

# Cost adjustment Claim

## AMP7 phosphorus removal operating expenditure (ANH\_CAC\_4.1)

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Anglian Water

June 2023

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Document reference	<b>ANH_CAC 4.1</b>		
Title of cost adjustment claim	<b>AMP7 phosphorus removal operating expenditure</b>		
Price control	Wastewater Network Plus	Symmetrical?	YES/NO
Basis of claim	The enhancement opex companies will incur in 2025-30 to operate the phosphorus removal schemes they built in 2020-25 will not be allowed for by the base cost models. Separate allowance will therefore be required for these costs.		
Gross value (£m five years)	60.1		
Implicit allowance (£m five years)	0.00		
Net value of claim (£m five years)	60.1		
How efficiency of costs are demonstrated	Oxera has analysed the opex reported by companies in Tables 7F of their APRs for 20/21 and 21/22 to derive efficient opex costs for P removal schemes		
Materiality (as % of totex for price control)	1.5%		
How customers are protected	Phosphorus limits are included in the environmental permits of all WRCs that were included in our AMP7P removal programme and will be enforced by the Environment Agency.		
Supporting document references	ANH_CAC_4.2 CAC calculations P removal opex.xls ANH_CAC_4.3 P removal by site opex benchmarking.do ANH_CAC_4.4 STATA P removal opex benchmarking.xls ANH_CAC_4.5 Implicit allowance analysis.do ANH_CAC_0.1 Oxera assurance letter ANH_CAC_0.2 PR24 Template		

## Cost Adjustment Claim

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## Enhancement opex costs in 2025-2030 due to phosphorus removal schemes delivered in 2020-2025

This is a claim for the base cost allowance made for Anglian Water at PR24 to include funds to enable the efficient operation of the phosphorus (P) removal schemes which Anglian installed in AMP7. We make the claim because the models Ofwat uses to determine our base cost allowance at PR24 will likely include neither the appropriate cost data nor the cost driver variables needed to forecast these costs. Ofwat recognises this in the base cost modelling consultation<sup>1</sup>:

*“We recognise that the additional ongoing cost associated with more stringent phosphorus removal programmes across the sector may not be fully captured in our proposed base cost models. We are exploring alternative options to ensure that our cost assessment approach funds efficient ongoing P removal costs”*

One of the alternative approaches to account for additional ongoing p-removal costs being considered by Ofwat is the cost adjustment claims process (alongside other potential measures, such as a post-modelling adjustment or eventually including a P removal cost driver in the relevant base cost models).<sup>2</sup>

**This CAC is thus submitted on a contingent basis.**

For the time being, none of the models proposed by Ofwat in its suite of models released in April 2023 included variables to control for phosphorus removal costs incurred from 2025/26 onwards as a result of companies' AMP7 P removal programmes. Furthermore, a negligible proportion of the costs companies have incurred are included in the historical years used for model estimation. Accordingly, it is highly unlikely that sufficient allowances for these costs can be made by Ofwat's current modelling suite. Should this be incorrect, we would withdraw or amend this claim accordingly.

We are submitting the CAC in accordance with advice provided by Ofwat during the Cost Assessment Working Groups during 2021 and early 2022 and the guidance set out in the PR24 Final Methodology.

We set out the data we have used to calculate the value of our claim in the associated Excel file, 'ANH4.2 - CAC calculations P removal opex.xls'. Oxera's supporting calculations on (i) the efficient annual opex of AMP7 P removal schemes and (ii) the implicit allowance for AMP7 P removal opex from the current base models are also appended therein.

Our claim is based the following main data sources: (i) the Annual Performance Reports for 2021-22 (APR22) published by companies in table 7F and (ii) the cost and cost-driver data used in Ofwat's wastewater network plus consultation models as at April 2023. We will update our claim for the October business plan, making use of the table 7F data from companies' 2022/23 APRs (APR23).

### Background

High levels of phosphorus in the final effluent returned to rivers from water company water recycling centres (WRCs) is a major cause of nutrient enrichment of rivers. Nutrient enrichment encourages algal growth which depletes the river of oxygen, with adverse consequences for riverine ecology and biodiversity. Reduction of phosphorus loading of rivers from WRCs is therefore seen as a key intervention to improve the ecological status of rivers. The Environment Agency identifies rivers where the need for

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<sup>1</sup> 'Econometric base cost models for PR24', Ofwat, April 2023 – page 41

<sup>2</sup> 'Econometric base cost models for PR24', Ofwat, April 2023 – page 41

intervention is greatest and the WRCs where reductions in phosphorus concentrations are required. It enforces these requirements by imposing, or tightening, limits for P concentrations in the discharge permits for those WRCs.

The technology to reduce phosphorus concentrations in waste water typically involves dosing incoming waste water at the head of the WRC with ferric or ferrous salts. These salts combine with soluble phosphorus in the waste water to form flocs of ferric or ferrous phosphate which precipitate on settlement or clarification and can be removed with the waste water sludge.

Additional operating costs are incurred once the P removal scheme has been installed. Opex is primarily incurred for the purchase of chemicals, power for running dosing pumps, the tankering of additional sludges and the maintenance of the relevant assets. These ongoing opex costs, incurred beyond AMP7, are the focus of our claim.

## Our AMP7 P removal programme

At PR19 we agreed a programme of work with the Environment Agency to install the treatment plant required to reduce the concentration of phosphorus in the final effluent from a large number of our WRCs over the period 2020-25 (AMP7). At the end of March 2022 our AMP7 programme comprised 176 separate schemes and we envisaged total capital expenditure of £336m (in nominal terms). The funding for this programme was allowed through the final determination of price limits made by Ofwat.

**Charts 1 and 2**<sup>3</sup> below shows the **capital expenditure profiles** for delivering the AMP7 P removal programmes, respectively for Anglian and the industry as a whole. These profiles are calculated based on company Table 7F data<sup>4</sup> and costs have been converted to real terms, in 2022/23 prices.<sup>5</sup> Both paint the same picture, showing that expenditure peaks in year four of the price control period (2023/24), indicating that the majority of the schemes will be completed in years four and five (and thus predominantly only operational by 2024/25). The only noticeable difference between the industry's profile and our own is that a material proportion of the industry's expenditure is to be made after the end of the price control period (driven by Thames Water's volume of late investments<sup>6</sup>).

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<sup>3</sup> Anglian Water analysis of companies' APR22 table 7F data in ANH4.2 – CAC calculations P removal opex.xls

<sup>4</sup> We note that there is a minor discrepancy between the opex reported for industry AMP 7 P removal schemes, when comparing company APR data with the aggregate cost series reported in Ofwat's wastewater consultation dataset over 2020/21 and 2021/2022. In 2017/18 prices, the former reports a total industry opex over the period of ~£6m and the latter ~£8m. Given that the AMP7 P removal scheme cost data underlying Ofwat's base cost consultation modelling is neither available on a disaggregated basis, nor over the entire AMP7 period, we base our analysis in this section on company APR data. The differences in costs reported by the datasets are also minor, such we do not expect them to have a material impact on the outcomes of the analysis.

<sup>5</sup> Based the latest CPIH series published by the ONS, available [here](#).

<sup>6</sup> Thames' APR data indicates that some 70% of its AMP 7 scheme capex, or £ 307.4 million (in nominal terms), will only be made after 2024/25. See accompanying Anglian Water analysis of companies' APR22 table 7F data, sheet 3. *Industry data>>aggregation>Totals* in ANH4.2 – CAC calculations P removal opex.xls.

Chart 1: Anglian AMP7 P programme - annual capex

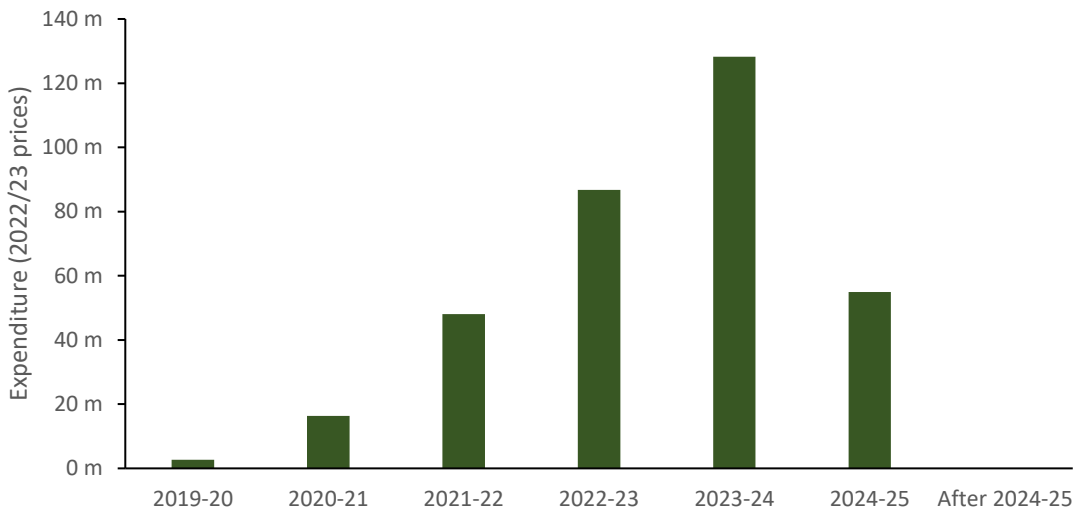
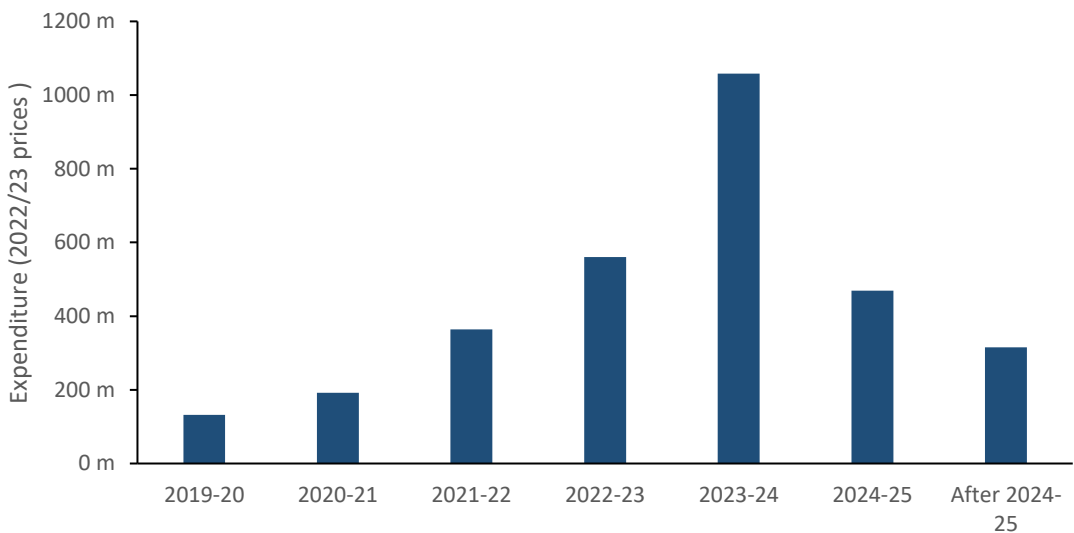


Chart 2: Industry AMP7 P programme - annual capex



Note: SRN capex data after 2024-2025 corrected for seeming reporting error (see accompanying Excel workbook).

The enhancement **opex profiles** associated with our own and the industry’s respective AMP7 P removal programmes are set out in **Charts 3 and 4**<sup>7</sup> below. Unsurprisingly, given the similarity in the capital expenditure profiles, our opex profile is very similar to the industry’s. Opex levels are very low in the first three years of the price control period, and only start becoming material as more schemes become operational from 2023/24 onwards - i.e. beyond the current base cost modelling period. Furthermore, the full impact of these programmes on our own (and likewise, industry) opex costs will not be realised until the first year of AMP8. This is entirely consistent with the profile of scheme completion shown above and the fact that opex is incurred only once schemes are completed.

<sup>7</sup> Anglian Water analysis of companies’ APR22 table 7F data in ANH4.2 – CAC calculations P removal opex.xls

Chart 3: Anglian AMP7 P programme - annual opex

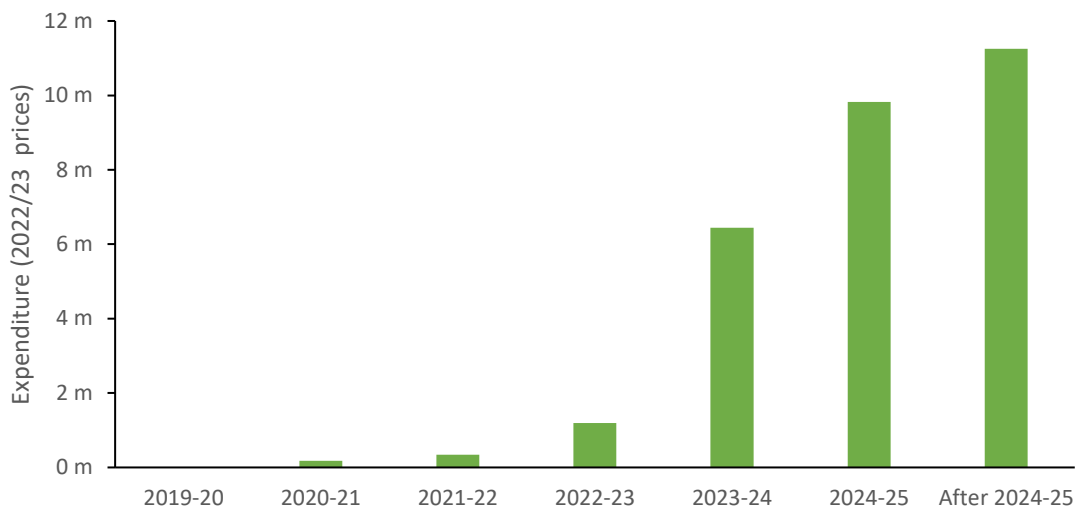
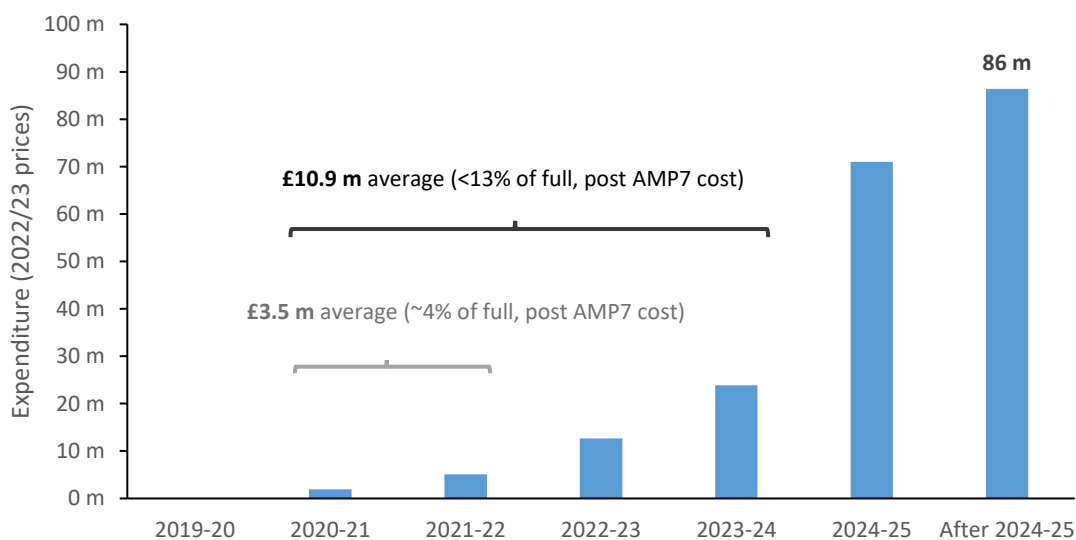


Chart 4: Industry AMP7 P programme - annual opex



**The key takeaway** from these observations is that the additional operating costs from the industry’s **AMP7 P removal programme** are **scarcely represented at all until 2024/25, and are not fully represented until at least 2025/26** (or possibly even later<sup>8</sup>). As shown in Chart 4, over the first two years for which we have AMP7 scheme outturn data, namely 20/21 and 21/22 (relevant to Ofwat’s current consultation base modelling), the average industry opex per annum was only 4% of what annual opex costs currently expected to be required after 2024/25 (all considered in real terms).<sup>9</sup> Moreover, as Ofwat does not model the step change in industry spend that occurred since 2015/16, the impact of this increase in opex that is contained within the base cost modelling is further reduced.

### Allowing for the ongoing costs of our AMP7 P removal programme

At PR24 Ofwat must determine the efficient level of expenditure companies will incur to deliver their statutory duties. These duties include the requirement to meet their permitted phosphorus standards in

<sup>8</sup>. That is, should some schemes be delayed and only become fully operational later than initially planned.

<sup>9</sup> See accompanying Anglian Water analysis of companies’ APR22 table 7F data, sheet 3. *Industry data>>aggregation>Totals in ANH4.2 – CAC calculations P removal opex.xls*

treated waste water effluent. The cost allowances must therefore provide for the operation of P removal plants which companies installed in AMP7.

Historically, Ofwat had modelled enhancement opex as part of totex-based enhancement models. However, these ongoing opex costs are no longer considered under enhancement models, but considered under base cost modelling from PR24.<sup>10</sup> Furthermore, historical total cost (or 'totex') enhancement modelling only considered the opex for AMP7 schemes that fell within the AMP7 period (2020/21 to 2024/25). The ongoing opex costs for existing AMP7 schemes over the 2025/26 to 2029/30 (or AMP8) period would thus need to be covered within the base cost modelling, as it falls outside the scope of either PR19 or PR24 enhancement models.

This brings us to the extent to which ongoing AMP7 P removal opex will be provided for through Ofwat's proposed PR24 base cost models. Ofwat's preferred approach is to derive cost allowances from cost models. These models establish the relationship between expenditure and the factors which drive expenditure on the basis of historical evidence, then use these relationships – in conjunction with forecasts of cost drivers – to assess future expenditure needs. Therefore, if ongoing P removal costs are not captured in either the costs or the cost drivers used in the models, they are not accounted for in the cost allowances.

Ofwat's proposed base cost models, as set out in the consultation, do not appropriately consider the ongoing cost of AMP7 P removal schemes through either (i) the cost to be modelled or (ii) the cost drivers included in the model. More specifically:

- Based on the current company APR data, we estimate that Ofwat's proposed base cost models (as set out in its consultation) account for ongoing industry opex for AMP7 P removal schemes of, at most, £3.5 million per annum.<sup>11</sup> This only 4% of the £86.4 million per annum expected for all AMP7 schemes after 2024/25 (all in 2022/23 prices). As shown in Chart 4, this is expected to increase to no more than 13% of the full ongoing costs by the time of Ofwat's final determination modelling, (considering outturn data up to 2023/24). Note that these are conservative estimates of the total annual industry opex expected over 2025-30, as some companies have seemingly not provided opex data for all their sites and/or years.<sup>12</sup> Moreover, as stated above, as Ofwat does not model the step change in industry spend that occurred since 2015/16, the impact of this increase in opex is further watered down.
- Ofwat has also not accounted P removal as a cost-driver in its models (which we discuss in more detail below)

A modelling approach to derive the costs of companies' AMP7 P removal schemes is theoretically possible, should it be accounted for in both the costs and cost drivers of Ofwat's base models. In other words, it is conceivable that the relationship between P removal levels and the base expenditure associated with achieving those levels could be established. This relationship could then be used to forecast the operating costs companies will incur beyond 2025 as a result of their AMP7 P removal programmes. However, in its

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<sup>10</sup> As noted by the 'PR 24 Final methodology, Appendix 9: Setting expenditure allowances', Ofwat, December 2022 – pages 5 and 11, and in the 'Econometric base cost models for PR24', Ofwat, April 2023 – page 35.

<sup>11</sup> As noted above, this is based on company APR data. Based on the industry aggregate ASMP7 P removal opex data used in Ofwat's wastewater network plus consultation models, the annual average is £4.7 million p.a. over 2021-22 (or 5.5% of the post 2024/25 expected opex in the APR data).

<sup>12</sup> For example, SWB has only provided opex data for two of its 30 planned AMP7 schemes (presumably only those that are already completed); whilst SRN has not provided any costs ongoing costs for sites after 2024/25 (which seems based on an incorrect interpretation, as the ongoing lifetime of a P removal plants would be several years – if not decades – after its construction). Anglian Water analysis of companies' APR22 table 7F data



April 2023 consultation on base cost modelling for PR24<sup>13</sup> Ofwat has not included the ongoing costs associated with P removal as a cost driver, based on the following explanation:

*“Treatment complexity is a key cost driver of sewage treatment costs. Tighter discharge permit limits tend to require more, or larger, treatment process units and are therefore more costly to comply with. In addition, tighter permits are associated with additional raw material costs, mainly driven by energy and chemical requirements.*

*Our proposed models retain the PR19 treatment complexity variable. This is the percentage of load with ammonia permit  $\leq 3\text{mg/l}$ . We include this explanatory variable in sewage treatment (SWT) and wastewater network plus (WWNP) models.*

*We considered alternative treatment complexity variables:*

- *percentage of load with a Total Phosphorus (P) permit  $\leq 0.5\text{mg/l}$  or  $\leq 1\text{mg/l}$ ;*
- *percentage of load with a Biochemical Oxygen Demand (BOD) permit  $\leq 7\text{mg/l}$  or  $\leq 10\text{mg/l}$ ; and*
- *percentage of load with an Ultra-Violet (UV) treatment permit.*

*None of the alternative variables improved on the PR19 complexity variable. They did not generate statistically significant results. The coefficient on the UV variable was also found to be of the wrong sign, predicting that tight permits have a negative impact on costs. For BOD  $\leq 7\text{mg/l}$ , we found that the data does not have a sufficient variation across the sector with a very limited proportion of load subject to these permits. This could lead to spurious results.*

*CEPA included percentage of load with ammonia permit  $\leq 3\text{mg/l}$  in its recommended models and did not recommend any other sewage treatment complexity variables.”*

On this basis, Ofwat recognises that the ‘additional ongoing costs associated with more stringent phosphorus removal programmes across the sector may not be fully captured in [its] proposed base cost models’, and that a cost adjustment claim is one means by which it may ensure that its approach funds efficient ongoing P removal costs.<sup>14</sup>

On a forward-looking basis, given the lack of historical AMP7 P removal costs, we are sceptical that a robust modelling approach will be found that satisfactorily provides for the ongoing opex associated with companies’ AMP7 P removal programmes. Illustratively, in the consultation document Ofwat discussed models proposed by companies which included alternative variables for treatment complexity. However, none of these models included variables for phosphorus limits only (although it is likely that companies will have attempted to build them). Further, as we discuss below, the cost data available also does not account for the incremental, ongoing costs of AMP7 P removal schemes over AMP8. We thus submit this cost adjustment claim for use in the event that these matters remain unaddressed by Ofwat’s approach at the time of the final determinations.

## **Valuing our claim**

We calculate the value of our claim as the efficient annual cost of operating our AMP7 P removal programme less the allowance for these costs implied by Ofwat’s PR24 base cost models. In accordance with the guidance in the PR24 Final Methodology document we have not applied any adjustment for

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<sup>13</sup> ‘Econometric base cost models for PR24’, Ofwat, April 2023 – page 40

<sup>14</sup> ‘Econometric base cost models for PR24’, Ofwat, April 2023 – page 41

frontier shift. We have not made any adjustments either for any real price effects which we may apply to our cost proposals in our final business plan.

## Gross value of our claim

We calculate the gross value of our claim as the number of P removal schemes in our AMP7 programme which we shall have to operate in 2025-30, multiplied by the efficient operating costs of operating those schemes. In table 7F of our APR22 we projected completing 162 schemes in our AMP7 programme.

We asked Oxera to analyse the APR22 table 7F data to derive an estimate of the efficient operating cost for each P removal scheme. The approach followed and accompanying results of Oxera’s analysis are summarised in Appendix 1. Oxera’s analysis found that the operating costs we expect to incur in operating our AMP7 P removal schemes are between around 20% and 70% lower than the average costs realised or projected by the rest of the industry. This conclusion holds whether the analysis is conducted on (i) only those schemes which were completed by the end of 2021/22 (for which actual, outturn data is available) or (ii) when looking at the figures companies project to the end of the AMP7 period (2024/25).

Consistent with the Competition and Market Authority’s decision on the company appeals at PR19<sup>15</sup>, we use the upper quartile efficiency cost when calculating the operating costs we claim from operating our AMP7 P removal schemes in 2025-30.

Oxera calculated two values for the upper quartile annual operating cost of P removal schemes: (i) one based on those schemes which were complete to the end of 2021/22 and (ii) another based on the costs companies project for the whole programme. We base our claim on the latter, as the sample used for the former is very small (only 12 schemes were completed to the end of 2021/22) and may thus be unrepresentative if it excludes larger and more expensive schemes which will not be completed until later in the price control period.

Oxera also calculated two sets of annual opex cost estimates, separately for the subset of industry schemes with tight consents and those with less tight consents. Tight consents were defined as having a permitted limit of 0.5 mg/l or less. Schemes with tight consents are more expensive to run than those with less tight consents, so our cost adjustment claim calculation takes account of the number of schemes in each category.

The table below shows the calculation of our cost adjustment claim. We calculate the total annual ongoing cost for AMP7 sites over 2025-30 as the product of the number of sites multiplied by the efficient (upper-quartile) cost per site (treating schemes with tight and less tight consents separately).

<b>Scheme type</b>	<b>No. of ANH schemes</b>	<b>Upper quartile operating cost</b>	<b>Total annual cost (after 2024/25)</b>
	<i>No.</i>	<i>(£m/yr)</i>	<i>(£m/yr)</i>
Tight consent	84	0.090	7.558
Less tight consent	78	0.034	2.621
<b>Total</b>	<b>162</b>		<b>10.179</b>

<sup>15</sup> ‘Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations – Final report’, Competition and Market Authority, March 2021 – paragraph 4.494

In 17/18 prices, the total annual figure is £10.179m per annum. Note that this is a conservative estimate, as our number of completed sites may be higher.<sup>16</sup> Note that the efficient operating cost estimate may change as updated company Table 7F data becomes available.<sup>17</sup>

In 22/23 prices this amounts to £12.017m per annum. The **gross value of our cost adjustment claim therefore is this annual figure multiplied by five, which is £60.087m.**

## Implicit allowance

Companies report the enhancement opex associated with their P removal programmes and these costs are included in the dependent variable in all of the wastewater network plus models proposed by Ofwat in its April 2023 base cost modelling consultation.<sup>18</sup>

As already alluded to above, only a very small proportion of companies' ongoing AMP7 costs will be used in the total cost assessment. For example, by the time Ofwat makes its draft determinations, it will only consider opex incurred up until 2022/23, and only up to 2023/24 for the final determination. As shown in Chart 4 above, even by 2023/24 the average annual opex incurred over the AMP7 period will only represent a minor share of the annual opex expected to be incurred once sites become fully operational over 2025-30. By the time of the draft determinations (using data to 2022/23), the average annual AMP7 opex considered by the base models will be less than 8% of the full, annual ongoing costs of the AMP7 schemes. By the time of the final determinations (2023/24), it will still be less than 13% of the full ongoing costs of these sites.

For avoidance of doubt, the AMP7 expected P removal costs are distinct from and incremental to the historical P removal costs from previous AMPs already included in industry base costs. In our experience, AMP7 schemes are (i) predominantly at sites where there were no P removal schemes previously, or (ii) in some cases at sites where there may have been pre-existing schemes but where tighter consents have since been implemented (e.g. with consents tightening say from 2 mg/l to 0.5 mg/l).<sup>19</sup>

Therefore, as these incremental costs are not appropriately included in the cost metrics, nor considered by model cost drivers, we do not expect there to be any implicit allowance in the models. Moreover, as stated above, as Ofwat does not model the step change in industry spend that occurred since 2015/16, the impact of this increase in opex is further watered down.

We have asked Oxera to calculate the implicit allowance for these AMP7 P removal schemes over the AMP8 period, based on Ofwat's PR24 consultation models. The approach and results are summarised in Appendix 2. Oxera's remodelling indicates that our efficient cost allowance would have been higher if Ofwat excluded AMP 7 P removal opex over 2020/21 to 2021/22 from companies' botex. We thus make the conservative assumption that the implicit allowance is zero (instead of applying an uplift to the gross value of the claim).

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<sup>16</sup> The 162 scheme-number above does not consider the remaining 14 schemes for which we do not yet have annual opex estimates

<sup>17</sup> As noted above, companies have seemingly not provided opex data for all their sites and/or years. Cost driver data is also not complete. For example, we note that Severn Trent and Yorkshire Water have not reported consent requirements for most of its schemes in the APR data (presumably those still to be completed). The calculation in the table above assumes that all of these sites do not have tight constraints (<0.5 mg/l). Reallocating some of these sites to the tight consents category could change the upper quartile / efficient operating cost estimates.

<sup>18</sup> More specifically, through the *B0321PRO\_SWT* variable used to construct the disaggregated sewage treatment (SWT)- and top down wastewater network plus (WWNP) botex cost variables used by Ofwat in its wastewater consultation models.

<sup>19</sup> In the latter case we thus assume that companies have reported the incremental opex required over AMP7 to meet the new tighter P consents, rather than the new total cost of P removal at the respective sites.

Accordingly, **the net value of our cost adjustment claim is thus equal to the gross value**, given the scope of the expected cost and cost driver coverage of Ofwat's base cost models at time of writing.

In line with Ofwat's guidance, we do not submit a symmetrical cost adjustment claim, as this claim does not relate to costs that have been incurred in the past.<sup>20</sup> As the full ongoing costs to be incurred over AMP8 are not accounted for in Ofwat's base cost modelling, we foresee that the entire industry will require an uplift for the ongoing cost of AMP7 P removal schemes over 2025-30 (though to varying extents per company, contingent on the scale and efficiency of the ongoing costs incurred on their respective AMP7 P removal schemes).

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<sup>20</sup> PR 24 Final methodology, Appendix 9: Setting expenditure allowances', Ofwat, December 2022 – pages 32.

## **Need for adjustment (necessary)**

### **1.1. Unique circumstances**

*Is there compelling evidence that the company has unique circumstances that warrant a separate cost adjustment?*

This claim is not based on the presumption that Anglian Water has unique circumstances. Indeed, other companies may be in a similar situation. This claim is based on the fact that the base cost models cannot take account of the costs in question because they were not incurred in the modelled period. As stated above, this has been recognised by Ofwat.<sup>21</sup>

*Is there compelling evidence that the company faces higher efficient costs in the round compared to its peers (considering, where relevant, circumstances that drive higher costs for other companies that the company does not face)?*

Not relevant – see above.

*Is there compelling evidence of alternative options being considered, where relevant?*

Decisions on the most efficient solutions for meeting the environmental outcomes were agreed at PR19. These decisions took into account the ongoing enhancement opex costs that would be incurred into the future. Alternative options were considered at the time.

### **1.2. Management control**

*Is the investment driven by factors outside of management control?*

The environmental standards to be achieved at each water recycling centre are set by the Environment Agency. Anglian Water has a statutory duty to comply with these standards. Management can control the type of solution which is employed to meet those standards, and decisions on this were made at PR19, as discussed above. Management can also control the ongoing efficiency of operating the solution which has been created. This claim is only for the efficient opex costs of the solutions it has created, as assessed by Oxera's analysis.

*Have steps been taken to control costs and have potential cost savings (eg spend to save) been accounted for?*

The efficient ongoing cost of operating our P removal plants has been determined from analysis of industry data, based on an upper quartile efficiency challenge. In accordance with Ofwat guidance, a frontier shift has not been applied.

### **1.3. Materiality**

*Is there compelling evidence that the factor is a material driver of expenditure with a clear engineering / economic rationale?*

The additional costs pass Ofwat's materiality threshold. There is an accepted case for both the need for P removal and the approach which we have taken to achieve it.

*Is there compelling quantitative evidence of how the factor impacts the company's expenditure? Adjustment to allowances (including implicit allowance)*

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<sup>21</sup> 'Econometric base cost models for PR24', Ofwat, April 2023 – page 41

The case and the valuation are set out above.

*Is there compelling evidence that the cost claim is not included in our modelled baseline (or, if the models are not known, would be unlikely to be included)? Is there compelling evidence that the factor is not covered by one or more cost drivers included in the cost models?*

There are no variables to control for P removal costs in any of the waste water network plus models proposed by Ofwat in its April base cost modelling consultation. The consultation document discusses how P removal variables had been tested but not selected and reports that CEPA did not recommend any P removal variables. P removal costs are not controlled by any of the other variables included in any of the waste water network plus models which Ofwat consulted on.

Even if these cost drivers were considered, the full ongoing costs associated with the industry's AMP7 P removal programmes over 2025-30 are not appropriately captured in the data series that will be considered by Ofwat in its modelling at the time of the draft- and final determinations. By 2022/23 the average annual AMP7 opex considered will be less than 8% of the full, annual ongoing costs of the AMP7 schemes and by 2023/24 it will still be less than 13% of the full ongoing costs of these sites (note that these are conservative estimates, as discussed above). Moreover, as stated above, as Ofwat does not model the step change in industry spend that occurred since 2015/16, the impact of this increase in opex is further watered down.

As mentioned above, we have asked Oxera to calculate the implicit allowance from Ofwat's current consultation models over the AMP8 period. The analysis confirms that the consultation models does not provide any implicit allowance for ongoing costs of the incremental P removal schemes (see Appendix A2<sup>22</sup>).

*Is the claim material after deduction of an implicit allowance? Has the company considered a range of estimates for the implicit allowance?*

The materiality of the claim is demonstrated below:

	£m
Total AMP8 wastewater network plus expenditure (June 23 estimate)	4,000
Enhancement opex to be incurred in AMP8	60
Allowance implied by the models	0
Net value of the claim	60
Materiality of the claim (as % of totex for the price control)	1.5%
Materiality threshold (as % of totex for the price control)	1.0%
Is the claim material?	Yes

We estimate the implicit allowance to be zero because:

- Only a small proportion of our AMP7 costs (those incurred in 22/23) will be used in the assessment of costs Ofwat makes at the draft determination. The models Ofwat uses for the final determination may include the costs we incur in 2023/24, but these will still represent only a minor share of the costs we will incur annually in the next price control period

<sup>22</sup> Oxera estimate the implicit allowance from the current consultation models to be -£0.71 million over AMP8 (in 2022/23 prices) – which would technically require an uplift to the gross value of the claim. We have, however, assumed an implicit allowance of zero to be conservative.

- These costs will represent only a minor share of the total base costs in the long modelled period used by Ofwat such that it is unlikely to have meaningful impact on model parameters.
- None of the waste water network plus models proposed by Ofwat in its April base cost modelling consultation included variables to control for P removal costs.
- Oxera’s analysis confirms that the consultation models in their current form provide no implicit allowance for ongoing costs of the incremental P removal schemes. This analysis would however need to be updated as more data becomes available over 2023 and 2024.

*Has the company accounted for cost savings and/or benefits from offsetting circumstances, where relevant?*

By basing our claim on efficient costs, as benchmarked against the industry upper quartile, our figures capture any cost savings we can achieve, or that should have been achieved in the past. We cannot think of any offsetting benefits.

*Is it clear the cost allowances would, in the round, be insufficient to accommodate the factor without a claim?*

Failure to allow the claim would impose a substantial and unjustified efficiency challenge to the company, over and above the other efficiency challenges which have been separately calculated and justified.

*Has the company taken a long-term view of the allowance and balanced expenditure requirements between multiple regulatory periods? Has the company considered whether our long-term allowance provides sufficient funding?*

Deferring this expenditure to later regulatory periods is not an option if we are to meet our statutory obligations. These costs represent ongoing costs of running p-removal schemes which have already been accepted by Ofwat at PR19.

*If an alternative explanatory variable is used to calculate the cost adjustment, why is it superior to the explanatory variables in our cost models?*

We have not used a modelling approach to calculate the cost adjustment. Attempts to do so have not been successful, as Ofwat confirmed in its base cost modelling consultation.

## **Cost efficiency (necessary)**

*Is there compelling evidence that the cost estimates are efficient (for example similar scheme outturn data, industry and/or external cost benchmarking, testing a range of cost models)?*

We have based our claim on the efficient cost, as represented in the annual opex of the upper quartile (as measured by Oxera on the efficiency of AMP7 annual opex<sup>23</sup>). These numbers were derived based on Oxera’s analysis of the current table7F APR data (set out in Appendix A1).

*Does the company clearly explain how it arrived at the cost estimate? Can the analysis be replicated? Is there supporting evidence for any key statements or assumptions?*

The estimate is set out in the accompanying Excel workbook and accompanying Stata do-files and underlying datasets, in addition to being summarised above. All the data on which it is based are derived from companies’ annual performance reports.

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<sup>23</sup> Thus based on efficiency with respect to P removal opex, and not based on efficient company performance as modelled in Ofwat’s consultation base cost models.

*Does the company provide third party assurance for the robustness of the cost estimates?*

Oxera has provided assurance for all the original analysis conducted by them, as well as the subsequent use of their analysis in our estimates of the Gross and Net value of the claim.

Our cost estimates are all sourced from companies' APRs. Whilst we cannot provide assurance on the accuracy of the underlying data on ongoing AMP 7 P removal cost data provided in company APRs, every company's Board confirms the accuracy and completeness of the information it has supplied, including those in its APR. We acknowledge, however, that the table 7F data for various companies are still at various stages of completeness, and that updated estimates would be required as updated data becomes available.

## **Need for investment (where appropriate)**

*Is there compelling evidence that investment is required?*

The investment was approved at PR19.

*Is the scale and timing of the investment fully justified?*

The scale and timing of the investment was approved at PR19.

*Does the need and/or proposed investment overlap with activities already funded at previous price reviews?*

These investments are independent of investments made at previous price reviews.

*Is there compelling evidence that customers support the need for investment (both scale and timing)?*

Customers' views were taken into account in approving the investment at PR19.

## **Best option for customers (where appropriate)**

*Did the company consider an appropriate range of options to meet the need?*

Optioneering was carried out when the investment was approved at PR19.

*Has a cost–benefit analysis been undertaken to select proposed option? There should be compelling evidence that the proposed solution represents best value for customers, communities and the environment in the long term? Is third-party technical assurance of the analysis provided?*

Cost-benefit analysis was carried out when the investment was approved at PR19.

*Has the impact of the investment on performance commitments been quantified?*

Failure to make the investment will impact the company's performance against the treatment works compliance performance commitment. Other performance commitments may also be adversely impacted.

*Have the uncertainties relating to costs and benefit delivery been explored and mitigated? Have flexible, lower risk and modular solutions been assessed – including where utilisation will be low?*

Optioneering was carried out when the investment was approved at PR19.

*Has the company secured appropriate third-party funding (proportionate to the third party benefits) to deliver the project?*

Third-party funding and delivery are not relevant to these investments.



*Has the company appropriately presented the scheme to be delivered as Direct Procurement for Customers (DPC) where applicable?*

Assessment of the potential application of DPC was conducted when the investment was approved at PR19.

*Where appropriate, have customer views informed the selection of the proposed solution, and have customers been provided sufficient information (including alternatives and its contribution to addressing the need) to have informed views*

Customers' views were taken into account in approving the investment at PR19.

## **Customer protection (where appropriate)**

*Are customers protected (via a price control deliverable or performance commitment) if the investment is cancelled, delayed or reduced in scope?*

Customers are protected via the treatment works compliance performance commitment, which returns money to customers if the companies' treatment works fail to meet their permit conditions. Other performance commitments may also be adversely impacted.

*Does the protection cover all the benefits proposed to be delivered and funded (eg primary and wider benefits)?*

Yes.

*Does the company provide an explanation for how third-party funding or delivery arrangements will work for relevant investments, including the mechanism for securing sufficient third-party funding?*

Third-party funding and delivery are not relevant to these investments.

## Appendix A1 – Oxera’s analysis of the efficient cost of P removal schemes

The first part of this appendix summarises the average annual opex for sites in the current AMP 7 period (in 2017/18 prices), based on the first year in which they are fully operational (as reported in the Table 7F data).

In short, we estimate annual opex as a scheme’s first full year’s opex and focus on traditional P removal schemes (separately from catchment areas, which have different cost profiles – as described below). The efficient annual opex is calculated as the upper quartile efficiency benchmark, based on the distribution average scheme AMP 7 P removal enhancement opex across companies for two sub-sets of AMP7 schemes. We conduct this analysis separately for schemes with tight consents (of 0.5 mg/l or less), and those with less tight consents. We also conduct the same analysis considering two different time periods: (i) considering only scheme reporting actual annual opex (and thus already completed by 2021/22) and (ii) considering the broader set of schemes to be completed in the current AMP7 period.

The main elements of our approach are summarised below, and should be read alongside the accompanying Stata do-file (*ANH4.3 – P removal\_by site opex benchmarking analysis.do*) and the underlying Excel dataset constructed based on company APR data (*ANH4.4 - stata p-removal\_opex benchmarking data.xls*). The sample considered and any necessary assumptions and adjustments made based on the underlying data are as follows:

- **Data set considered:** We consider company APR data as received from Anglian Water as at February 2023. This dataset did not include HDD and we are aware that Ofwat has since requested improvements to company submissions on the data, as submissions were in some places either incomplete and/or inconsistent with values obtained by the Environment Agency (EA) at the time of PR19. The estimates are thus preliminary, based on the best data available at the time (and should be updated as and when updated, more complete table 7F data becomes available).
- **Data adjustments:** We have made minimal adjustments to company APR data – reserved only for instances of clear and obvious reporting errors. This includes: (i) only considering sites that report opex within the AMP7 period, (ii) correcting SRN’s seeming misreported capex after 2024/25 (as they seem to have incorrectly reported the aggregate of their earlier AMP 7 capex, instead of the capex still to be incurred after 2024/25), (iii) coding instances where sites report negative opex to zero, and (iv) merging duplicate reported schemes. We also exclude observations that are clearly not individual AMP7 P removal schemes. All these adjustments are clear in the accompanying Excel constructed dataset and Stata do files.
- **Treatment of missing cost-driver data:** Note that we have not made adjustments for incomplete cost driver data (most notably for SVH and YKY, who only seem to report cost drivers for completed sites). Our categorisation of schemes into those with tight consents ( $\leq 0.5$  mg/l) and not so tight consents ( $> 0.5$  mg/l) assumes that all sites that do not report consent levels have not so tight consents.
- **Inflation assumptions:** On a historical basis (2019/20 to 2021/22), we use the ONS CPIH series as used by Ofwat in its latest base cost consultation datasets. For 2022/23, we update the series with the latest available data directly from the ONS. On a forward-looking basis, we forecast the CPIH series from 2023/24 to 2025/26 based on Ofwat’s latest draft financial model.
- **Real cost conversions:** We use the actual and forecast CPIH series above to convert companies annual capex and opex costs (as reported in the Table7F APR data) to real values, all in 2017/18 prices. Note that for both the total remaining scheme capex- and ongoing annual scheme capex after 2024/25, we use the CPIH forecasted for 2025/26 to convert values to 2017/18 terms.
- **Identifying catchment areas:** We identified schemes that are clearly catchment areas (or some other type of nature-based solution, treated equivalently here), and treat them separately than traditional P removal sites (discussed above). However, the table 7F data at the time of use did not include an explicit column in which companies indicated whether a site is a catchment area. We thus identified catchment areas based on (i) scheme names (which would in some instances indicate whether a site is a catchment area) and/or (ii) comments in the cost driver columns (where catchment solutions would often have both a backstop and stretch P removal limit, for example). It is

possible that some underlying catchment areas, i.e. those that had no indication as such in the data, may have been incorrectly categorised under traditional schemes.

- **Separate treatment of catchment areas and from traditional p-removal schemes:** For traditional sites we take the relevant opex to be the first full year for which opex is reported (as opposed to catchment solutions, where we take the period average – given costs here fluctuate more on a year-to-year basis).
- **Definition of first full year costs:** For traditional schemes, the first full year is taken as either the first or second year in which a site reports opex – depending on which is higher. The assumption is that if opex is lower in year one, this may be due to the fact that the site was only operational for part of that year (and not reflective of full operational costs).

The main results are summarised below for each of the two respective periods and type of consent stringency considered:

- **Sites currently operational:** This considers all sites reporting opex by 2021/22, thus those delivered so far in AMP7 (in the strict sense). The sample of sites is fairly small – only 83 sites (or 9% of those reported in the table 7F data). We break down annual unit costs by traditional scheme and catchment area, and within traditional by those with tight consents (<0.5 mg / L) and those that do not have tight consents. ANH only has traditional sites, and catchment sites are considered separately given their much higher costs (£681 k per annum). The table below summarises how ANH site costs compare to the industry average (that is, all site costs divided by the number of sites):

	Traditional sites (all)		Tight consent		Not tight consent	
	Average annual opex	Nr of sites	Average annual opex	Nr of sites	Average annual opex	Nr of sites
<b>ANH</b>	0.040	12	0.047	7	0.031	5
<b>Industry</b>	<b>0.06</b>	<b>79</b>	<b>0.076</b>	<b>24</b>	<b>0.054</b>	<b>55</b>
<b>% difference</b>	<b>-34%</b>		<b>-38%</b>		<b>-43%</b>	
<b>Upper quartile</b>			<b>0.053</b>		<b>0.031</b>	

- **All sites expected operational in AMP7:** This benchmarks ANH costs to all sites reporting opex by 2024/25, thus all those expected to be operational within AMP7. This sample of sites is much larger: 611, or 66% of sites reported. The main results are as follows:

	Traditional sites (all)		Tight consent		Not tight consent	
	Average annual opex	Nr of sites	Average annual opex	Nr of sites	Average annual opex	Nr of sites
<b>ANH</b>	0.059	162	0.084	84	0.032	78
<b>Industry</b>	<b>0.111</b>	<b>607</b>	<b>0.108</b>	<b>207</b>	<b>0.112</b>	<b>400</b>
<b>% difference</b>	<b>-47%</b>		<b>-22%</b>		<b>-72%</b>	
<b>Upper quartile</b>		<b>607</b>	<b>0.090</b>	<b>207</b>	<b>0.034</b>	<b>400</b>

## Appendix A2 – Oxera’s implicit allowance estimate

The second part of this appendix summarises the implicit allowance (IA) of Ofwat’s proposed wastewater network plus (WWNP) models for PR24 for the ongoing costs of AMP7 P removal schemes over the AMP8 period. We calculate the IA by comparing the triangulated efficient modelled costs for AMP8 with and without ongoing AMP7 P removal costs.

The cost drivers forecasts used for the purpose of the calculation of the IA are exactly the same as those used for the CAC for large sewage treatment works. The different steps of the IA calculation are summarised below (to be read with the accompanying Stata do file named ‘ANH4.5 – Implicit allowances analysis.do’ and Appendix 2 of the summary Excel workbook ‘ANH4.2 – CAC calculations P removal opex.xls’):

- **Remove AMP7 ongoing P removal costs** (variable *B0321PRO\_SWT*) from companies’ SWT and WWNP BOTEX plus in order to run models with and without P removal costs.
- **Obtain coefficients for Ofwat consultation models with and without P removal costs.**
- **Obtain cost driver forecasts for AMP8** (summarised in the accompanying Excel workbook<sup>24</sup>). Depending on the cost drivers considered, three different types of projections have been made, namely:
  - A linear extrapolation of the trend observed over 2011/12-2021/22 for each company with the aim of replicating Ofwat’s PR19 approach. This applies to properties, sewer length, total load, pumping capacity, WAD LAD from MSOA and WAD MSOA.
  - When a trend appears ambiguous/less obvious we have retained the 2022 value for the whole duration of AMP8. This applies to economies of scale and treatment complexity variables (WATS, load treated in STWs larger than a p.e. of 100,000, load treated in bands 1-3 and load treated with ammonia consents lower than 3mg/L.
  - When the variable is highly volatile from one year to another, i.e. for urban rainfall, we have extrapolated forward the average observed over the last four years.
- **Estimate Anglian’s efficient modelled costs over AMP8 with and without the relevant ongoing P removal costs based on industry cost driver forecasts.** In each case, we apply a UQ efficiency challenge estimated with the last five years of data (2017/18-2021/22) in line with Ofwat’s guidance.
- **Calculate the IA for ANH as the difference between AMP8 efficient modelled costs with and without P removal costs.**
- **Convert the IA in 2022/23 prices.**

As shown in the table below, we estimate the IA for ANH from the current consultation models to be -£0.71 million over AMP8 (in 2022/23 prices). That is, ANH would receive a greater allowance if Ofwat’s current consultation models did not include the AMP7 P removal enhancement opex over 2020/21 and 2021/22, as is currently the case.

	With P removal	Without P removal
<b>ANH efficient predicted costs (£m)</b>	1,823.75	1,824.46
<b>IA (£m)</b>		-0.71

This is the result of changes in the UQ challenge based on the remodelling without the relevant P removal costs, which counteracts (and has a relatively greater effect on) the impact of the marginally lower costs in the models without P removals.

<sup>24</sup> See the accompanying Excel workbook, sheet *Annexes\_Oxera calculations>>>A2\_Implicit allowance>>add. model inputs and outputs>>Cost driver forecasts* in ANH4.2 – CAC calculations P removal opex.xls