in raw water deterioration and growth at wastewater treatment works) are required to avoid significant deterioration in performance commitments such as pollution incidents, CRI, and supply interruptions. These financial impacts under ODIs are larger than the enhancement investments, so customers would already be compensated fully for any failure to deliver these.

Table 35 also looks at materiality. This assessment would only remove some WINEP lines which would otherwise be immaterial, but these could instead be combined with other WINEP lines to provide a PCD for WINEP scheme delivery (similar to our PR19 WINEP delivery performance commitment).

Many of the outcomes from our enhancement cases overlap with existing performance commitments; or it is difficult to measure the outcome as they are long-term (for example, lead replacement) or reflect wider risks to communities that are met by the specifications of schemes (for example, water resources schemes or reservoir safety) rather than by readily measurable outcome metrics.

TABLE 35: ASSESSMENT AGAINST PCD CRITERIA

Enhancement scheme	Benefits linked to PC?	Materiality	Possible outcomes?
Water resources – supply schemes (NES14)	Pass – benefits relate to meeting 1:500 level of resilience requirement	Pass - 13%	Could be linked to 'water available for use' (WAFU) but most schemes don't complete until 2032; or are interconnector schemes or nitrate removal. Resilience outcome is not easily measurable, except through models (which themselves are based on output measures). Customers could be protected through output measures for schemes delivered to the design requirements set out in WRMP.
Water resources – metering (NES15)	Partial fail – benefits of metering to PCC Partial fail – benefits of metering to leakage	Pass – 4.3%	Possible outcome of PCC – but this is already covered by performance commitments. Customers could be protected through output measure based on meters installed (calibrated for predicted loss of benefits to PCC and leakage, as per the ODI rate).
Water resources – NHH metering (NES36)	Partial fail – benefits of metering to business demand and leakage	Fail - <1%	Partial link to business demand. Customers could be protected through output measure based on meters installed (could be aggregated with HH metering).

Water resources – PCC (NES15)	Fail – benefits to PCC	Fail – 0.3%	Outcome covered by PCC performance commitment
Water resources – leakage (NES15)	Fail – benefits to leakage	Fail – 0.9%	Outcome covered by leakage performance commitment
Raw water deterioration (NES21)	Fail – impact on unplanned outage and taste/odour complaints	Fail – 0.2%	Outcome covered by performance commitments
Reservoir safety (NES22)	Pass – benefits relate to community safety	Pass – 2.0%	Outcome of community safety is not easy to measure – and cannot be directly attributed to this investment. Outcome of 'drawdown flow rate increase delivered' is not directly related to costs. Could measure the delivery of individual schemes.
Lead replacement (NES20)	Pass – benefits relate to community safety, not PCs	Pass – 1.6%	Outcome of community safety is not easy to measure and cannot be directly attributed to this investment. Measurements of lead at customer taps would be unduly invasive. Customers could be protected through output measures based on the number of lead pipe replacements (split by vulnerable customers, hot spots, and rural supplies to reflect the different unit costs of these).

Climate change resilience process enhancements (NES24)	Partial fail – impact on unplanned outage	Pass – 1.5%	The outcome would be to prevent increases in unplanned outage at WTWs – the contribution from these investments is difficult to measure and can vary greatly between years (as it relates to extreme heatwaves). Customers could be protected through an output measure based on delivery of schemes.
Flooding and power resilience, water and wastewater (NES32)	Partial fail – impact on unplanned outage	Pass – >1% when aggregated	The outcome would be to prevent increases in unplanned outage at WTWs – the contribution from these investments is difficult to measure and can vary greatly between years (as it relates to extreme weather). Customers could be protected through an output measure based on delivery of schemes.
Water WINEP – long-term environmental destination (NES17)	Pass – benefits are environmental or investigations	Fail – 0.1%	Outcome difficult to measure effectively and vary between schemes (particularly investigations). Customers could be protected through an output measure based on delivery of schemes.

Water WINEP – protected areas and biodiversity (NES18)	Pass – benefits are environmental or investigations	Fail – 0.7%	Outcome difficult to measure effectively and vary between schemes (particularly investigations). Customers could be protected through an output measure based on delivery of schemes.
Water WINEP – water framework directive (NES19)	Pass – benefits are environmental or investigations	Fail – 0.3%	Outcome difficult to measure effectively and vary between schemes (particularly investigations). Customers could be protected through an output measure based on delivery of schemes.
Growth at wastewater treatment works (NES26)	Partial fail – benefits to pollution incidents	Pass – 1.7%	The outcome is regulated by the Environment Agency (that is, not meeting our permit requirements). We would be fined and required to meet this if we did not carry out this work.
WINEP - Storm overflows (NES27)	Partial fail – benefits to storm overflows Partial fail – benefits to sewer flooding	Pass – 32%	Outcome is measured by the storm overflows average flow PC – but this is not large enough to reflect the scale of this programme. An alternative outcome is 'storm overflows improved' – that is, how many storm overflows are improved by 2030 to the requirements of SODRP. This is not as effective as an output measure because of the high variability in costs to tackle specific storm overflows.

WINEP – protected areas and bathing waters (NES28)	Pass – benefits are environmental or investigations	Pass - 2%	Outcome is reduced nitrogen released to the environment. This can be measured for 'end of pipe' solutions at the end of treatment works, but the benefits of nature-based solutions on the catchment as a whole will need to be estimated. Nitrogen is not covered by performance commitments. Customers could be protected through an output measure based on delivery of schemes.
WINEP – phosphorus (NES13)	Partial fail – benefits to river water quality	Pass - >1%	Outcome difficult to measure directly. Customers could be protected through an output measure based on delivery of schemes.

WINEP – 25 Year Environment Plan (NES29)	Pass – benefits to environment not covered by performance commitments	Pass – 6%	Outcome for environmental improvements is difficult to measure effectively and vary between schemes (particularly investigations). Customers could be protected through an output measure based on delivery of schemes. Customers could be protected through an output measure based on number of improvement schemes delivered through NIDP. Outcomes for blue spaces include amenity and access improvements (in addition to biodiversity and river water quality, which are already covered by ODIs). Customers could be protected through an output measure based on schemes delivered.
WINEP – monitoring (NES30)	Pass – benefits to environment not covered by performance commitments	Pass – 9.4%	Outcomes include transparency and use of this data for regulation and other purposes – not easily measurable. Customers could be protected through an output measure based on the number of monitors delivered of different types (to reflect different unit rates).

WINEP – septic tanks (NES31)	Pass – very small impact on performance commitments	Pass – 1.7%	Outcome is the delivery of secondary treatment to named sites by 2028. Some delays are possible due to factors outside our control (to 2030). For seven sites, where we have identified best value solutions to deliver increased carbon benefits, we could return these costs to customers.
First time sewerage (NES33)	Pass – legal requirement not covered by performance commitments	Fail - <1%	Outcome is meeting our obligations under S101A to provide new sewerage services. Outputs are dependent on demand, and there are likely to be delays from third parties. We already report separately on S101A costs and numbers (in the APR), and this is subject only to cost sharing for 2020-25.
WINEP – sewage sludge (NES34)	Pass – legal requirement not covered by performance commitments	Pass – 3.1%	Outcome is sludge resilience – which is not possible to measure directly. However, we could measure 'storage capacity added' which would cover most of the output (around 88%).

Civil asset replacement at WTWs (NES35)	Partial fail – benefits to unplanned outage and CRI	Pass – >1%	We propose a mechanism to return funds to customers in full where either projects are not completed, or any efficiency savings from completed projects. For any partially complete projects at 31 March 2030, the remaining costs could be returned to customers (if these overlap with funding in 2030-35) or retained with a commitment to complete existing projects.
Civil asset replacement at WWTWs (NES35)	Partial fail – benefits to pollution incidents	Pass – >1%	As NES35.
Water mains replacement (NES35)	Partial fail – benefits to mains repairs in AMP9	Pass - >1%	As NES35.
Physical and cyber security (NES23)	Pass – benefits to resilience are unmeasured	Fail - <1%	Strong oversight of project delivery from other regulators

6.4.2. Our PCDs – overview

From the assessment in 9.5.1, we propose the following aggregated PCDs:

- A **pooled scheme delivery** PCD. Where there are no clear outcome measures, and there are no other regulators or specific legal obligations that already provide customer protection, we can set a PCD based on delivery of specific schemes (where there are a few large schemes with variable costs). In particular, the assessment of the delivery of these schemes will be done through external assurance reports to be provided at PR29 (including assessment of partial delivery). This includes:
    - Water supply schemes – at the individual cost estimates and specifications set out in our **water supply enhancement case** (NES14).
    - Climate change resilience process enhancements – at the individual cost estimates set out for five slow sand filter upgrades, six RGF backwash improvements, and our hypochlorite programme in our **climate change resilience process enhancement case** (NES24).
    - Reservoir safety – we do not propose a specific PCD at this stage, as there is uncertainty about costs. However, it will likely to be appropriate once these costs and timings are more certain - as set out in our **reservoir safety enhancement case** (NES22).

  These rates can easily be updated to reflect Ofwat's determinations and cost sharing rates. We explain these in more detail in the individual enhancement cases, including providing the information Ofwat asks for in IN23/05.

- A **pooled unit rate** PCD. Where there are no clear outcome measures, and there are no other regulators or specific legal obligations, **and** where there is a reasonably consistent unit cost for delivery of lots of small projects, we can set a PCD based on a unit rate. These are individually small projects, and using a unit rate means that these do not need external assurance reports to determine the degree of completion (they are either fully completed before 2030, or not). This includes:
    - **Lead replacement** (NES20) – with a single unit rate.
    - **Power resilience** (NES32) – with a single unit rate for each power site.
    - **Flooding resilience** (NES32) – with a single unit rate for each flooding site.
    - Smart metering (**NES15** and **NES36**) – with a unit rate set for new meter installations and replacements, by location installed.

  These unit rates can easily be updated to reflect Ofwat's determinations and cost sharing rates.

- A **storm overflows** PCD. The ODI for storm overflows does not – and cannot – adequately protect customers, as this investment is very large compared to the size of the ODI. So, we propose a PCD based on unit rates for the number of storm overflows improved (159) and the number of screens installed (66). A PCD based on delivery of improvements

will help to create an incentive to deliver against the Government's SODRP, which will protect customers from the risk of delays causing us to miss the 2035 targets (or requiring much larger increases in bills from 2030).

The Ofwat ODI, which focuses on average spills per overflow, incentivises companies to reduce the total number of spills but not necessarily to deliver against the SODRP – if taken on its own. This ODI supports efficiency and innovation in delivering system solutions, and so both are needed.

We considered if this should be aggregated with WINEP delivery, as it shares some properties. However, the storm overflows programme is long-term and delivery requirements are set by the SODRP trajectory. We expect that this PCD will continue through the lifetime of this programme, and Ofwat will need to take this into account when considering the credibility and pace of this programme at future price reviews. So, we chose to keep this separate from other WINEP projects.

- A **WINEP delivery** PCD. Our WINEP programme is set by the Environment Agency, which determines the statutory and non-statutory investments we should make. The EA assures that WINEP actions are delivered to the agreed timeframe, and environmental obligations are met. We therefore propose a PCD that makes sure that costs are returned to customers either where the EA has decided that a project is no longer required, or where we have not delivered to the agreed timeframe and/or environmental obligations have not been met (according to the EA). This includes:
    - All WINEP projects except for storm overflows, with the costs set for each individual project as in our enhancement cases.

  Setting these costs for each project individually (rather than a unit rate for all projects) means that there is no bias towards delivering the lowest cost schemes. We expect to deliver all our WINEP schemes, as we have in 2020-25.

- An **asset health** PCD. Our asset health enhancement cases demonstrate the importance of investing more in asset health during 2025-30, but also describe the importance of making sure that we deliver for customers – and that customers are protected if we do not.

  As set out in 9.5.1, we propose a mechanism to return funds to customers in full where projects are not completed. We would also return any efficiency savings from completed projects – or reinvest these in additional asset health projects where there are clear immediate benefits to service levels and where there are cost savings by investing now rather than after 2030 (in line with customer expectations). This PCD would mean that we would not keep any share of unspent funds.

We also considered how to set an **aggregate wider benefits** PCD. In developing our PCDs, we realised that there are many enhancement schemes which provide wider benefits – including some where best value options are selected rather

than least cost. Customers receive protection for some of these benefits, such as operational carbon emissions or biodiversity, through the relevant ODIs. However, there are some that do not have ODIs – in particular:

- **Embedded carbon emissions**. For our storm overflows and septic tanks programmes, we have selected some best value options that are slightly more expensive but provide increased carbon benefits. For storm overflows, where this increase was significant, we asked customers what they preferred. For septic tanks, where the additional costs were very small (~£100k) we chose these options based on wider observations about customer preferences. As it would be possible for us to deliver cheaper options *without* these benefits, and still meet the storm overflows and WINEP PCD requirements and all our PC targets, customers need protection.
- **Amenity benefits**. Some of the preferred options in our enhancement cases deliver wider amenity benefits, such as: the benefits of 'greening' streets per resident; the number of visits to new green and blue spaces; or the air quality benefits of new trees. Customers need to be confident that these wider benefits will be delivered, and they are not protected from this by WINEP or by ODIs.

We assessed these benefits using the CIRIA B£st Tool for our enhancement cases. For consistency, we will assess the final projects again using CIRIA B£st to understand any change in the benefits expected from redesigned or alternative projects before these are constructed. In practice, measuring the outcomes for embedded carbon emissions and amenity benefits can be very difficult indeed and take longer to develop than the project closure date – for example, measuring the air quality benefit of new trees would require an assessment similar to CIRIA B£st as a modelled value for expected benefits, rather than an actual measurable impact by 2030. We would then test through programme assurance that these projects had been delivered to the specification we had set out in our redesigned or alternative project (as we do for every project).

We know that these benefits are difficult to measure, and for construction projects these benefits can easily be missed. It is not appropriate to use a bespoke performance commitment here because of this uncertainty – we do not think that genuine outperformance could be separated from reporting methodology differences, and it would not be appropriate to earn outperformance payments unless it was clear that these had been delivered (this also does not meet the criteria for bespoke performance commitments, and we do not have evidence that customers would support outperformance payments). Using a PCD would mean that we return the benefits to customers if we do not deliver them, so driving better decision making – including taking into account wider environmental and social benefits - when it comes to delivering projects.

We have not, however, proposed this PCD in detail within our enhancement cases. There is still considerable uncertainty about some of our WINEP requirements - including on nutrient neutrality and septic tanks – which could change how this PCD might be designed. The measurement and reporting of this type of PCD would also not be as robust as Ofwat's guidance suggests for other PCDs, because this relies on an inspection based on *expected benefits*. We would like Ofwat

to consider how this might work across the sector, and we would like to work together to develop this idea further. If this is not suitable for a PCD, we would like to consider how we report on this to our customers anyway.

We considered including other benefits within this type of PCD – but many of these are already included under the wider environmental benefits of WINEP (for example, improvements in catchment resilience). These are assessed by the Environment Agency as part of determining whether or not environmental obligations have been met (see the WINEP delivery PCD above).

7. DATA/BOARD ASSURANCE

For costs, we must demonstrate that the Board has challenged and satisfied itself that:

- The expenditure forecasts included in our business plan and robust and efficient. We explain how we have tested this in Sections 6, 7, and 8 of this appendix.
- The needs for enhancement investment are not influenced by non-compliance or non-delivery of programmes of work (both base and enhancement) that customers have already funded. We explain how we have tested this in Section 7 of this appendix.
- The options proposed within the business plan are the best option for customers and a proper appraisal of options has taken place. We explain how we have done this in Section 7 of this appendix, as well as within each enhancement case.
- The plan includes price control deliverables covering the benefits of material enhancement expenditure (not covered by performance commitments). Section 6 in this appendix explains how we have selected appropriate price control deliverables, and these are included in more detail within each enhancement case.
- Expenditure proposals are affordable by customers and do not raise bills higher than necessary. In Section 7, we explain how we have tested the whole plan as 'packages' through our pre-acceptability and acceptability testing. We also explain how we have challenged ourselves to reduce enhancement investment to make sure that bills are not increased higher than necessary, including radical alternative approaches and phasing decisions where possible.
- Expenditure proposals reflect customer views, and where appropriate are supported by customers. We explain how we have engaged with customers for each enhancement in Section 7 and explain in more detail how we have arrived at our decisions in our **line-of-sight document** (NES45).

Our Appendix **A2 – Data, Information and Assurance** (NES03) shows how we have met all the Board assurance requirements, though we provide most of the evidence our Board used to satisfy itself that we had done so within each individual appendix (including this one, on costs) appendix A2 also summarises and provides links to the independent third party assurance we have had on our costs and outcomes work.

Other Board assurance requirements are addressed in other appendices, including the requirements on stretching performance commitments (**A4 – Outcomes**, NES05) and deliverability (**A6 – Deliverability**, NES07).

8. ANNEX 1: OUR EFFICIENCY

This annex sets out our strong track record on being efficient; steps we take in order to maintain that level of efficiency; and the steps we have put in place to make sure that our PR24 plan also delivers good value.

At PR19, Ofwat's preferred base cost models positioned us in the upper quartile across all of the price controls, and we were sector-leading for bioresources. During AMP7 we have continued to operate efficiently. Using the PR24 proposed models (that is, equally weighting all of Ofwat's proposed model suite), and using the five years of data, we rank second among water and sewerage companies across the different price control areas. This is shown in the table below.

TABLE 36 : WATER, WASTEWATER AND RETAIL EFFICIENCY PERFORMANCE (2018/19 – 2022/23)

	Water		Wastewater		Bioresources		Retail		
	Actual cost (£m)	Modelled cost (£m)	Actual cost (£m)	Modelled cost (£m)	Actual cost (£m)	Modelled cost (£m)	Actual cost (£m)	Modelled cost (£m)	Efficiency score
Severn Trent Water	2,403	2,351	1,905	1,972	449	535	518	600	0.97
Northumbrian Water	1,246	1,172	699	700	85	151	287	301	1.00
United Utilities	2,037	1,950	1,901	1,884	354	410	529	588	1.00
Anglian Water	1,403	1,437	1,579	1,552	427	369	377	435	1.00
South West Water	671	688	642	593	123	111	136	170	1.01
Thames Water	3,610	3,549	3,038	3,073	680	639	949	798	1.03
Wessex Water	556	427	728	787	174	144	161	171	1.06
Yorkshire Water	1,646	1,411	1,428	1,370	370	319	343	379	1.09
Dŵr Cymru	1,218	1,065	988	921	258	191	283	262	1.13
Southern Water	993	673	1,673	1,451	237	239	343	281	1.23

Source: NWL analysis based on Ofwat's proposed PR24 models and accompanying data published April 2023 and a comparison of the modelled 'efficient' costs versus the actual expenditure of NWL. The efficiency score captures the ratio of actual to modelled costs where a lower score denotes higher levels of efficiency.

Overall, in AMP7 we are seeking to deliver c.£260m of efficiencies overall. These efficiencies have positioned us around the upper quartile overall in base costs (as shown above). We have carried this desire to be efficient into the development of our PR24 plan. Therefore, in forecasting future costs, we have also considered where we can make further efficiency improvements by deploying innovation and new technologies. These are key to making sure that our costs remain efficient into the future and so that we can provide ongoing value for money for our customers.

8.1. BENCHMARKING OUR EFFICIENCY

To help us make sure we remain near the industry upper quartile, and to help us identify potential areas that may require organisational efficiency programmes, we carry out regular benchmarking of our costs. In this area, we have:

- Engaged in external efficiency studies run by independent organisations focused on operational costs and associated headcount.
- Explored the use of external productivity datasets such as APQCC to see whether they can provide further insights into our levels of efficiency.
- Conducted our own unit cost benchmarking.

We detail each, in turn, below.

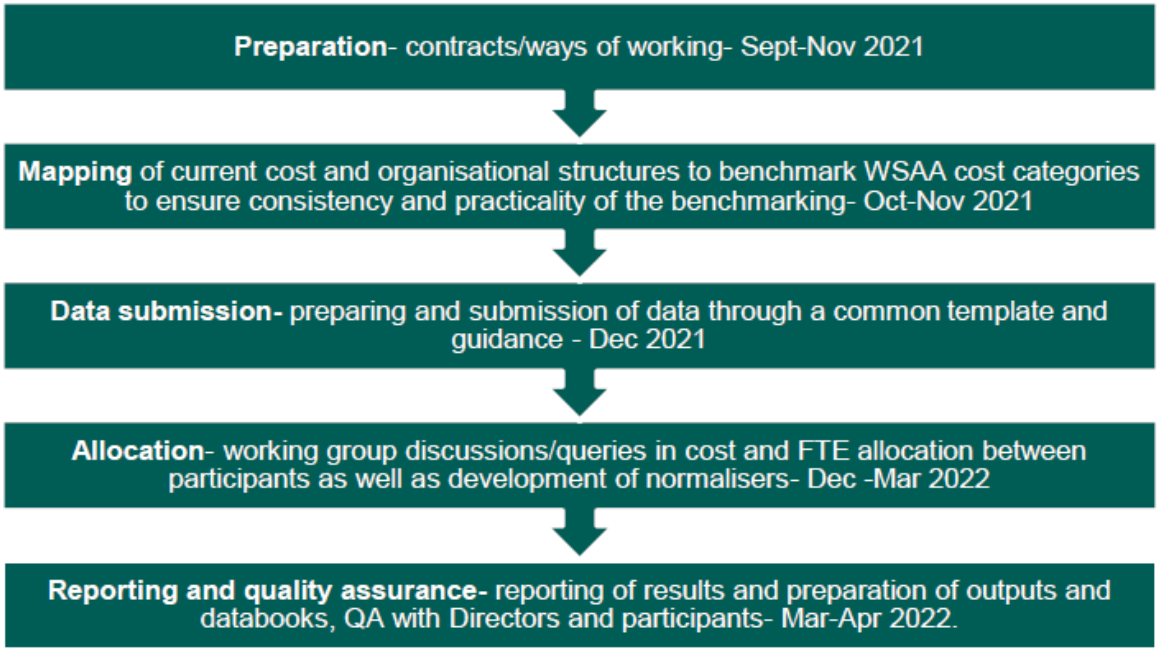
8.1.1. Participation in external efficiency studies

Water services association of Australia (WSAA) operating cost benchmarking

In 2021/22, we took part in an independent study carried out by the Water Services Association of Australia (WSAA) to assess our operational efficiency. The WSAA had run similar exercises for Australian water companies and was, therefore, well placed to assist with an assessment of water and wastewater companies in England and Wales.

The study focused on 2020/21 financial year opex and followed the approach set out in Figure 15 below. The study included seven UK companies in total (six WaSCs and one WoC), including other leading performers on costs and service quality. To make comparisons between companies, the study also collected 'normaliser' data (for example the number of customers or the length of the sewerage network) to allow unit costs to be calculated.

FIGURE 15: WSAA BENCHMARKING STUDY APPROACH



Source: WSAA operating efficiency study outputs.

At an aggregate level, excluding the impact of abstraction charges which differ for reasons not captured in the study, the study showed us to be in line with the upper quartile (only, £1.79m or 0.6% away) when assessed as the company level averaged across a range of normalisers. This is shown in Figure .

FIGURE 16: WSAA STUDY BENCHMARKING RESULTS EXCLUDING ABSTRACTION COSTS (£M)

Level	Normaliser	FY Spend	Diff to UQ	Diff to median
Water	Weighted over 3 normalisers	107.32	-8.29	-26.65
Wastewater	Weighted over 3 normalisers	68.43	0.83	-5.89
Sched. disp. & cont.	Weighted over 2 normalisers	7.13	2.03	1.50
Retail	Weighted over 2 normalisers	44.35	2.06	-1.16
Asset manage.	Weighted over 3 normalisers	3.99	2.46	0.99
Corporate	Weighted over 4 normalisers	86.03	10.64	1.79
Company	Weighted over 4 normalisers	317.24	1.79	-18.17

Source: WSAA

Nevertheless, we have used more granular information from the study to identify areas of our cost base where other companies appeared to be more efficient and established efficiency initiatives focused on reducing costs in those areas.

In conjunction with this study, we and three of the WaSCs in the study also engaged an external consultant to consider full time equivalent headcount using the same data structure as the WSAA study. It included both internal and external labour carrying out operational activities to help make sure that companies could be compared more accurately regardless of their operating model. This showed that, on an FTE basis, we were operating beyond the upper quartile for the study at the company level by 62 FTEs (that is, headcount ~3% below the industry upper quartile averaged over four different normalisers). This result, along with other evidence, helped shift our focus for operational efficiencies onto non-headcount related costs such as energy and chemicals.

8.1.2. American Productivity and Quality Center (APQC) benchmarks

In 2022, following on from the WSAA study and during earlier work in 2019 as part of our 'Whole Business Optimisation' exercise we carried out additional specific benchmarking using the APQC benchmarks. APQC is a benchmarking organisation based in the US that contains proprietary data for international comparator companies and sectors. It is particularly useful for benchmarking central or corporate functions, such as how many finance or HR employees or costs

should be expected given the scale of the organisations being served. We used this data to examine the scope for efficiency and productivity improvement across the corporate functions of the business.

TABLE 37: APQC BENCHMARKING OF FUNCTIONS

		All companies			Utilities		
		UQ	Median	NWL	UQ	Median	NWL
Customer	Number of FTEs that perform the customer service function per business entity employee	0.15	0.17	0.18	0.15	0.17	0.18
Finance	Number of business entity employees per finance function FTE	25.39	53.3	25.78	20.34	31.91	25.78
HR	Number of business entity employees per HR function FTE	60	95.24	76.12	50	66.3	76.12
IT	Number of end users serviced by the IT function per IT function FTE	23.33	42.23	24.18	16.33	25.38	24.18

Source: APQC productivity data.

These benchmarks also highlighted our relative efficiency to other sectors and comparators' but we did identify some segments of our central functions where our costs appeared higher than they could be based on the comparators. This led to targeted action in several corporate functions to reduce costs and also changes to our pension arrangements.

8.1.3. Unit cost benchmarking using water industry data

We also annually examine industry data available from the APR to carry out further unit cost benchmarking of our costs in addition to re-running Ofwat's cost assessment models with the additional year of data. We annually examine our operating expenditure and ranking compared to our peers against the number of properties we serve, the length of the network and the volume of water/wastewater capacity provided. The results of this are shown in the table below which includes the results for last year and the last five years. We are consistently at, or near the upper quartile, based on our unit cost analysis.

TABLE 38: BASE EXPENDITURE UNIT COST BENCHMARKING OF WASCS USING APR DATA

2018-2023 ranking by cost driver	ANH	NES	SRN	SVT	SWT	TMS	NWT	WSH	WSX	YKY
Water ranking based on:										
Properties	3	2	8	5	4	10	1	7	9	6

Length of main	1	5	9	7	2	10	6	3	4	8
Volume	4	3	10	5	2	7	1	8	9	6
Sewer ranking based on:										
Properties	4	3	10	1	9	2	5	8	6	7
Length of main	2	4	10	1	9	8	5	6	3	7
Load	4	6	9	1	10	2	3	8	5	7
Retail ranking (number of properties)	2	5	9	1	4	7	8	10	3	6
Overall weighted ranking (properties)	3	1	10	2	5	6	4	9	8	7

8.2. OUR ONGOING EFFICIENCY PROGRAMMES

We consistently seek to identify and deliver efficiencies across our business to ensure that we constantly deliver value for money to our customers. We identify operational efficiencies through two main routes:

- **Periodic company-wide efficiency reviews,** where we ask independent consultants to review our processes and approaches, with the aim of improving cost and performance to make sure that we make best use of external expertise and learn lessons from other companies and sectors. We highlight some of these assessments in the previous section. For example, in 2019 we carried out a diagnostic review with one of the 'Big 4' as part of a Whole Business Optimisation programme. This review identified 21 opportunities across the organisation with a potential totex saving of £41m. This included opportunities that ranged from optimising back-office functions (HR and Finance) to improvements in asset maintenance and reliability. This has been followed up with subsequent consultant reviews, including an ongoing engagement on planning and scheduling of operational crews, and optimisation of key variable costs (energy and chemicals).

- We also pursue **internal identification opportunities** which can improve our operational outcomes. We run an annual business planning process which seeks to identify priorities for the business, develop projects which can improve either service or cost efficiency, and monthly Executive Leadership Team monitoring of these through their lifecycle with particular focus on projects that are behind schedule or might not deliver the expected outcomes.

In combination, these activities have allowed us to make year-on year improvements to our operations. We discuss each of these in more detail below.

External consultant reviews and implementation of recommendations

Our Whole Business Optimisation programme launched in 2019 and provided us with tangible opportunities which we have delivered over the period 2019/22. In 2019 we appointed an external partner and hired an independent Programme Director to conduct a full diagnostic review of our business, develop detailed designs of the identified opportunities, and assist with the implementation. Assets, Procurement, Customer and Support Functions were the four areas of opportunity identified with 21 projects/programmes taken into the detailed design phase and then to implementation with initial estimates of £22-63m totex opportunity. Examples included:

- Customer – reducing inbound call volumes – changing the inbound contact channels and reducing inbound volumes through developing and promoting more digital self-serve options for customers. This also included improved management information to monitor repeat contacts and diagnose root cause of failures.

- Procurement / support functions – transform procurement function – moving to a business partner role rather than a sourcing capability, improving the governance and process of channelling to preferred suppliers to reduce the 'long tail' of suppliers, and refocus resources on higher value activities and delivering savings.

By the end of 2021, we felt we had implemented all the available opportunities developed through this exercise (or they were already in-flight). We held an efficiency workshop with key internal representatives from all Directorates to seek their views and opinions on new efficiency opportunities ranging from those that were quite futuristic and long-term, to short-term options but for which they had limited capacity to deliver alongside their day job. One strong priority for this group, and the Executive Leadership Team, was productivity improvements so we procured a productivity review in summer 2022 through a competitive tender and appointed a new partner who had not worked with us before and could provide fresh insight into our ways of working. We were clear with all parties that we did not wish to conduct a simple diagnosis but needed a partner who could work with us to implement the recommended improvements. Specific areas of focus for implementation are (we began in November 2022 and continue to deliver on these):

- Water and wastewater network crew productivity improvements through better coordination with planning colleagues including short interval control and introducing metrics that engaged and motivated the operational team.

- Call validation for flooding and leakage calls – improving our diagnostics of customer issues through more detailed discussions on initial contact to make sure we optimise the despatch of our resources to properties. This has resulted in a reduction in crew visits to private issues producing opex savings.

Energy and chemical efficiency programme

We have established an efficiency programme run centrally to coordinate activities across the business focusing on reducing our spend on energy and treatment chemicals. From an energy perspective we are pursuing a wide range of options including:

- Increasing our Automatic Meter Reader coverage across our non-half hourly sites to ensure that we record and are billed against accurate energy consumption readings.
- Reliability and performance monitoring of our highest energy consuming assets such as blowers and pumps; this is using more traditional approaches, such as pump performance testing, and technology-based solutions to detect early indications of asset efficiency deterioration.
- Energy audits across the sites consuming the highest amounts of energy; our audits covered 15 water and wastewater sites which between them use more than 35% of our total energy demand. These audits were conducted by external experts and produced short-term, medium-term and long-term opportunities for reducing our consumption which we are now implementing.
- Continuing to progress our solar generation capabilities as we work towards our net zero goal.
- Further improvements to our strategic network optimisation software. Our use of Aquadapt has already enabled us to optimise our network flows across our asset base, in particularly in Essex where we have the most integrated network. We are now using live energy tariff prices within the automated decision-making process. We are also making sure data is up to date on pump performance so optimum pump selections are made depending on our flows.
- Progressing optimisation options for our Advanced Aerobic Digesters at Bran Sands and Howdon.
- Utilising predictive tools to enable our operational teams to effectively manage energy consumption at times when national energy demand is likely to be at its highest.

From a chemical perspective, our priority is to make sure all our water quality parameters are met on both water and wastewater operations. We are therefore only pursuing efficiency opportunities where these are not compromised. Some examples of these are:

- Improvements to dosing equipment and monitoring to introduce more automation into our sites reducing the need for human intervention to changing conditions.
- End-to-end process reviews looking at chemical dosage and effects downstream (on sludge for example) using internal and external process expertise and utilising the knowledge within our chemical supplier organisations.
- Reviewing our chemical procurement and adopting industry standard strengths and larger bulk deliveries where possible to improve unit costs and the reliability and versatility of supply. This has also included reviewing our storage to make sure we optimise use of existing tanks and building new / different options where appropriate.
- Continuing to develop strong working relationships with our suppliers by establishing longer term arrangements where necessary to secure the best unit cost rates possible given the unpredictable current climate.

8.3. THE ROLE OF INNOVATION

Innovation is at the heart of everything we do at NWG and is now one of our core values. It is strongly anchored to the 14 goals set out in our PR19 and will continue to be tied to our core business objectives as we move into AMP8. These goals are truly ambitious so require every day incremental innovation changes supported by step changes resulting from disruptive innovation.

We are leading the way in providing opportunities for innovation to be embraced throughout the business notably through:

- Our internationally recognised annual Innovation Festival which provides time and space for new ideas to be shared and worked into practical solutions to some of our toughest challenges. We bring partners and supporters together from across the globe to take part in an intense week of workshops, sprints, and data hacks. Many of the ideas borne from the Innovation Festival have gone on to be implemented as national or industry leading opportunities for example the National Underground Asset Register (NUAR). It is our main idea generating machine which feeds the innovation pipeline.
- Invest Quest which is an annual opportunity for our colleagues to pitch innovative ideas to a 'Dragon's Den' style panel of Directors and specialist to receive funding to take their idea to the next stage of development.
- Amplify, an idea management tool which is always open to all colleagues to submit ideas. We actively support employees to come forward with innovative ideas and support their development. We have had some brilliant technologies adopted through this process which are now making a difference such as the pressure vessel ('Mowbi') which can be quickly deployed to reduce interruptions to supply and a burst rising main sensor which is a simple device that is deployed in rural wastewater sites to alert failure which is preventing pollution events. These are a few examples of how innovation at our company is really making a difference to our customers, now and for a more resilient future.
- Our Innovation Ambassador Group which supports and funds colleague ideas in their first stages of development. They are enabling and spreading an innovative culture across our business and driving the implementation of innovative new ideas so that innovation becomes business as usual. It has representation from all directorates, functions and levels and meets monthly to share knowledge across the business and brings in external speakers to learn from outside of the business as well. It started out with 14 members in 2018 and now has over 80 participants.
- Our monthly Innovation Connect newsletter which provides a regular opportunity for engagement with internal and external colleagues.

We have a clear stage-gated innovation process in place to significantly boost the chances of success of the innovation projects and to make it a more efficient process. Each specific stage gate is time bound and has clear success criteria with go/no go decisions laid out to create a fail-fast and learn faster culture. All innovation projects have an innovation passport that will hold all the key information including size of the prize calculations to make sure we are working on the right projects. We provide training for all those running innovation projects to build capability and skills in this area across

our business. We have senior leader champions for all our innovation projects to provide support, reinforce the cultural shift, and make sure that these projects are fully embraced and adopted into the business.

We are leading participants in the Ofwat Innovation Fund and have been successful in securing funding of £18.9m to support 12 projects. We are constantly looking for opportunities to adopt new technologies and approaches for the water sector and beyond and will continue to fully embrace funding streams to support our commitment to innovation.

TABLE 39: OUR KEY INNOVATION TARGETS AND PERFORMANCE

Metric	Description	Target	2018/19	2019/20	2020/21*	2021/22**
Innovation funding	External funding secured	>£500k	n/a	n/a	£475K	£11.77M
Pipeline Value	Potential worth of the pipeline	>£20m	5	15	27	£37M
# ideas in pipeline	# ideas in the pipeline	>50	42	56	70	87
Success Rate	% projects into business as usual	>40%	n/a	38	41	42
# innovation ambassadors	# NWG ambassadors	All of NWG	14	47	71	82
IF participation	# attendees	>2,500	2,373	3,311	2,730	4,000
Employees at IF21	# employees part of the festival	600 (>20%)	328	484	645	439
External collaboration	# business/ organisations taking part in IF	>140	510	734	941	800
Training	Training hours delivered	>12	23	46	400	256
# sprints and hack	# sprints and hacks delivered at IF	>20	16	23	40	44
Unfiltered ideas	# ideas brought into the business	>300	334	615	2,000	1,675
Social Reach	Social media reach at IF	>5m	4.1m	8.6m	15m	5.1m

Innovation will continue to play a key role during AMP8 and we plan to focus on the following areas over this period. This is our current view, but of course we will be agile in adapting to any significant need to deviate from these areas for the benefit of the environment and our customers:

- Net zero.
- Sustainability and nature-based solutions.
- Smart networks – water and waste (SO).
- Increased use of digital solutions and AI.
- Climate change resilience of our business and operations.
- Asset health monitoring and method improvements.
- Forever chemicals (like PFAS) and microplastics.
- Working with customers to change behaviours around PCC.

9. ANNEX 2: REAL PRICE EFFECTS / INPUT PRICE PRESSURE

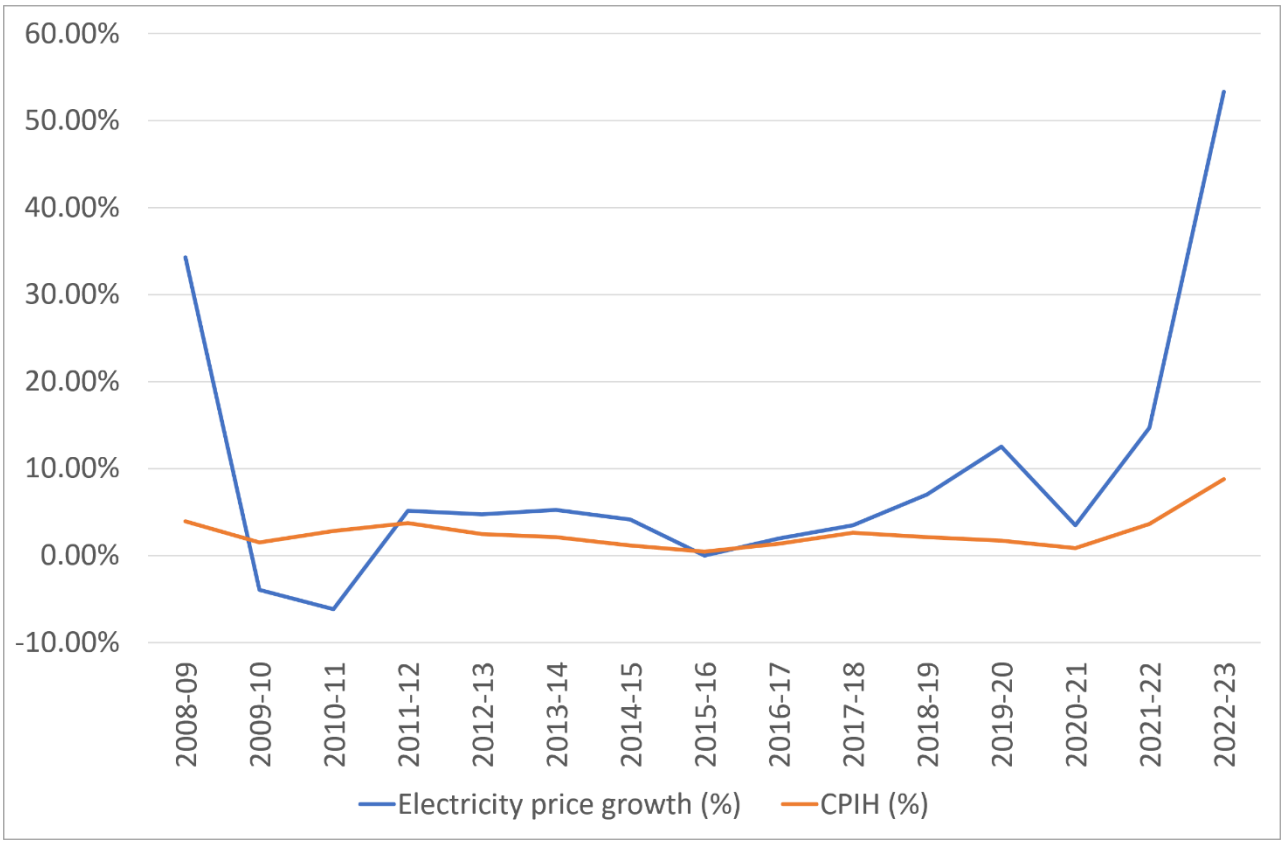
This annex outlines further detail on our proposed approach to real price effects and input price pressure. We outline in turn:

- The approach that we take to calculate the correction for the starting point of allowances at AMP8, relating to energy costs.
- For each key cost category, the evidence to suggest that there should be an adjustment made at AMP8, specifically: (i) evidence of limited management control; and (ii) evidence of input cost pressure. We also set out whether the adjustment should be made on one or both of the following bases: (i) ex-ante RPE; and/or (ii) ex-post true-up. We do this for each of the following: (i) labour costs; (ii) energy costs; (iii) materials, plant and equipment (MPE) costs; and (iv) retail costs.

9.1. CORRECTION FOR STARTING POINT OF ALLOWANCES AT AMP8

Given the recent hike in energy prices relative to CPIH (shown in the figure below), we have been exposed to significant exogenous IPP over the PR19 period – specifically during the extraordinary price increase in 2022/23. This was caused by the start of the war in Ukraine – during which the supply of energy (both oil and gas) was severely impacted, given that Russia is a major producer of both. As such, the production of electricity (which form the majority of our energy costs) was heavily affected, with subsequent large increases in the wholesale (and hence retail) price of electricity.

FIGURE 18: HISTORICAL INDUSTRIAL ELECTRICITY PRICE GROWTH AND CPIH INFLATION

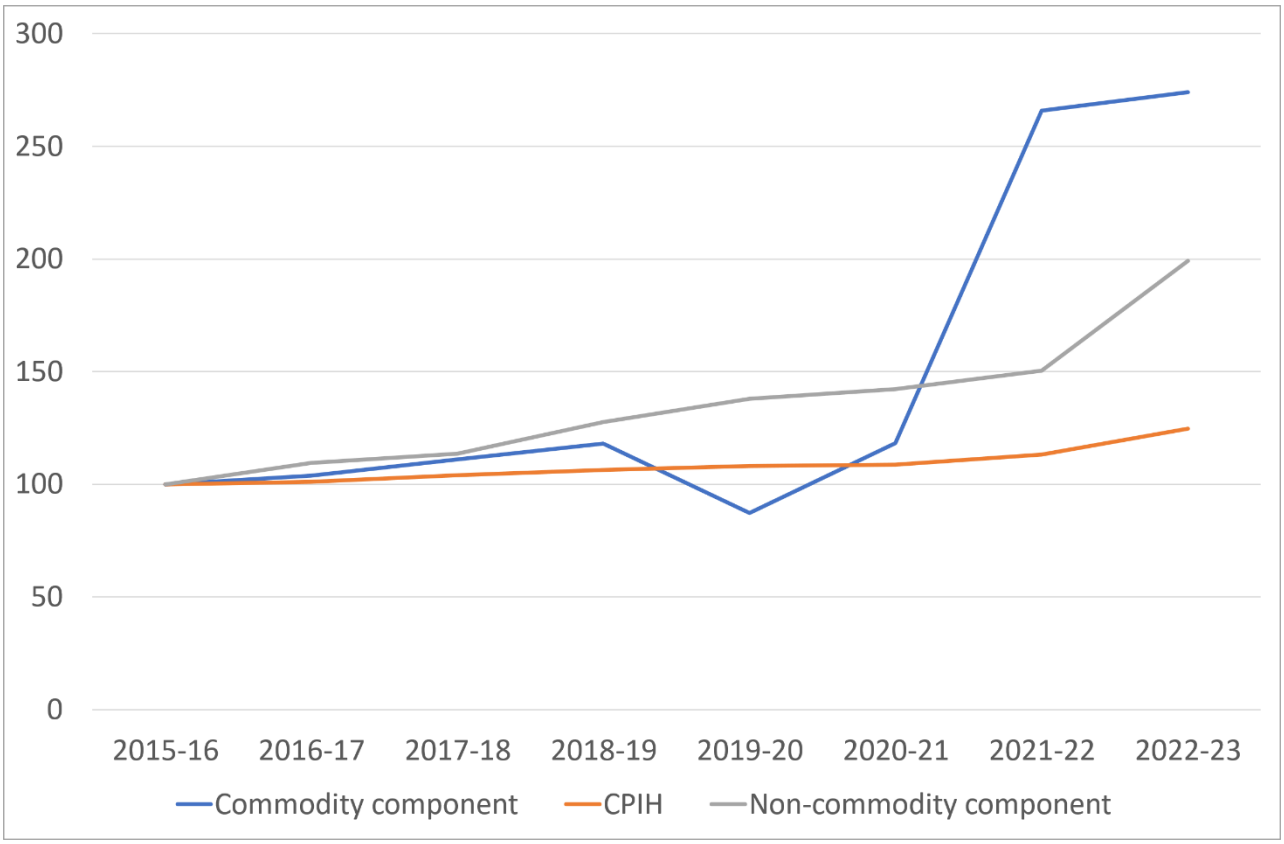


Sources:https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1166291/table_331.xlsx (Table 3.3.2); https://www.ons.gov.uk/generator?format=xls&uri=/economy/inflationandpriceindices/timeseries/l522/mm23.

Our energy prices are driven by two key areas. The figure below shows how these move over time, relative to inflation:

- A commodity component – this reflects the wholesale price of energy we purchase. This cost is determined by the supply-demand balance on world markets for fuels such as gas and has been very volatile during AMP8 with low prices during Covid-19 due to a drop in demand, and very high prices following the war in Ukraine and the resulting shortage of energy on world markets.
- A non-commodity component – this reflects the other elements of the energy bill covering network costs of transporting the energy, the costs of balancing and operating the system, and other government policy costs (for example, the costs of contracts for different renewable generators). These costs have steadily been increasing in excess of CPIH as part of the increasing costs of delivering net zero and decarbonisation of electricity.

FIGURE 19: COMMODITY AND NON-COMMODITY COMPONENTS OF ELECTRICITY PRICES



Sources: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1166291/table_331.xlsx (Table 3.3.2); https://www.ons.gov.uk/generator?format=xls&uri=/economy/inflationandpriceindices/timeseries/l522/mm23; https://www.ofgem.gov.uk/sites/default/files/2023-05/Default_tariff_cap_level_v1.18_0.xlsx (Table ElecMulti_SC_4200kWh).

The 'starting point' for allowances at AMP8 needs to be corrected as Ofwat's models do not sufficiently capture the increase in energy prices we will likely face. This is because the cost benchmarking models are run on historical data, when energy prices were lower than the level that we expect to face at AMP8. Absent a variable to measure this in Ofwat's models, our allowances estimated by these models will therefore not reflect the recent rise in energy prices. This is relevant to both water and wastewater base costs, that is, the areas in which we primarily use energy.

Therefore, we use the BEIS electricity price[49] paid by industrial customers to an off-model adjustment (that is, performing an adjustment to allowances outside of Ofwat's econometric models, in a similar way to RPEs and frontier shift). We use electricity because, as was noted above, this makes up the vast majority of our energy cost base. We consider that this index is appropriate as it most closely matches up with the electricity prices that we pay since:

[49] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1166291/table_331.xlsx (Table 3.3.2).

- We (and other water companies) are very large, industrial users of electricity. As such, it is likely that water companies more closely fit the 'Industrial' bracket than 'Non-domestic – Very Large', due to our activities being closely related to manufacturing and other industrial activities. In addition, we considered the electricity prices in the Green Book but did not use this for the reasons described above.
- The data is taken from a survey based on prices paid for energy – as such, it will include hedging undertaken by industrial entities which, as we noted above, we consider to be similar to the water sector. Therefore, the index will most closely incorporate the effects of the hedging practices in water.

Specifically, we uplift our forecast energy allowances at AMP8 by the BEIS energy price[50] in 2022/23 (that is, the most recently available year), relative to the BEIS energy price indices between 2017/18 and 2022/23 (Ofwat's PR24 modelling period). As we detail in Section 9.3 below, we propose a true-up mechanism is granted for energy costs at PR24. If energy prices fall over AMP8, the true-up mechanism would downward adjust our energy costs (including for the first year of AMP8). Given the significant rise in energy costs experienced following the war in Ukraine (that is, in 2022/23), without an uplift to allowances to account for this, we would be significantly underfunded over time.

The specifics of how we have calculated the uplift is as follows:

- First, we estimate our implicit allowance for energy costs. In line with our approach to forecasting base allowances, we use Ofwat's econometric models in its proposed PR24 benchmarking suite and estimate our costs with and without energy costs. We also apply the upper-quartile catch-up challenge. The difference in predicted costs between these models for 2022/23 is our implicit allowance for each year.
- Second, we estimate the ratio between current energy prices (2022/23) and the energy prices in the five-year modelling period, over and above inflation.
- Third, we multiply this ratio by the implicit energy allowance to obtain the efficient energy cost uplift that we require at AMP8.

Our estimates are shown in the table below. Overall, we require £23.4m in each year of AMP8 (£116.9m in totality). Note, we also apply frontier shift to this uplift, which is set out in Section 3.6.

TABLE 40: ENERGY UPLIFT ESTIMATE PER YEAR (2022/23 PRICES)

STEP	METHOD	WATER	WASTEWATER	TOTAL
A	Implicit energy allowance	£33.9m	£22.8m	£56.7m
B	Energy price ratio, over and above inflation	1.41	1.41	1.41

[50] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1166291/table_331.xlsx (Table 3.3.2).

C = B X A	Implicit allowance with uplift	£47.8m	£32.2m	£80.1m
D = C - A	Annual uplift	£14.0m	£9.4m	£23.4m
D X 5	Total uplift	£69.9m	£47.0m	£116.9m

We have compared these estimates with our current spend, which suggest that they are conservative.

- First, our actual energy costs in 2022/23 are £59m for water, and £44m for wastewater (in 2022/23 prices). This is materially higher than the implicit allowance with the uplift we are suggesting above.
- Second, we compared our actual costs in 2022/23 with the average of the past five years. For water, our actual costs are £19.3m higher than the five-year average, and for wastewater, this is £13.9m. Again, this is lower than our proposed annual uplift.

9.2. LABOUR COSTS

We need an RPE adjustment for labour costs because: (a) they are largely outside of management control; and (b) there is estimated to be upward pressure on labour costs, in excess of recent inflation, during AMP8. In addition, since there is an inherent association between labour productivity and wage rises, expected increases in wages would be consistent with our ambitious frontier shift challenge.

Evidence of limited management control

Our labour costs (both on a wholesale and a retail basis) are outside of our control. Specifically, we are price takers in both the wholesale and retail markets, such that we are unable to materially influence the wage rates that we pay. At PR19, Ofwat cited the assessment undertaken by EE that looked into the extent that labour is outside of management control, specifically stating that: *"While there is no evidence that water companies have market energy in labour markets, there are a number of ways they can reduce their exposure to labour costs, for example through long term contracts."*[51] However, in the water industry, long term contracts are not common and, therefore, we cannot manage our labour costs as EE suggests.

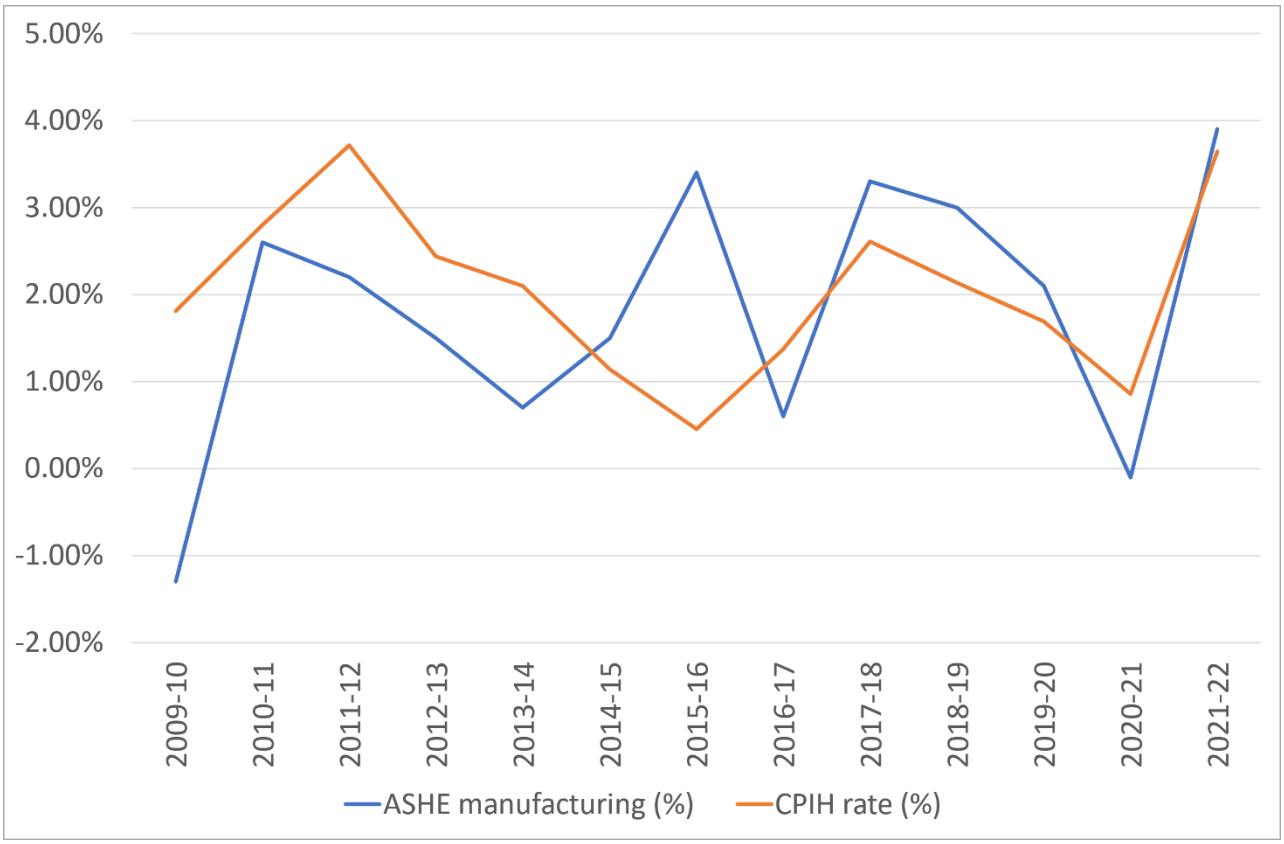
Evidence of pressure on labour costs

The figures below present the historical movements in wage rates (based on representative indices for wholesale labour and retail labour respectively).

[51] 'PR19 final determinations - Securing cost efficiency technical appendix.' Ofwat (December 2019); Table A3.7.

For wholesale labour, the figure below clearly shows: (i) the wedge between movements in wages and CPIH is historically generally non-zero; and (ii) significant volatility in the wedge over time. This suggests that the presence of an RPE at PR24 for wholesale labour at PR24 is highly plausible – given that this has been a trend shown consistently over time.

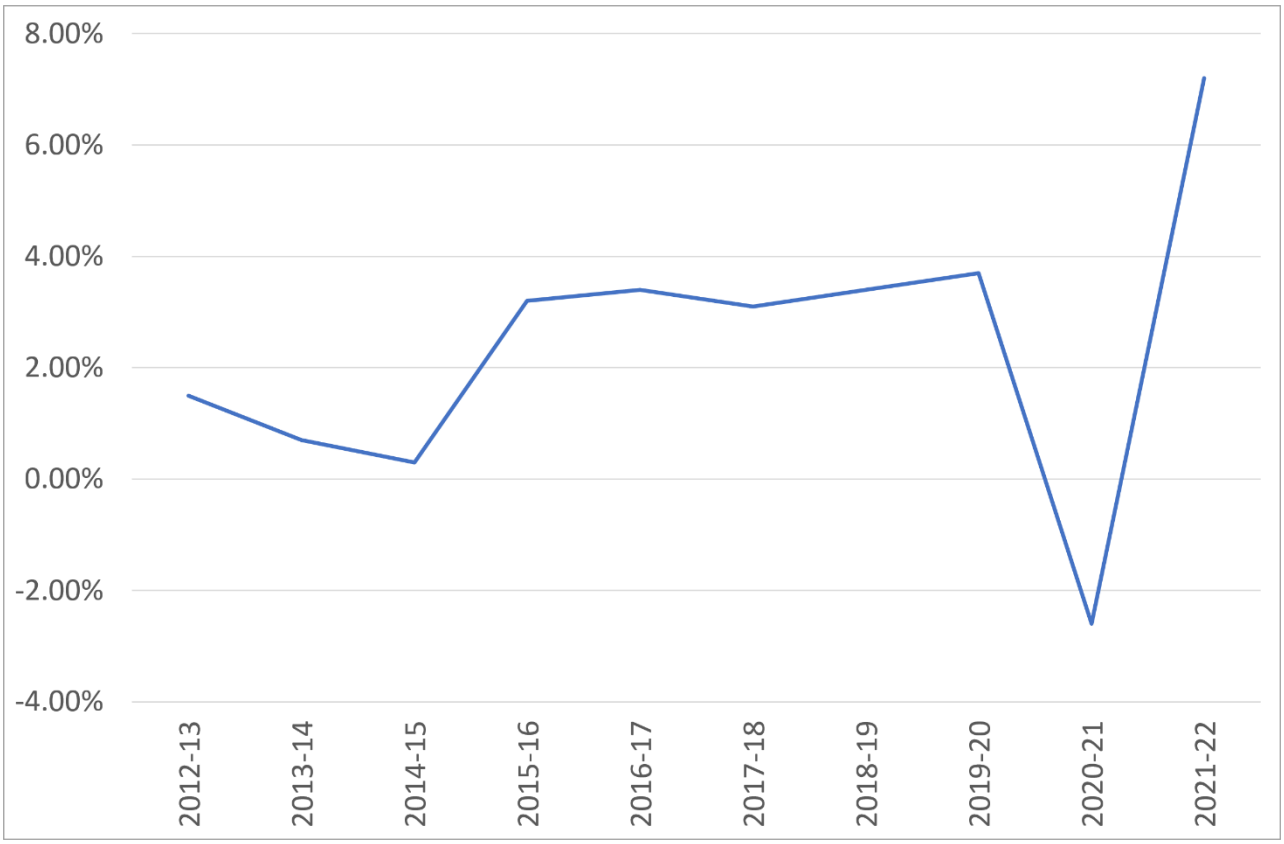
FIGURE 20: WAGE GROWTH BASED ON WHOLESALE LABOUR INDEX (ASHE MANUFACTURING) AND CPIH INFLATION



Sources:https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/regionbypublicandprivatesectorashetable25 (Annual ASHE data).
https://www.ons.gov.uk/generator?format=xls&uri=/economy/inflationandpriceindices/timeseries/l522/mm23.

For retail labour, the figure below shows: (i) historical non-zero movements in wages; and (ii) significant volatility over time of movements in wage rates. In the same way as with wholesale labour, these historical trends therefore point towards such a pattern potentially materialising at PR24 – that is, significant IPP in relation to our retail labour cost base.

FIGURE 21: WAGE GROWTH BASED ON RETAIL LABOUR INDEX (ASHE PRIVATE SECTOR)

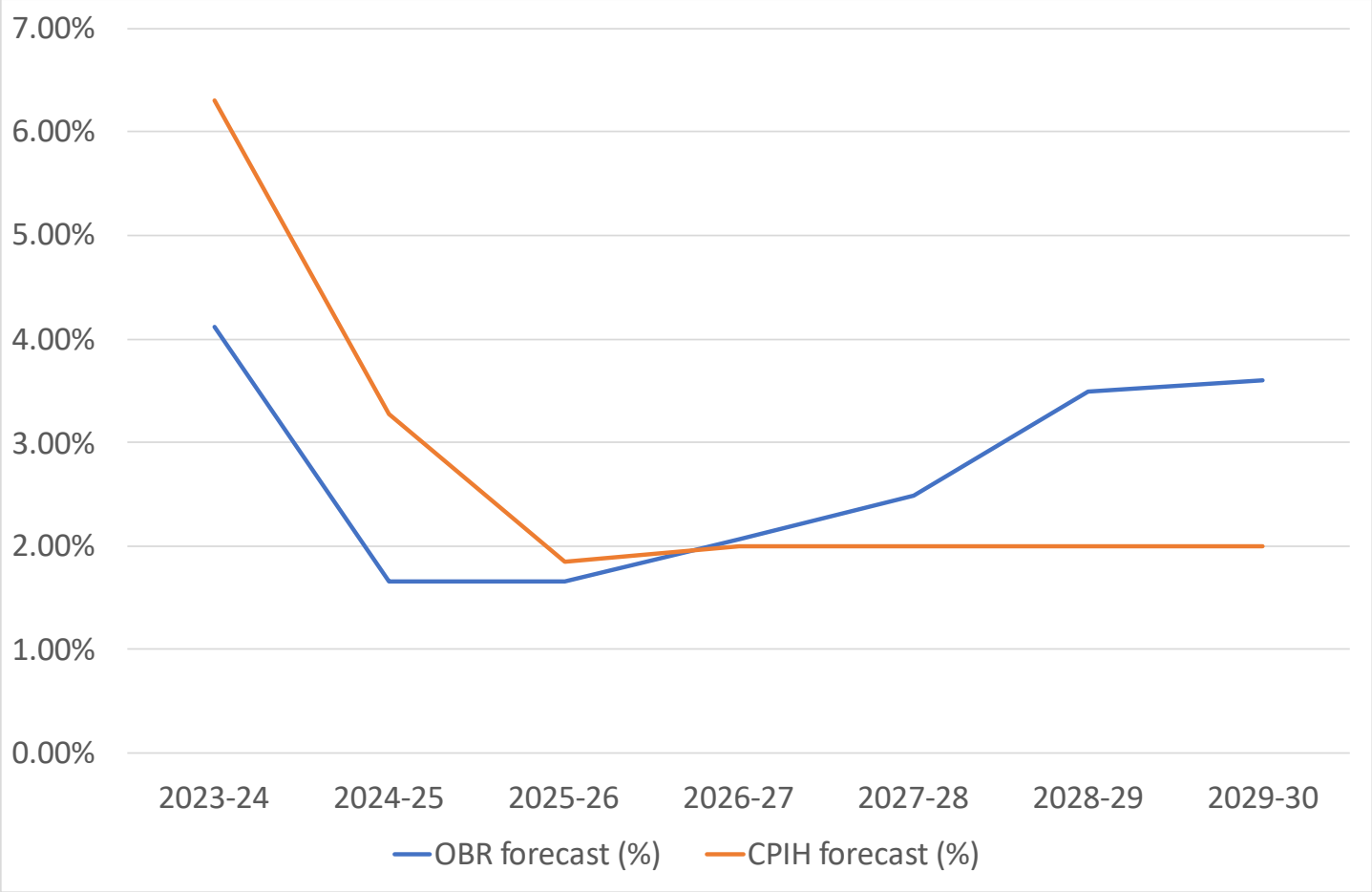


Source:https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/regionbypublicandprivatesectorashetable25 (Annual ASHE data).

Need for RPE adjustments

The OBR publishes forecasts of UK-wide growth in wage rates which are available for the entirety of the PR24 period (that is, up to and including 2029/30). Although these forecasts cover the entire UK workforce (rather than water company specific workforce), we consider it likely that much of the trend in wages for water company labour force will follow the trend in UK wages (since the current changes in wages are driven by exogenous economy-wide factors such as inflation) and were relied upon by Ofwat at PR19. The forecasts also show a material wedge to our expected CPIH (in the figure below) – this also demonstrates overall significant in-year RPEs over the PR24 period (that is, from 2025/26 up to 2029/30).

FIGURE 22: OBR WAGE GROWTH AND CPI INFLATION FORECASTS



Source:https://obr.uk/download/long-term-economic-determinants-march-2023-economic-and-fiscal-outlook/?tmstv=1691655766.

The table below shows estimates of: (i) IPP (based on the OBR wage growth forecasts); (ii) our CPIH inflation expectations; and (iii) RPE (the percentage difference between (i) and (ii)) for the PR24 period. In addition, we note that the wage growth forecasts can be reviewed once updated information is published – specifically if the OBR publishes its long-term forecasts following its Spring 2024 release, this should provide updated data for the entirety of the PR24 period.[52]

[52] The OBR's Spring 2024 medium-term forecast is unlikely to include the final year of PR24; therefore we propose using the OBR's long-term forecast that is generally published a few months later. The Autumn 2024 forecasts will likely be released too late to be incorporated into final determinations in December 2024.

TABLE 41: ESTIMATES OF IPP, CPIH, AND RPE

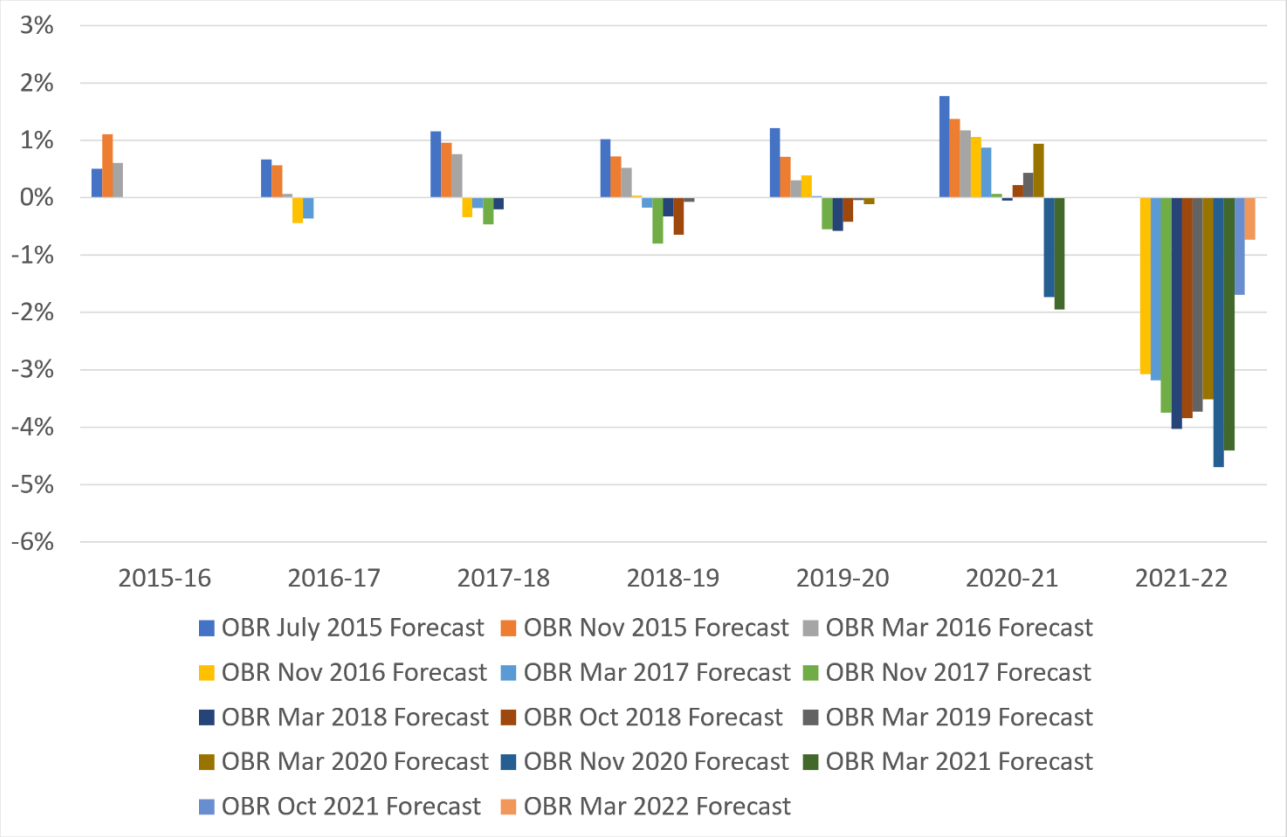
	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
IPP (%)	4.11%	1.66%	1.66%	2.06%	2.48%	3.49%	3.60%
CPIH (%)	6.30%	3.27%	1.85%	2.00%	2.00%	2.00%	2.00%
RPE (%)	-2.06%	-1.56%	-0.18%	0.06%	0.47%	1.46%	1.57%

Need for a true-up mechanism

Notwithstanding the above, macroeconomic conditions are highly uncertain at present, which means there is residual uncertainty regarding the evolution of labour costs over the PR24 period. For instance, evidence below shows that the PR19 assumptions have been shown to be incorrect.

The figure below shows the percentage point difference between the OBR's forecasted wage inflation and the outturn data for all OBR forecasts from July 2015 to March 2022 (the most recent for which outturn data is available). The bars are in chronological order of the forecast's release date. A positive difference represents where the OBR has overestimated future wage inflation, while a negative difference represents underestimation. This figure shows that the OBR's forecasts are rarely completely accurate (they both over- and underestimate future wage inflation) and at times the forecasts have been significantly different from outturn data.

FIGURE 23: PERCENTAGE POINT DIFFERENCE BETWEEN OBR FORECAST AND OUTTURN DATA



Source:https://obr.uk/efo/economic-and-fiscal-outlook-march-2023/.

Therefore, to shield customers from overpaying in case outturn labour costs are lower than current forecasts suggest (or, underpaying in case outturn labour costs are higher than current forecasts suggest), we propose including an ex-post true-up mechanism.

For wholesale labour, we think that the ASHE Manufacturing index is appropriate for an ex-post true-up mechanism. This is because:

- We consider this index sufficiently representative of our wholesale labour costs as:
    - Activities involved in manufacturing are similar to those carried out by wholesale water employees, for example, the processing of a resource; and the construction of major infrastructure.
    - The ASHE index is based on hourly rates and is thus less affected by factors such as the split between full and part time workers, and changes in working hours/overtime (unlike the Average Weekly Earnings (AWE) index).
- It was used by Ofwat at PR19 and is generated by an independent third-party, that is, the ONS.

- It is outside of management control, unlike (for instance) 'AWE: Electricity, Gas & Water Supply Index'; or 'ASHE Water Supply; Sewerage, Waste Management and Remediation Activities' – both of which could be influenced by large water companies.

For retail labour, we consider that the private-sector salaries ASHE measure is appropriate for an ex-post true up mechanism because:

- We consider this index sufficiently representative of our retail labour costs as:
    - Although there does not appear to be one clearly similar industry to use for retail specifically, the fact that the UK is a service-based economy likely means that movements in ASHE generally map movements in retail labour costs over time.
    - Furthermore, we consider that private sector wages are likely to be more affected directly by market forces than public sector wages (which are subject to other factors) and are thus more representative of our retail labour costs over PR24.
    - As was also set out in relation to wholesale labour above, the ASHE index is based on hourly rates, and is thus less affected by factors such as the split between full and part time workers, and changes in working hours/overtime (unlike the Average Weekly Earnings (AWE) index).
- It is generated by an independent third-party, that is, the ONS.
- It is outside of management control.

9.3. ENERGY COSTS

We need a further true-up mechanism for energy costs because: (a) they are largely outside of management control; and (b) there has been recent pressure on energy costs, in excess of recent inflation, driven by macroeconomic shocks related to the start of the war in Ukraine, which is not expected to normalise over AMP8; but (c) there is significant uncertainty regarding how energy costs forecasts are expected to evolve over the PR24 period (which makes ex-ante adjustments challenging).

Evidence of limited management control

As with labour, we are price takers in the energy market, and therefore (unit) energy costs are largely outside management control. We note that, while hedging can theoretically help us manage energy costs in the short-term (for example, through one to two-year forward contracts), hedging does not allow us to 'beat the market' in the long-term. It was also acknowledged by Ofwat in its PR19 Final Determination that, in relation to fixed energy contracts, companies are only able to mitigate risk for one to two years.[53] Both these mechanisms are also limited by the uncertainty in the current

[53] 'PR19 final determinations - Securing cost efficiency technical appendix.' Ofwat (December 2019); p. 205.

climate surrounding energy prices. This further limits the extent to which energy costs are within our control – and increases the importance of Ofwat making an adjustment for our energy costs at PR24.

Evidence of pressure on energy costs

As was shown in Section 9.1, there is: (i) significant evidence of a wedge over time (with electricity prices and CPIH only moving in line between 2015/16 and 2017/18); and (ii) large volatility in the wedge over time. As such, this is suggestive that an energy RPE over the PR24 period is highly plausible. In addition, we note the large spike in electricity prices seen in 2022/23 (driven by recent global events). Furthermore, much of the period shown in Figure and Figure corresponds to periods of (relative) stability, that is, before the war in Ukraine. Given that this is still ongoing and economic conditions have not yet normalised, it seems likely that the volatility shown in energy prices will continue.

Need for a true-up mechanism

We do not think that there are reliable forecasts of energy costs over the AMP8 period. This is because there is currently significant uncertainty relating to energy costs largely due to the war in Ukraine. Although this began two years ago, conditions have not yet normalised. We therefore consider that any estimate of energy RPEs over the AMP8 period is likely to be uncertain.

Therefore, we do not suggest that an ex-ante RPE allowance for energy, but instead an ex-post true-up mechanism.

To do this, we think that the retail electricity price index for industrial customers (including the Climate Change Levy) is appropriate as an index. This is because:

- This index most closely matches up with the energy prices that we pay for the reasons provided in Section 9.1, including the fact that electricity makes up the majority of our energy cost base.
- It is generated by an independent third-party, that is, the Department for Energy Security and Net Zero.
- It is outside of management control.

As such, we think that it is in the best interests of all stakeholders for an ex-post true-up mechanism to be granted, particularly given the uncertainty surrounding how energy costs will move over the PR24 period.

9.4. CHEMICALS COSTS

We need a true-up mechanism for chemical costs for the same reasons as for our energy costs. This is because: (a) they are largely outside of management control; and (b) there has been recent pressure on chemicals costs driven by macroeconomic shocks related to the start of the war in Ukraine - which affect the price of oil - and it is not expected to normalise over AMP8; but (c) there is significant uncertainty regarding how chemicals costs are expected to evolve over the PR24 period (which makes ex-ante adjustments challenging).

Evidence of limited management control

As with labour and energy, we are price takers in the market for chemicals, and are unable to affect the price that we pay. This is consistent with Ofwat's assessment at PR19.[54] As with energy costs, the current climate further exacerbates the issue, and our ability to mitigate against price rises (even in the short-term). This further highlights the need for an adjustment to be made at PR24 to prevent significant risk of exposure to exogenous chemical IPP.

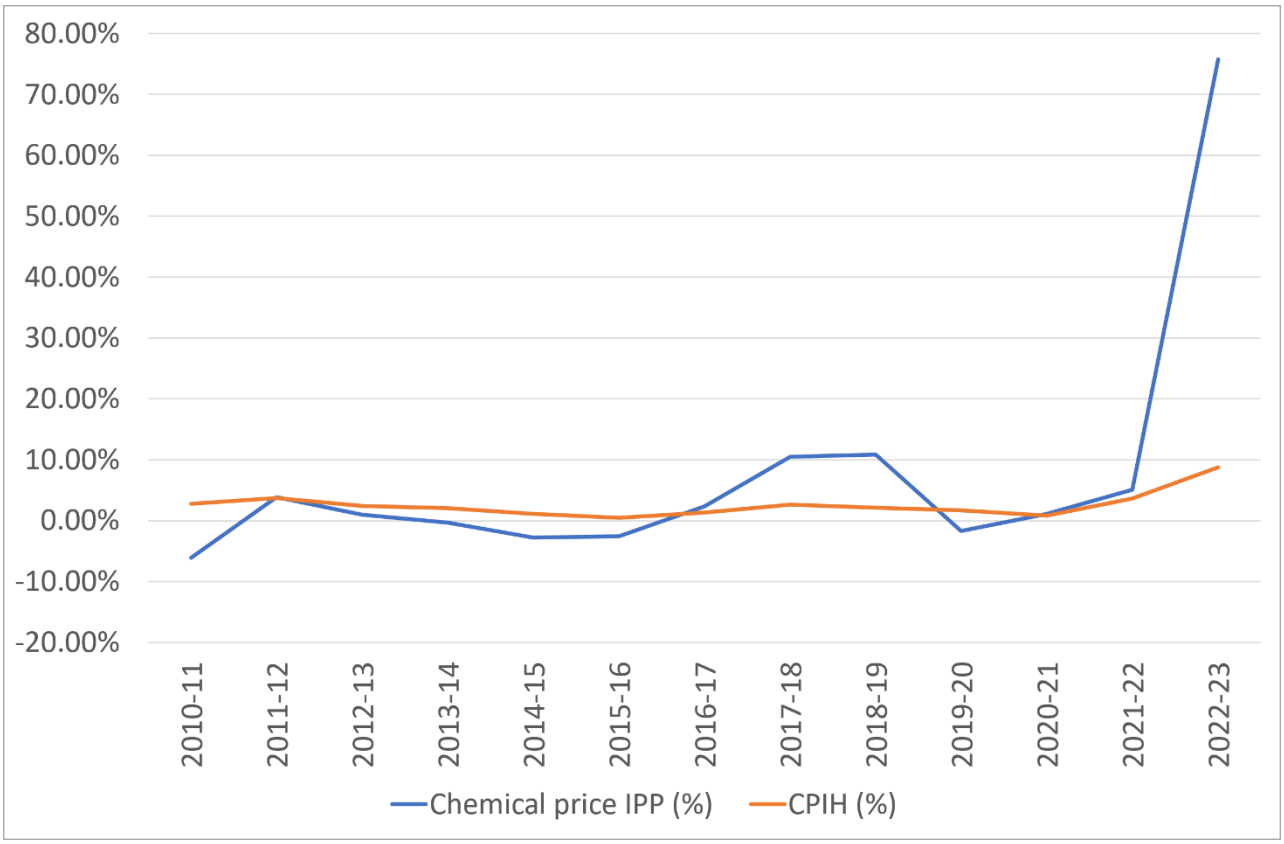
Evidence of pressure on chemicals costs

The figure below shows how historical chemical price growth and CPIH move over time. The metric that we use to capture chemical price changes over time is 'Other Inorganic Basic Chemicals for Domestic Market',[55] which is published by the ONS. We use this metric as it most closely corresponds to the mix of chemicals that we used in our day-to-day operations.

As can be seen in the figure, there is: (i) significant evidence to suggest the presence of a wedge between chemical price growth and CPIH over time; (ii) much volatility in the wedge over time, with it consistently negative prior to 2016/17, and mostly positive from this point onwards; and (iii) a significant rise in chemicals prices in 2022/23, likely caused by the war in Ukraine, since the primary inputs to the chemicals we purchase are energy and transport – of which the former was heavily affected by the war; while the latter was also affected due to the heavy impact on supply chains.

[54] 'PR19 final determinations - Securing cost efficiency technical appendix.' Ofwat (December 2019); Table A3.7.
[55] https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/evxb/mm22.

FIGURE 24: CHEMICAL PRICE INPUT PRICE PRESSURE AND CPIH INFLATION



Sources: https://www.ons.gov.uk/generator?format=xls&uri=/economy/inflationandpriceindices/timeseries/evxb/mm22; https://www.ons.gov.uk/generator?format=xls&uri=/economy/inflationandpriceindices/timeseries/l522/mm23.

Need for a true-up mechanism

As with energy costs, reliably forecasting chemicals costs would be challenging. Specifically, the only forecasts of chemicals prices available are from the World Bank. In relation to these forecasts, we note:

- The index includes several chemicals, such as petrochemicals and fertilisers, which are not reflective of the chemicals used in the water industry. This could be one of the reasons that Ofwat chose to place limited weight on these forecasts in its PR19 assessment.[56]
- The only forecasts that extend into the PR24 period were made in 2021, that is, before the start of the war in Ukraine. Given that this highly relevant exogenous event is not accounted for in these forecasts, this calls into question their validity. The forecasts made since the war began do not extend beyond 2024.

[56] 'PR19 final determinations - Securing cost efficiency technical appendix.' Ofwat (December 2019); p. 208.

Therefore, to shield customers from overpaying (or, underpaying), we propose using an ex-post true-up mechanism. We suggest using the PPI metric corresponding to 'Basic Inorganic Chemicals' to index chemical costs since:

- It relatively closely matches our chemicals cost base.
- It is generated by an independent third-party, that is, the ONS.
- It is outside of management control.

9.5. MPE COSTS

We need a true-up mechanism for MPE costs because: (a) they are largely outside of management control; and (b) there has been pressure on MPE costs, relative to CPIH (partly driven by the changes in the price for steel, used in concrete, which has also been affected by the war in Ukraine); but (c) there is uncertainty regarding how these costs are expected to evolve over the PR24 period (which makes ex-ante adjustments challenging).

Evidence of limited management control

As noted by Ofwat at PR19, MPE costs are primarily outside of our control.[57] Specifically, although we are often able to sign long-term contracts, these do not allow us to shield ourselves from price pressure in relation to MPE, given that the contracts incorporate price increases. In addition, given the nature of the products in question, they are demanded by many different consumers across a range of industries – meaning that we are inherently price takers in these markets. As with the other cost categories, this evidence highlights the need for an adjustment to be made for MPE input costs at PR24.

Evidence of pressure on MPE costs

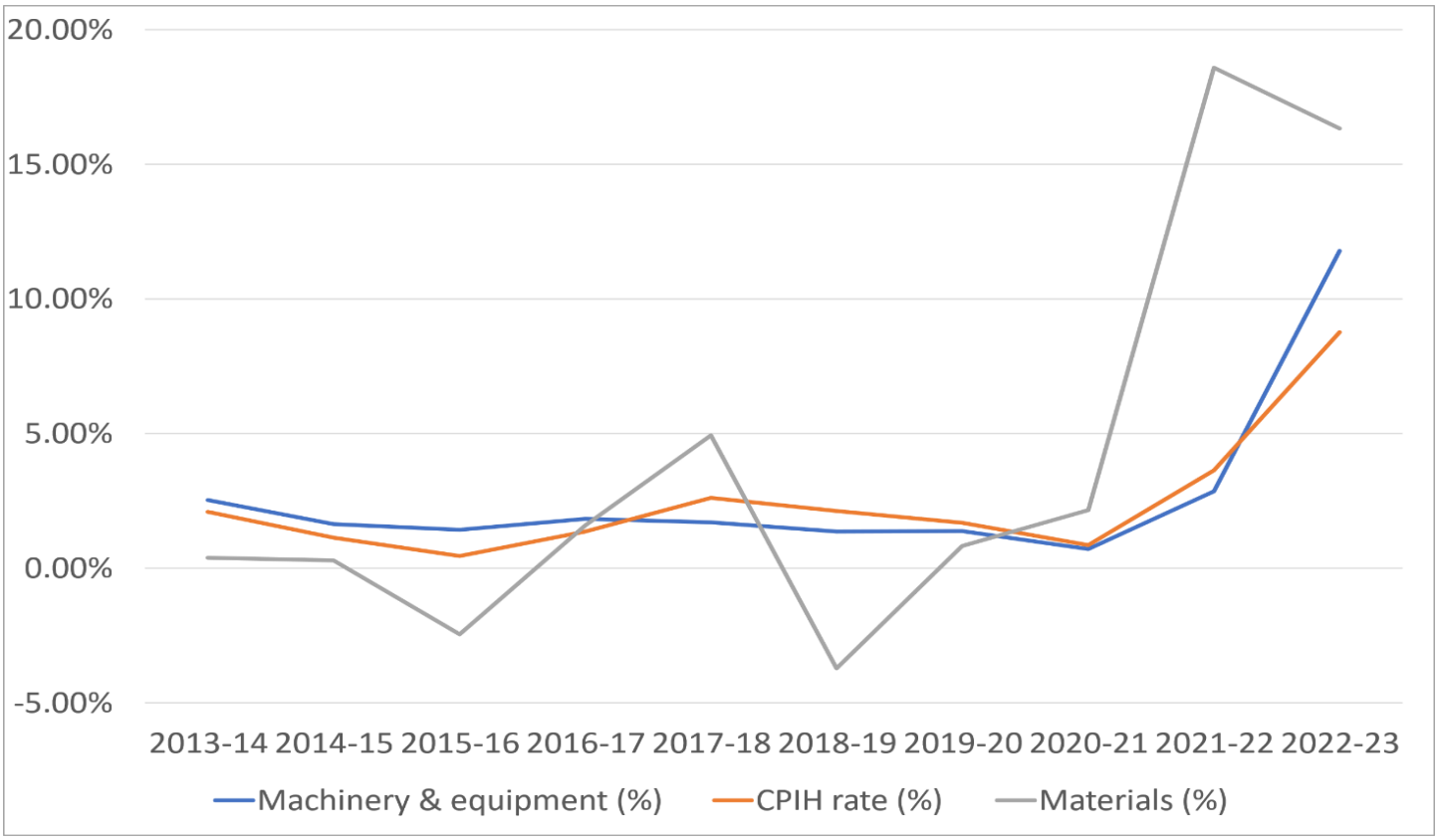
The figure below shows relative movements between two indices and CPIH over time. Specifically, we show this for the following metrics:

- 'Construction materials price index', which *"[p]rovides information on selected building materials and contains monthly data on price indices, bricks, cement and concrete blocks; and quarterly data on sand and gravel, slate, concrete roofing tiles and ready-mixed concrete."*[58] We consider this to be relatively comparable to the mix of materials that we use in our day-to-day operations, and therefore use this to capture input cost changes in the 'Materials' part of MPE.
- The PPI index for 'Machinery and equipment n.e.c.', which measures the average change over time in the selling prices received by domestic (UK) producers for their output.[59]

[57] 'Real Price Effects and Frontier Shift – Final Assessment and Response to Company Representations.' Europe Economics (7 December 2019); p.47.
[58] https://www.data.gov.uk/dataset/75ee36ed-21f7-4d7b-9e7c-f5bf4546145d/building-materials-and-components-statistics.
[59] https://www.ons.gov.uk/economy/inflationandpriceindices/bulletins/producerpriceinflation/previousReleases.

The figure below shows that, for 'Materials', the wedge has been significant in magnitude over recent years, and also highly volatile. Meanwhile, for 'Machinery and equipment', the size of the wedge is much smaller, and also significantly less volatile – with the index generally moving with inflation (although a wedge begins to appear in 2022/23). Taken together, this is suggestive of the need for an adjustment overall for MPE – but primarily for 'Materials' as opposed to 'Plant and equipment'.

FIGURE 25: HISTORICAL INDICES CAPTURING MPE



Sources:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1175417/Construction_Building_Materials_-_Tables_July_2023.xlsx (Table 3.3.2).
https://www.ons.gov.uk/generator?format=xls&uri=/economy/inflationandpriceindices/timeseries/l522/mm23.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1163671/Construction_Building_Materials_-_Tables_May_2023.xlsx (Table 1). https://www.gov.uk/government/statistics/building-materials-and-components-statistics-june-2019 (Table 1). https://www.gov.uk/government/statistics/building-materials-and-components-statistics-december-2017 (Table 1).

Need for a true-up mechanism

In relation to an ex-ante RPE allowance for MPE, there do not appear to be forecasts of MPE costs available – meaning that there is no reliable forecast on which the allowance can be based. Therefore, we do not think that an ex-ante RPE allowance should be granted for MPE at PR24.

We consider the following two metrics are best suited as indices: (i) 'Construction materials price index'; and (ii) the 'Machinery and equipment n.e.c.' PPI index. This is because:

- In relation to 'Construction materials price index', we consider that it includes components that are likely relevant to water companies, for example 'Metal products' and 'Cement and concrete'. In relation to 'Machinery and equipment n.e.c.', we consider this to be more relevant for water companies than other equivalent manufacturing PPI indices.
- These indices are both generated by independent third-parties; the Department for Business and Trade and the ONS respectively.
- They are outside of management control.

As this input cost category is based on two metrics, the respective RPEs need to be combined and weighted appropriately in order for the true-up mechanism to be implemented effectively. This could be done by weighting the actual RPEs across each index using our total spend over AMP8 on 'Materials' compared to 'Plant and equipment'.

9.6. RETAIL COSTS

As shown above in Section 3.6.3, evidence suggests that (i) we have limited management control in relation to retail labour costs; (ii) there has been historical pressure on retail labour costs; and (iii) there is likely to be significant pressure on retail labour costs over the PR24 period. As such, we consider it necessary for an ex-ante IPP allowance to be granted in relation to our retail labour costs at PR24. Furthermore, we also showed in Section 3.6.3 that the forecasts available for retail costs are subject to uncertainty, particularly due to the current macroeconomic conditions. As such, this is suggestive of the need for an additional ex-post true-up mechanism in relation to retail labour costs.

Labour costs make up the majority of our retail cost base, specifically 62%. The majority of the remainder of our retail cost base is primarily made up of bad debt costs, which we expect to rise in line with inflation. We have therefore applied CPIH to our forecasted non-labour retail costs. This issue is exacerbated at PR24 due to the magnitude of inflationary pressure we experience now, as well as the cost-of-living crisis. Therefore, there is a material risk that we will be underfunded if inflation is applied to our non-labour retail costs. We also note that, in line with Ofwat's approach in the wholesale controls, we would be open to indexing our non-labour retail costs to CPIH (rather than applying forecast CPIH ex-ante).

Beyond labour and bad debt costs, a small proportion of our retail cost base is made up of energy and MPE costs. Ofwat plans to index these costs to CPIH on a wholesale basis, but not on a retail basis. This is inconsistent and means we will be further underfunded if inflation is not accounted for in the retail control.