

SRN22 Network and WTW Growth Cost Adjustment Claim

2nd October 2023

Version 1.0



from
**Southern
Water** 

Contents

| | |
|--------------------------------------------------------------------------------------------------------------------|----|
| Contents | 2 |
| Cost Adjustment Claim: Wastewater Growth | 4 |
| What is the claim for? | 4 |
| 1. Need for Adjustment | 6 |
| 1.1. Why is Southern Water Unique? | 6 |
| 1.2. Management Control? | 7 |
| 1.3. Materiality of Claim? | 7 |
| 1.4. What are the adjustments to the allowances? | 8 |
| 1.4.1. Adjustment for network and treatment growth to take account of the above-average forecast housing growth | 8 |
| 1.4.2. Atypical Investment in treatment works at growth hotspots | 12 |
| 2. Cost Efficient | 15 |
| 2.1. Symmetrical adjustment for network and treatment growth | 15 |
| 2.2. Atypical Investment at growth hotspots | 15 |
| 3. Need for Investment | 17 |
| 4. Best Option for Customers | 20 |
| 5. Customer Protection | 27 |
| References | 28 |
| Appendix 1 | 29 |
| Identification of atypical wastewater treatment works growth schemes in AMP8 | 29 |
| Appendix 2 | 30 |
| Industry average unit costs for growth at treatment works | 30 |
| Appendix 3 | 31 |
| Forecasted number of new connected properties in 2025 | 31 |

List of Tables and Figures

| | |
|---------------------------------------------------------------------------------------------------------------------------|----|
| Table 1: Materiality Thresholds | 7 |
| Table 2: Materiality of Claim | 8 |
| Table 3: The forecasted number of new connected properties based on historical growth rate, by company | 9 |
| Table 4: The forecasted number of new connected properties based on ONS forecast annual growth rate (2025-30), by company | 10 |
| Table 5: Growth unit cost per new property connected | 11 |
| Table 6: Value the wastewater growth net adjustment | 12 |
| Table 7: Identification of schemes with high growth and atypical investment requirements | 13 |
| Table 8: Additional capacity to be delivered and the incremental cost of each | 14 |
| Table 9: Derivation of the net value claim for wastewater atypical investment | 15 |
| Table 10: Breakdown of costs for preferred scheme at Whitfield | 16 |
| Table 11: Breakdown of costs for preferred scheme at Sellindge | 16 |
| Table 12: Breakdown of costs for preferred scheme at Thornham | 16 |
| Table 13: Whitfield Urban Expansion solution options | 23 |
| Table 14: Otterpool Park solution options | 25 |
| Table 15: Thornham WTW solution options | 26 |
| Table 16: Identification of atypical wastewater treatment works growth schemes in AMP8 | 29 |
| Table 17: Unit cost for growth at treatment works per new population equivalent (PE) served | 30 |
| Table 18: Forecasted number of new connected properties in 2025 based on ONS household growth rate, by company | 31 |
| Figure 1: Customer support for solutions to a growing population | 19 |
| Figure 2: Whitfield Urban Expansion showing proximity to Port of Dover and associated strategic infrastructure | 21 |
| Figure 3: Broomfield Bank from above – an underground treatment works | 22 |
| Figure 4: Broomfield Bank entrance to underground treatment works | 22 |

Cost Adjustment Claim: Wastewater Growth

| Name of claim | Wastewater growth |
|----------------------------------------------------|-------------------|
| Business Plan Tables where botex claim is reported | CWW18 |
| Price control the claim relates to | WWN+ |
| Total gross value of claim for AMP8 | £161m |
| Total implicit value of claim for AMP8 | £60m |
| Total net value of claim for AMP8 | £98m |
| Materiality for relevant price controls | £33m |
| DPC? | No |

What is the claim for?

As established by Ofwat at PR19, and confirmed by the CMA, Ofwat's econometric models provide an allowance for wastewater network reinforcement based on sector average historical growth rates in housing. According to ONS forecasts (the same data source used by Ofwat at PR19 Final Determinations when evaluating growth related costs), the Southern region will experience higher than historical average growth in AMP8. This means that the Ofwat models will provide insufficient allowances to accommodate growth in our region.

This claim covers both the additional funding required for above average growth to our network and the above average investment required at three sites to ensure there is sufficient capacity for the forecast exceptional housing growth. This is required in AMP8 to ensure we can continue complying with our statutory requirements.

Ofwat has confirmed in the April 2023 base cost model consultation that the network reinforcement costs will be part of the base cost models.¹ Ofwat has also indicated that it will retain costs for growth at wastewater treatment works in the base models if it cannot find a robust standalone model. This claim assumes that Ofwat will keep cost for growth at wastewater treatment works in the base models at PR24, as it did at PR19. If instead a standalone enhancement model is used, this component of the claim will no longer be applicable, and we will revert to the Growth a Wastewater Treatment Works enhancement business case (SRN44 Wastewater Growth), which include the costs at the three sites requiring above average growth-related investment listed above.

| Test | Brief summary of evidence to support claim |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Need for cost adjustment | <p>If Ofwat maintains its PR19 modelling approach, an adjustment is needed to account for higher than average housing growth in the Southern region. During AMP8 this results in c.15,000 (or 20%) more properties than the Ofwat models provide an allowance for.</p> <p>To avoid detriment in the service we provide to our customers, we need additional allowances in AMP8 to:</p> <ul style="list-style-type: none"> Expand our sewer network capacity to deal with more houses connected into our system; and <p>Increase capacity at three wastewater treatment works in areas of high housing growth.</p> |
| Uniqueness | <p>We operate in a region where expected housing growth is significantly above the historical industry average. Due to this, we also have three sites which are near capacity and require atypical investment in response to higher growth.</p> |
| Management Control | <p>Housing growth is outside management control. Three treatment works are reaching full capacity due to high housing growth, which cannot be accommodated through incremental expansion.</p> |
| Materiality | <p>The claim is material at 3.00% of the forecast AMP8 WWN+ business plan totex allowances.</p> |
| Adjustment to allowances | <p>The net value of the claim is £97.882m, resulting from a net adjustment of £10.639m for network reinforcement (calculated as a symmetrical adjustment) and £87.243m for expenditure to expand capacity in three treatment works (calculated as atypical investment).</p> |
| Cost Efficient | <p>We have benchmarked the network reinforcement adjustments at the industry upper quartile unit cost rate, using Ofwat published data. Cost estimates for the three treatment works are derived using SWS's cost curves, based on previous similar works with additional efficiency factors applied to prevent duplication of indirect costs.</p> |
| Need for Investment | <p>The investment is needed to ensure there is no detriment to customers and the environment in AMP8. Customers support investment to address population growth.</p> |
| Best option for customers | <p>Optioneering has shown expansion at the three sites is the best option and has customer support. This test is not applicable for the symmetrical modelling adjustment.</p> |
| Customer Protection | <p>For network reinforcement, customers nationally are protected by a symmetrical adjustment across the industry. For capacity expansions, our customers will be protected against non-delivery by a PCD.</p> |

1. Need for Adjustment

1.1. Why is Southern Water Unique?

Our claim covers the investment needed for the above average housing growth in our region. This includes growth-driven investment in both our network and in wastewater treatment works. The claim covers:

- Modelling adjustment to accommodate the effect of above-average housing growth on network reinforcement and growth at wastewater treatment works; and
- Atypical investment in three sites to ensure there is sufficient capacity for the expected exceptional housing growth.

Over the 5 years of AMP8 (2025-30), housing in the Southern Water region is projected to grow at 0.85% per year¹¹, which is the highest in the industry (see Table 3 in Section 1.4). Ofwat's econometric models do not take account of the variation in housing growth across the country. As such, the models estimate a unit cost for botex using average growth rate during the sample period, which is 0.71% per year (see Appendix 1). However, the unit cost is higher for companies with an above average growth rate, mainly due to the positive correlation over time between housing growth rate and growth-driven costs. Therefore, the models provide insufficient allowance for companies operating in high growth regions and excess allowance for companies operating in low growth regions. This was the case at PR19 and if Ofwat does not change the approach, the error will be exacerbated.

We are proposing to quantify the claimed amount for additional network and typical wastewater growth costs as a symmetrical adjustment to account for the variations in growth, as Ofwat applied at PR19. This would provide an adjustment to the Ofwat base allowance depending on each company's level of housing growth, relative to the historical average for the sector. Specifically, the symmetrical adjustment would allow an upward adjustment for companies with expected high growth in 2025-30, and downward adjustments for companies with expected low growth in 2025-30 relative to the historical sector average.

Due to the historical high housing growth in Southern Water's region and more acutely in three hotspots of strategic future growth, we also need atypical investment to expand capacity at three of our wastewater treatment works. These sites are located in areas of high forecast housing growth and environmental constraints require enhanced treatment to accommodate growth, given that they are reaching their full capacity. This investment cannot be accommodated through typical incremental capacity growth at the sites and is required in AMP8 to provide capacity for the high levels of population growth forecast.

This means that the Ofwat models will provide insufficient allowances to accommodate growth at these treatment works. This is under the assumption that Ofwat will keep enhancement expenditure related to growth at wastewater treatment works as part of the base models at PR24, as it did at PR19. In its April 2023 base cost model consultation Ofwat indicated that growth at sewage treatment work enhancement costs will be considered in the base cost models at PR24, if a robust standalone model cannot be found. The three sites included in the claim are:

- A new wastewater treatment works (WTW) at Whitfield² to cater for strategic urban expansion, where we estimate at additional 15,240 population equivalent (PE);
- Atypical investment at Sellindge WTW to serve a new garden town at Otterpool Park³, estimated at an additional 16,000 PE;

- New processes at Thornham⁴ to both meet nutrient neutrality at Chichester Harbour and accommodate growth estimated at additional 8,500 PE growth.

Our estimates of PE growth at each of these sites are from a commercially obtained data set on housing growth derived from ONS data and information collected from local councils on housing plans published in their Local Plans (see Appendix 1).

Should Ofwat use a standalone enhancement model to assess growth at wastewater treatment works at PR24, the component of this claim related to the three sites above where atypical growth-related investment is needed will no longer be applicable and we will revert to the enhancement case on Growth at Wastewater Treatment Works (SRN44 Wastewater Growth), which covers also these three sites.

1.2. Management Control?

The level of housing growth is beyond management control. National Government set housing targets and local councils share the collective responsibility to plan and enable housing development. Local plans are made by the Local Planning Authority (LPA) and provide a framework for addressing housing needs and other economic, social and environmental priorities. We have a statutory duty to provide additional capacity to enable housing development and serve new customers without detriment. However, we are unable to recover the full marginal cost of treatment work expansion from specific developers in areas of high growth and rely on the Ofwat modelling to provide an efficient allowance for the quantum of growth. This aligns with the current charging framework whereby the recovery of network reinforcement and strategic assets are treated differently, with developers not contributing to the cost of strategic assets.

1.3. Materiality of Claim?

We have calculated the materiality threshold for the wastewater network plus price control, based on an early view of our AMP8 totex.

Table 1: Materiality Thresholds

| Price control | Expected AMP8 totex | Materiality threshold (%) | Materiality amount (£m) |
|---------------|---------------------|---------------------------|-------------------------|
| WWN+ | £3,268m | 1% | £33m |

The claim is material. We estimate Ofwat's implicit allowance provide for £59.612m of totex allowance. The additional costs above those provided by Ofwat's modelled base costs amount to £97.882m. This is 3.00% of the projected business plan totex for wastewater network plus (and is above the 1% threshold). This is comprised of two components:

- The costs of network and treatment works growth above industry average, at £10.639m net of implicit allowance; and
- Cost of atypical investment at three treatment works to serve growth at Whitfield, Sellindge and Thornham at £87.243m, net of implicit allowance.

Table 2: Materiality of Claim

| Price control | Threshold (£m) | Net value of the claim (£m) | Status |
|---------------|----------------|-----------------------------|--------|
| WWN+ | £33m | £97.882m | Pass |

Section 1.4 explains how we derived the cost of the claim gross and net of implicit allowances.

1.4. What are the adjustments to the allowances?

At PR19, Ofwat included network reinforcement and enhancement expenditure for growth at wastewater treatment works in its base cost models and made an off-model adjustment to the base allowance depending on whether the company operates in an area with a high/low forecast of housing growth, relative to the historical average for the sector. Southern Water received an additional off-model allowance for growth above the average forecasted number of connections.

If Ofwat retains costs with network reinforcement and growth at treatment wastewater works in base models at PR24, Southern Water needs a similar off-model allowance adjustment at PR24. According to ONS projections, Southern Water will face the highest annual household growth in 2025-30 in the sector (see Table 3).

Southern Water will also need atypical investment in three of its wastewater treatment sites that are operating at near full capacity and serving housing growth hot spots. Should Ofwat use a standalone enhancement model to assess growth at wastewater treatment works, this component of the claim will no longer be applicable and we will revert to the enhancement case on Growth at Wastewater Treatment Works (SRN44 Wastewater Growth), which covers also these three sites.

We quantify the value of these two components of the claim in turn below.

1.4.1. Adjustment for network and treatment growth to take account of the above-average forecast housing growth

As outlined in section 1.1, the costs of housing growth above the average historical growth rate for the industry, is not reflected in Ofwat’s assessment of botex requirements. This is despite Ofwat’s view that “differences in population growth rate can lead to differing levels of network reinforcement expenditure between companies and over time”.⁵ However, although Ofwat recognises the linkage between growth and network reinforcement, it does not address this in the econometric models.

Indeed, in the April 2023 base cost model consultation, Ofwat did not include a variable in the models to account for differences in population growth as CEPA found the coefficients to be insignificant and of the wrong sign (negative).⁵ This is partly because site specific developer services expenditure is excluded from modelled base costs at PR24. Our calculations below demonstrate that the impact of population growth on both network reinforcement and at treatment works is still significant, even excluding on-site costs, and that an off-model adjustment is still necessary.

The required adjustment for network and treatment works growth above the funded average, is £10.639m. We adopted the methodology applied by Ofwat in PR19⁶ to calculate this off-model adjustment as follows:

Step 1a. We calculate the forecasted number of connected properties in 2025, by multiplying the number of connected properties in 2022 (from the dataset Ofwat released for the base cost models consultation in April 2023⁷) by the ONS forecast of household growth rate from 2022 to 2025. These calculations are in Appendix 3.

Step 1b. We calculate the average industry historical growth rate of connected properties across the period 2011-12 to 2021-22 from the data set Ofwat released for the base cost models consultation in April 2023⁷. For wholesale wastewater, this is 0.71% per year.

Step 1c. We calculate the forecasted new connected properties across AMP8 by multiplying the 'number of connected properties in 2025' by the 'industry average historical growth rate' of 0.71% per year. For Southern Water, in the 5 years of AMP8, Ofwat's model would assume 74,688 new connected properties.

Table 3: The forecasted number of new connected properties based on historical growth rate, by company

| Company | Step 1a | Step 1b | Step 1c | |
|-------------------------|--------------------------------------------------------|------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| | Forecasted number of properties connected in 2025 (nr) | Industry average historical annual growth rate | Forecasted number of properties connected in 2030 (nr) | Forecasted new connected properties across AMP8 assuming industry average historical growth rate (nr) |
| | (1) | (2) | (3) = (1) x [(1+2) ⁵] | (4) = (3) – (1) |
| Anglian Water | 2,947,788 | 0.71% | 3,053,931 | 106,143 |
| Dwr Cymru | 1,504,572 | 0.71% | 1,558,748 | 54,176 |
| Hafren Dyfrdwy | | | | |
| Northumbrian Water | 1,309,159 | 0.71% | 1,356,299 | 47,140 |
| Severn Trent Water | 4,312,737 | 0.71% | 4,468,028 | 155,292 |
| South West Water | 793,554 | 0.71% | 822,128 | 28,574 |
| Southern Water | 2,074,223 | 0.71% | 2,148,911 | 74,688 |
| Thames Water | 6,259,977 | 0.71% | 6,485,384 | 225,407 |
| United Utilities | 3,480,771 | 0.71% | 3,606,106 | 125,335 |
| Wessex Water | 1,307,444 | 0.71% | 1,354,522 | 47,078 |
| Yorkshire Water | 2,379,805 | 0.71% | 2,465,496 | 85,691 |
| Industry average | - | 0.71% | | - |

Source: Ofwat base cost models consultation dataset April 2023⁷, and ONS household projections¹¹

Step 2a. We calculate the forecast annual growth rate of new properties for each company for 2025-30 based on Office for National Statistics (ONS) household growth rate projections. This is the same source that Ofwat used at final determination at PR19.⁶ For Southern Water, this is equal to 0.85% per year across AMP8.

Step 2b. We calculate the forecasted new connected properties across AMP8 by multiplying the 'forecasted number of connected properties in 2025' by the 'ONS forecast annual growth rate for AMP8'. For Southern Water, in the 5 years of AMP8 this amount to 89,516 new connected properties, 14,828 (20%) more than the current models provide for, a material difference.

Table 4: The forecasted number of new connected properties based on ONS forecast annual growth rate (2025-30), by company

| Company | Step 1a | Step 2a | Step 2b | |
|-----------------------|--------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| | Forecasted number of properties connected in 2025 (nr) | ONS forecast annual growth rate for AMP8 | Forecasted number of properties connected in 2030 based on ONS growth rate (nr) | Forecasted new connected properties across AMP8 assuming ONS growth rate |
| | (1) | (2) | (3) = (1) x [(1+(2))^5] | (4) = (3) - (1) |
| Anglian Water | 2,947,788 | 0.79% | 3,066,753 | 118,965 |
| Dwr Cymru | 1,504,572 | 0.54% | 1,545,559 | 40,987 |
| Hafren Dyfrdwy | | | | |
| Northumbrian Water | 1,309,159 | 0.32% | 1,318,111 | 8,952 |
| Severn Trent Water | 4,312,737 | 0.63% | 4,450,155 | 137,419 |
| South West Water | 793,554 | 0.71% | 822,089 | 28,535 |
| Southern Water | 2,074,223 | 0.85% | 2,163,739 | 89,516 |
| Thames Water | 6,259,977 | 0.84% | 6,528,753 | 268,776 |
| United Utilities | 3,480,771 | 0.41% | 3,552,964 | 72,193 |
| Wessex Water | 1,307,444 | 0.76% | 1,357,816 | 50,371 |
| Yorkshire Water | 2,379,805 | 0.47% | 2,436,326 | 56,522 |

Source: (*) Ofwat base cost models consultation dataset April 2023⁷ and ONS household projections¹¹

Step 3. We determine the benchmark historical growth unit cost based on the upper quartile company using expenditure for growth at sewage treatment works (excluding sludge treatment) and network reinforcement. We use data from the dataset Ofwat released for the base cost models consultation in April 2023. For wholesale wastewater, this is £717.48 per new connected property in 2022-23 prices. We use the upper quartile company as it is the same approach that Ofwat used at PR19.

Table 5: Growth unit cost per new property connected

| Company | Total growth expenditure (2011-22) (£m) ¹ | Number of new wastewater properties connected (2011-22) ² | Unit cost (£/new property connected) |
|-----------------------|------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------|
| | (1) | (2) | (3) = (1) / (2) |
| Anglian Water | 330.08 | 218,179 | 1,512.90 |
| Dwr Cymru | 137.13 | 86,524 | 1,584.86 |
| Hafren Dyfrdwy | | | |
| Northumbrian Water | 47.37 | 72,692 | 651.66 |
| Severn Trent Water | 135.83 | 236,697 | 573.88 |
| South West Water | 83.64 | 60,104 | 1,391.65 |
| Southern Water | 131.61 | 99,245 | 1,326.08 |
| Thames Water | 367.91 | 396,439 | 928.03 |
| United Utilities | 183.02 | 179,524 | 1,019.48 |
| Wessex Water | 65.49 | 71,582 | 914.91 |
| Yorkshire Water | 20.59 | 115,745 | 177.93 |
| | | Upper quartile | 717.48 |
| | | Median | 973.76 |

Sources: Ofwat base cost models consultation dataset, April 2023⁷

Notes:

¹ Growth expenditure includes expenditure related to growth at sewage treatment works (S3021CAS_21) and expenditure with network reinforcement (B0200DSISWCWWC).

² Number of new wastewater connections is the sum of new household (BP3410) and new non-household (BP3415) properties connected during the year.

Step 4a. We calculate the variance in forecasted connected properties as the difference between 'forecasted new connected properties assuming industry average historical growth rate' (step 1c) and 'forecasted new connected properties assuming ONS growth rate' (step 2b).

Step 4b. We calculate the net adjustment by multiplying the variance in forecasted new connected properties (step 4a) and the unit cost of £717.48 (step 3).

We calculate the downward growth unit rate adjustment in the same way as the upward growth unit rate adjustment, as carried out by the CMA at PR19⁸, (rather than applying a 50% reduction, which was the Ofwat approach at PR19 final determination).

We applied this as a symmetrical adjustment to all companies to ensure customers are protected across the industry.

Table 6: Value the wastewater growth net adjustment

| Company | Step 1c Forecasted new connected properties across AMP8 assuming industry average historical growth rate (nr) | Step 2b Forecasted new connected properties across AMP8 assuming ONS growth rate (nr) | Step 4a Variance in forecasted connected properties relative to historical industry average | Step 3 Efficient unit cost (£/new property connected) | Step 4b Wastewater growth net adjustment (£m) |
|-----------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------|
| | (1) | (2) | (3) = (2) – (1) | (4) | (5) = (3) x (4) |
| Anglian Water | 106,143 | 118,965 | 12,822 (12%) | 717.48 | 9.20 |
| Dwr Cymru | 54,176 | 40,987 | -13,189 (-24%) | 717.48 | -9.46 |
| Hafren Dyfrdwy | | | | | |
| Northumbrian Water | 47,140 | 8,952 | -38,188 (-81%) | 717.48 | -18.62 |
| Severn Trent Water | 155,292 | 137,419 | -17,873 (-12%) | 717.48 | -12.82 |
| South West Water | 28,574 | 28,535 | -39 (0%) | 717.48 | -0.03 |
| Southern Water | 74,688 | 89,516 | 14,828 (20%) | 717.48 | 10.64 |
| Thames Water | 225,407 | 268,776 | 43,369 (19%) | 717.48 | 31.12 |
| United Utilities | 125,335 | 72,193 | -53,142 (-42%) | 717.48 | -38.13 |
| Wessex Water | 47,078 | 50,371 | 3,293 (7%) | 717.48 | 2.36 |
| Yorkshire Water | 85,691 | 56,522 | -29,170 (-34%) | 717.48 | -20.93 |

Source: Ofwat base cost models consultation dataset April 2023⁷ and ONS household projections.¹¹

The implicit allowance is £53.587m. This is derived by multiplying the 'forecasted new connected properties across AMP8 assuming industry average historical growth rate' (step 1c) by the efficient unit cost of £717.48. Therefore, the gross value of the claim is £64.226m, which is equal to the net adjustment (£10.639m) plus the implicit allowance (£53.587m).

1.4.2. Atypical Investment in treatment works at growth hotspots

We are forecasting significant population growth across the whole of our region to 2040. We also have some sites which have atypical investment due to both the extent of housing growth in the area and the environmental constraints requiring enhanced treatment to accommodate growth given that they are reaching their full capacity.

Three sites have been identified which have:

- Projected localised growth significantly higher than across the region as a whole and far in excess of the average national population growth; and
- Have high investment costs due to atypical solutions and investment.

We identified these three sites by analysing our Drainage and Wastewater Management Plan (DWMP) and selecting sites with high growth and requiring atypical investment. We identified the sites with atypical investment by reviewing the list of our 34 wastewater treatment works with investment needs in AMP8 and applying the step-wise methodology below. The full list of 34 sites and the outcome of the criteria applied can be found in Appendix 1.

Step 1. We identified catchments with above 40% forecasted growth in Population Equivalent (PE) between 2022 and 2040 (significantly above the cumulative average growth rate of 16%, which is equivalent to the average 0.63% annual growth rate forecasted by the ONS, as shown in Table 4).

Step 2. We identified schemes where the forecasted investment is exceptionally high. These are sites where the forecasted investment per additional PE capacity (£/PE) is above £1,000/PE, which is almost four times greater than the industry average £254/PE as calculated in Appendix 2; and

Step 3. We reviewed the shortlist to identify the schemes which required atypical solutions such as requiring new treatment works or abnormal treatment processes necessary to achieve new discharge consent conditions.

As a result of this three-step option selection process, we identified three schemes which have high growth, exceptionally high investment and atypical solutions. These are identified in Table 7.

We will continue to examine our short list of wastewater treatment schemes with high growth and demonstrable high forecasted investment per additional PE capacity to identify whether any others require atypical investments and should be added to this claim.

Table 7: Identification of schemes with high growth and atypical investment requirements

| Catchment | Current PE Served | Forecast PE in 2040 | Growth in (P.E.) from 2022 to 2040 | Growth (%) | Atypical Scheme |
|-----------|-------------------|---------------------|------------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Whitfield | n/a | 18,715 | 18,715 | n/a | New WTW with new long sea outfall |
| Sellindge | 5,241 | 21,299 | 16,058 | 306% | EA's permit levels require to go below 'technically achievable limits' (TAL). This requires non-conventional treatment processes. |
| Thornham | 20,473 | 29,026 | 8,553 | 42% | |

When determining the additional capacity to be provided, a design horizon of ten years beyond the end of the funding AMP period is chosen. Therefore, when considering design parameters for sites requiring a growth scheme in AMP8, the forecast PE by 2040 is used. This ensures repeat sub-optimal investments in subsequent AMP periods is minimised, while balancing the increasing uncertainty of growth projections as time goes on.

Table 8: Additional capacity to be delivered and the incremental cost of each

| Scheme | Maximum Current Capacity (PE) | Forecast Capacity required in 2040 (PE) | Additional Capacity to be Delivered (PE) | Total Cost of Scheme (£m) | Incremental Cost (£/PE) |
|-----------|-------------------------------|-----------------------------------------|------------------------------------------|---------------------------|-------------------------|
| Whitfield | n/a | 15,240 | 15,240 | 54.632 | 3,585 |
| Sellindge | 8,700 | 21,299 | 12,599 | 20.467 | 1,624 |
| Thornham | 23,409 | 29,026 | 5,617 | 18.169 | 3,235 |

Source: Appendix 1

The costs required to build a new works at Whitfield and expand the wastewater treatment works at Sellindge and Thornham are a material driver of this expenditure. We acknowledge that we are expected to deal with uneven and lumpy investment, which is funded over different AMP periods, but the challenges at Whitfield, Sellindge and Thornham are unusual and significant. They are hotspots of strategic growth which require atypical investment for new and extensive treatment processes necessary to achieve new discharge consents in an ecologically sensitive part of the UK.

Historically, we have been able to accommodate growth through incremental investment at our wastewater treatment works (WTWs), generally by removing process bottlenecks or increasing treatment capacity. This is not possible for Whitfield, Sellindge and Thornham which all have high growth and atypical investment needs to deliver sufficient capacity and meet discharge consents. In AMP8, the size of these three developments will have passed the threshold beyond which incremental network and standard expansion will be sufficient, and at which point more substantial and highly atypical investment solutions are required. To illustrate the highly atypical nature of these requirements, Whitfield will be our first new greenfield Wastewater Treatment Works as a result of growth since before privatisation.

To calculate the net value of the claim for each site we undertook the following steps:

1. Obtain the expenditure on growth at treatment works (S3021CAS_21) over the 2011-12 to 2021-22 period from the Ofwat April 2023 base cost model consultation dataset.
2. Calculate the change in population equivalent served (BN1603) between 2011-12 and 2021-22, from the Ofwat April 2023 base cost model consultation dataset.
3. Derive the unit cost (£/additional PE) for each company by dividing one by the other.
4. Use the upper quartile across the industry as the unit cost that is funded in the base cost models, as calculated in Appendix 2. This gives an implicit unit cost allowance of £180.08/PE in 2022-23 prices.
5. Calculate the implicit allowance by multiplying this unit cost by the total expected PE added at each site.
6. Calculate the net cost adjustment claim by deducting the implicit allowance from the forecasted cost of each scheme.

Table 9 summarise the results of the steps described above.

Table 9: Derivation of the net value claim for wastewater atypical investment

| Site/Scheme | Additional Capacity to be Delivered (PE) | Total Cost of Scheme (£m) | Implicit Unit Cost Allowance (£/PE) | Implicit Allowance (£m) | Net Cost Adjustment Claim (£m) |
|--------------|------------------------------------------|---------------------------|-------------------------------------|-------------------------|--------------------------------|
| Whitfield | 15,240 | 54.632 | £180.08 | 2.744 | 51.888 |
| Sellindge | 12,599 | 20.467 | £180.08 | 2.269 | 18.198 |
| Thornham | 5,617 | 18.169 | £180.08 | 1.012 | 17.157 |
| Total | 33,456 | 93.268 | | 6.025 | 87.243 |

2. Cost Efficient

2.1. Symmetrical adjustment for network and treatment growth

For the adjustment related to network and treatment growth above industry average, we calculated the off-site unit cost per connection based on the upper quartile of company expenditure. We followed Ofwat's PR19 methodology and used historical costs from 2011 onwards from the PR24 Cost Assessment Master Dataset, April 2023,⁷ to produce an average connection cost (see Table 5 above). We included expenditure in growth at sewage treatment works (excluding sludge treatment) and wastewater network reinforcement to calculate the connection unit cost.

As with the Ofwat's adjustment at PR19, the overall adjustment is not symmetrical. However, the overall adjustment is negative, i.e. in favour of customers.

2.2. Atypical Investment at growth hotspots

The wastewater treatment schemes at Whitfield, Sellindge and Thornham have been identified as requiring above average atypical of investment.

Net direct cost estimates for the 3 schemes have been derived by SWS' costing team using cost curves for specific items as identified in the high-level design carried out by our design team. Net direct costs are those associated with installing an asset, typically labour and plant materials, and are derived from either process function or asset equipment cost curves, top down or bottom-up estimates from suppliers and other sources such as specialist quotations. Further information on estimating direct costs can be found in Section 13 of Enhancement Cost Estimation and Optioneering: Technical Annex

The Equipment Set Cost Curves were updated with applicable, up-to-date captured data, curves were generated that are a mix of AMP7 and AMP6 data. Where sufficient data points were unavailable to create a purely AMP7/6 model, a curve was generated via a mix with historic AMP5 data, uplifted in line with a Water Industry based Basket of Goods. Additionally, historic curves with little to no new data points were uplifted to current price base using the same Basket of Goods to reduce the formation of gaps through the Equipment Set and provide consistency. Throughout the process, outlying data points from the cost capture process were considered and removed to ensure the curves represent the asset comprehensively.

Taking into account the level of design maturity, complexity, and quality of cost data for each high-level design, a tool was used to apply cost risk, overhead and indirect (e.g. project management, risk) cost uplifts to the net direct work cost to determine an overall project cost estimate.

In addition, where other work is planned at the WTW for AMP8 outside of growth (for example to meet a WINEP driver), an additional efficiency factor was applied to prevent duplication of project indirect costs for Sellindge (25% efficiency factor) and Thornham (10% efficiency). There is no WINEP-related investment at the new Whitfield treatment works and therefore we do not apply a WINEP efficiency factor to the costing.

Our business plan submission includes a technical annex enhancement cost estimation and optioneering which explains the rationale and provides benchmarking evidence for the uplifts and efficiency factors applied to these net direct costs.

Table 10: Breakdown of costs for preferred scheme at Whitfield

| Site | Solution | Cost (£m) |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Whitfield | Sewer upgrades to transfer flows from new development to the new WTW | 18.0 |
| | New WTW including 1.9ha land purchase. Treatment process is Activated Sludge Process (ASP) treating up to 105l/s, 530m3 of storm storage, and sludge thickening and storage. | 30.3 |
| | New connections to existing long sea outfall at Broomfield Bank WTW | 6.3 |
| | Total | 54.6 |

Table 11: Breakdown of costs for preferred scheme at Sellindge

| Site | Solution | Cost (£m) |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Sellindge | Replace existing Sequencing Batch Reactor (SBR) with new Activated Sludge Process (ASP) and Membrane BioReactor (MBR), increasing capacity to treat up to 127l/s. | 10.6 |
| | Sludge thickening and associated power upgrades | 6.6 |
| | Sewer network upgrades | 3.3 |
| | Total | 20.5 |

Table 12: Breakdown of costs for preferred scheme at Thornham

| Site | Solution | Cost (£m) |
|----------|----------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Thornham | Replace the existing biological filter beds with a new Bardenpho Activate Sludge Plant (ASP) with chemical dosing for nutrient removal | 8.8 |
| | Groundworks | 5.5 |
| | Electrical Upgrades | 3.9 |
| | Total | 18.2 |

3. Need for Investment

To accommodate the growth above the historical industry average and avoid detriment in the service we provide to our customers, we will need additional allowances in AMP8 to:

- Expand our sewer network capacity to deal with the increased number of houses to be connected into our system; and
- Increase capacity at our wastewater treatment works, including three sites located in areas of high housing growth which require atypical investment above the level that the econometric models provide allowances. The three sites with exceptional high growth requiring atypical investment included in this claim are:
 - A new wastewater treatment works required to deal with strategic housing growth at the Whitfield Urban Expansion development². Without this investment in AMP8, the additional flow from housing growth would breach our statutory obligations with regard to providing capacity.
 - A new treatment process stream at Sellindge to service a new garden town at Otterpool Park³. As above, this investment is required in AMP8 to avoid breaching statutory obligations and environmental discharge permits.
 - A new treatment process at Thornham WTW to accommodate high growth discharging into Chichester Harbour, which is in a designated sensitive area for nutrients.⁴ This investment is proposed in AMP8 to provide additional capacity, whilst providing a long term solution given the strict permit requirements at this site.

Without this investment, the additional flow from the development would breach our statutory obligations (e.g. to provide capacity to new developments) and the environmental discharge permits. It would also impact our environmental and customer obligations through increased spills to the environment, increased flooding risk and impact on customer wellbeing.

Exceeding DWF at a site for 3 years out of a 5-year rolling period would result in that WTW being classed as failing, leading to enforcement from the EA for non-compliance with an Environmental Permit condition – a legal obligation Southern Water is required to meet. Failure to comply with this obligation would result in enforcement, prosecution, and significant detrimental impact to reputation.

In addition to the regulatory obligation enforced by the EA, a performance commitment for underperformance as a result of failing to invest in assets due to population growth is in place to recompense customers if performance expectations are not met.

Finally, failing to provide sufficient capacity for population growth would lead to detrimental environmental impact through increased nutrient and pollutant load being discharged, the reason for the above measures being in place.

Whitfield WTW

The Whitfield Urban Expansion (WUE) development is part of the Dover District Council strategic development plan. The investment would deliver additional treatment capacity of 15,240 PE at the new wastewater treatment works serving the Whitfield development. The investment is required to ensure that we can continue to meet our statutory duty to accommodate forecast growth, without harm to the environment whilst improving resilience.

A unique confluence of environmental, engineering and construction constraints mean that the lowest cost viable solution, is the provision of a new treatment works. This results in significant costs beyond the modelled allowances, making Whitfield an atypical case.

Upgrade of the existing treatment works at Broomfield Bank is constrained by rail infrastructure assets, two rail bridges and the requirement to build over the High Speed 1 Tunnel, presenting considerable construction risk and driving up costs. Additionally, Broomfield Bank WTW is constructed partially below ground and therefore incremental expansion is not practicable, cost efficient or likely to be viable within current local planning limitations (see Section 4).

These two factors mean that the incremental approach allowed for in the model is not suitable in this case. This places unacceptable risks on our statutory obligations, license conditions and customer expectations. Therefore, construction of a new WTW to service the Whitfield Urban Expansion separately has been identified as the best option (see section 5).

This solution is atypical investment requiring a new wastewater treatment works with above average investment costs (see Appendix 1). This is a highly unusual scenario which requires the exceptional solution of constructing a new treatment works. This is our first new greenfield Wastewater Treatment Works as a result of growth since before privatisation.

We originally submitted as a CAC at PR19 but withdrew it from our Business Plan as the required by date was borderline between AMP7 and AMP8. We deferred the investment to the latest point in the interests of customers, but it is now essential for the scheme to be delivered in AMP8.

Sellindge WTW

The Otterpool Park Garden Town development is part of the Folkstone and Hythe District Council Core Strategy⁹ and will provide at least 5,600 residential properties to the south of the M20 and HS1 (Channel Tunnel Rail Link) railway line, by 2037. Along with the residential properties, the site will also include significant commercial development including over 36,000m² of office space, 10,000m² of retail properties, and educational and medical facilities.

Due to this significant projected increase in population respective to the current population served by Sellindge WTW, capacity currently served at the treatment works will be exceeded by 306% by 2040. This cannot be accommodated by incremental increase of the current process.

Therefore, our preferred option is an entirely new wastewater (activated sludge) process stream at Sellindge WTW, running in parallel with the existing package plant on land owned by Southern Water. This solution is atypical investment requiring above average investment costs. Non-typical treatment options are required as the site permit conditions for phosphorous and nitrogen will need to go beyond Technically Achievable Limits.

Thornham WTW

Thornham WTW discharges into Chichester Harbour which is in a designated sensitive area for nutrients defined by the Environment Agency (EA) and as such has a Total Nitrogen (TN) permit limit of 10mg/l. To maintain load standstill and prevent deterioration on the watercourse due to an increase in permitted DWF, a reduction in permitted final effluent determinant limits would be required, including TN. The current Technically Achievable Limit (TAL) for TN is 10mg/l. The guidance document "PR24 WINEP driver guidance – Nitrogen Technically Achievable Limit" from the Environmental Agency states that "The current Technically Achievable Limit (TAL) for N remains around 10 mg/l". Reducing below this level would require special measures to be undertaken at the WTW with associated atypical investment costs.

The preferred solution requires a totally new treatment process at Thornham WTW, replacing the current filter beds with activated sludge processes. This option has been chosen as it provides the treatment capacity for this growth, whilst also providing the best long-term solution for ensuring the strict permit requirements at Thornham are met.

Without this investment, we would be at high risk of breaching our statutory obligations, with discharge above permitted TN levels into a harbour designated as a sensitive area for nutrients by the Environment Agency.

What our customers say

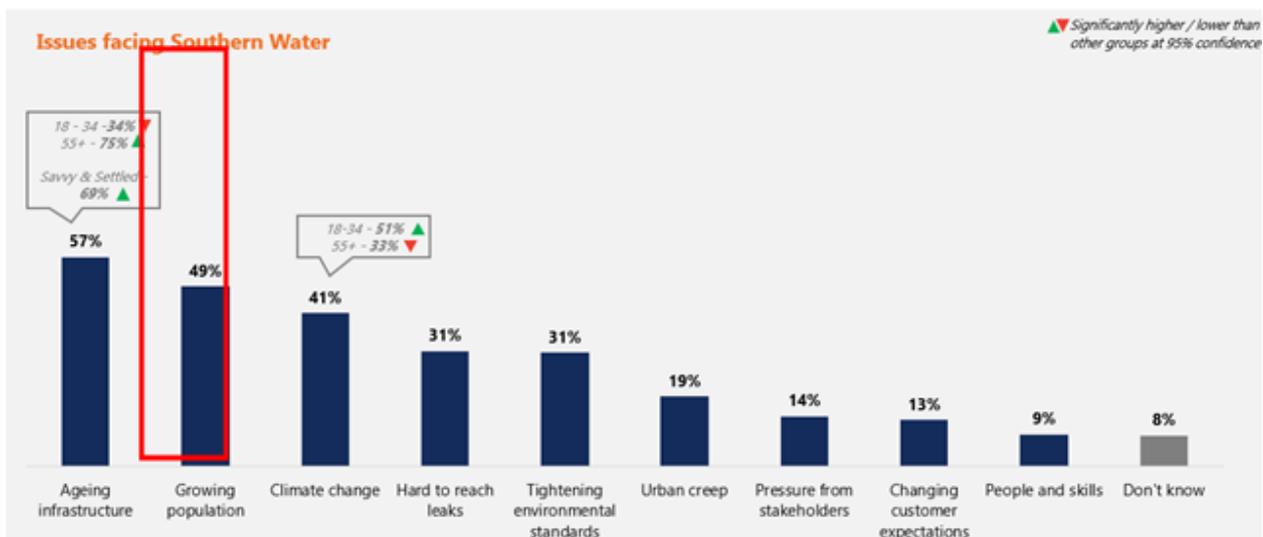
Our customers recognise that population growth in the South East is high. They want us to ensure infrastructure is developed to not just 'keep up' with growth but protect for future generations. For our stakeholders, development and new housing remains a top issue in our engagement and Southern Water is seen as central to the planning process.

Customers want to see solutions that feel logical and are more focused on the right option for the long term. They want solutions that can cope with increases in population and demand, and climate change for the years ahead. Customers, in general, do not support a quick fix (using the term 'sticking plaster' coming up during research) for important infrastructure. The Covid pandemic has further helped to highlight to customers the need to plan ahead. There is an underlying belief that the UK in general has been poor at forward thinking and investment planning.

In detailed review of our DWMP, our customers cited addressing ageing infrastructure combined with the impact of population growth and climate change as the most important issue for our plans. We see the same feedback when engaging less informed customers, with the top 2 issues for Southern Water being the ageing infrastructure and population growth.

Figure 1: Customer support for solutions to a growing population

There is a realisation that SW is facing considerable issues, especially related to an aging infrastructure and a growing population



Source: WF2030 Quant Wave 3, 1,010 customers across the region, March '23¹⁰

When engaging with our local communities, of 15 major population areas of our region – 57% have concerns about ageing infrastructure and 49% have concerns about population growth. For example, customers in central Kent are concerned at the over development and loss of green space. However, customers in Deal (close to the Whitfield site) feel there are too many houses being built without the proper infrastructure in place.

To support the best option, customers want reassurances that the right solutions have been explored. They want to see nature based and partnership options prioritised, but also understand a twin track of natural and traditional solutions are often needed. Customers want to see the infrastructure delivered in a sustainable way, that balances the need for the long term, innovation and technology with keeping bills affordable.

4. Best Option for Customers

In this section we cover the adjustments in relation to Whitfield, Sellindge and Thornham only. The test is not applicable for adjustment for network and treatment growth above-average forecast housing growth element of the claim.

Potential solutions at each site have been identified through a consistent optioneering process and evaluated through use of a scorecard. In developing a shortlist of options, we considered the following criteria:

- How well the solution meets business needs, including alignment with maintenance and operational goals, deliverability and affordability.
- Natural capital considerations, including interactions with the Water Framework Directive, Bathing Water Directive, land use, carbon sequestration, natural hazard regulations and biodiversity.
- Social capital considerations, including impact on public and stakeholder trust, and engagement with partner organisations.
- Level of risk reduction associated with the solution

Whitfield WTW

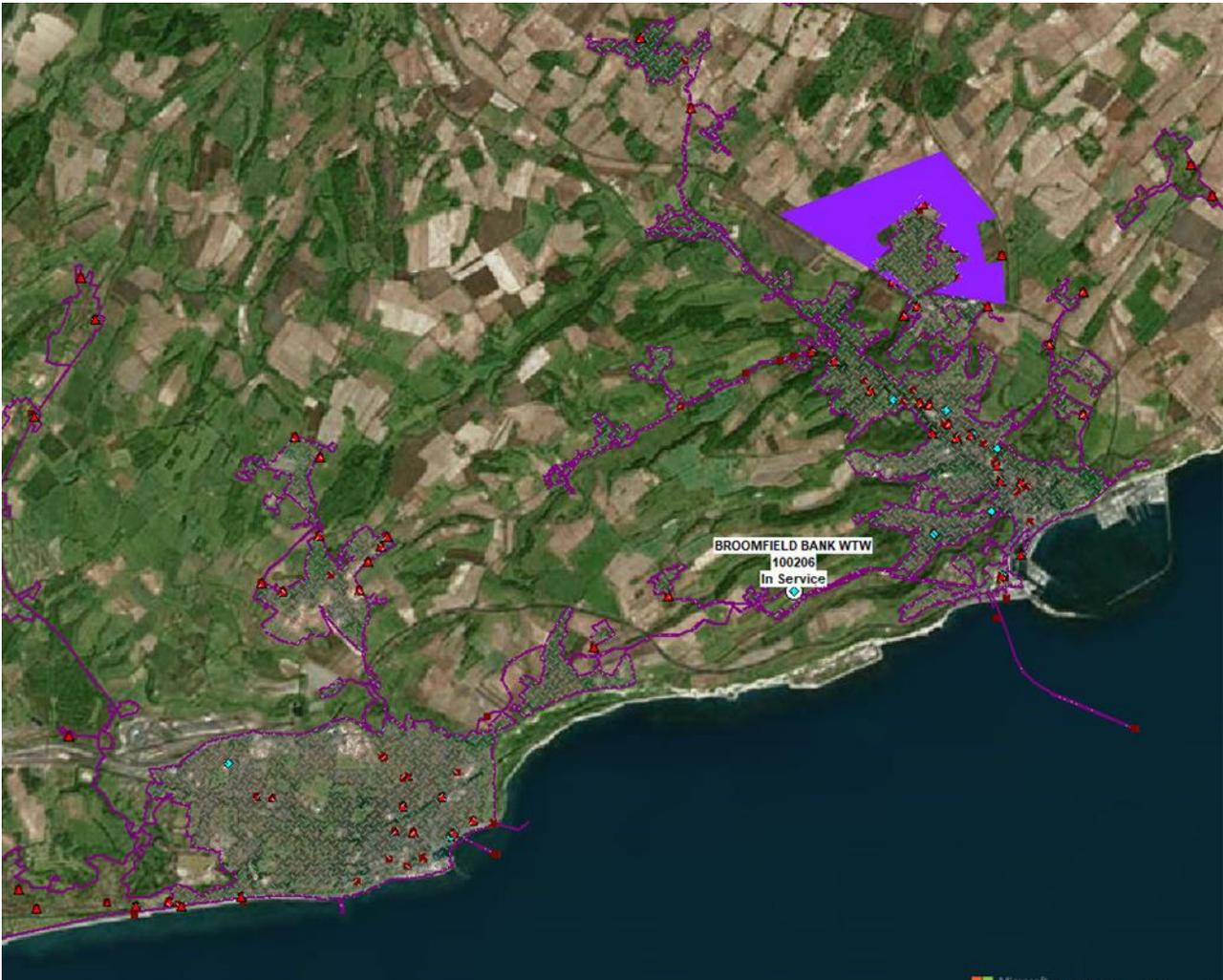
We assessed five options for serving the Whitfield development. The preferred option for the catchment is construction of a new wastewater treatment works at Whitfield. This option represents the best combination of low investment costs, minimal customer disruption and environmental impact.

The option to expand the treatment capacity at Broomfield Bank (Option 2) was assessed to be of similar cost, but much higher risk. Whitfield is situated north of Dover bounded on both sides by the Kent Downs designated Area of Outstanding Natural Beauty. It is 6.5 km as the crow flies from the Broomfield Bank WTW and 10.5 km from the Broomfield Bank WTW in terms of existing infrastructure routed via the port town of Dover. Providing new infrastructure in and around the Port of Dover is a highly complicated area for construction and involves multiple stakeholders and agreements due to the national strategic importance of the location. This includes:

- The Port of Dover handles 13 million passengers, 2.5 million freight vehicles and £119 billion of UK (17% of all UK) trade a year; up to 160km of freight in a single day
- Crossing main communications links – A2/A20
- Large amount of other infrastructure underground; telecommunications, utilities, tunnels
- Channel Tunnel Rail Link.

It is anticipated that there would also be significant challenges in obtaining the necessary planning permission to upgrade Broomfield bank WWTW. There were significant constraints imposed on the construction of the original treatment work and similar restrictions are likely to apply to any major expansion.

Figure 2: Whitfield Urban Expansion showing proximity to Port of Dover and associated strategic infrastructure



Under normal circumstances, the existing treatment works would be expanded but Broomfield Bank WTW is constructed underground in a hillside (See Figures 3 & 4); therefore, providing additional process capacity whilst maintaining current levels of service is highly complicated. Due to such complexities and risk, a new treatment works at Whitfield is seen as the best option.

Figure 3: Broomfield Bank from above – an underground treatment works



Figure 4: Broomfield Bank entrance to underground treatment works



Table 13: Whitfield Urban Expansion solution options

| Whitfield Urban Expansion | | | | | |
|---------------------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Option | Description | Scope | Investment cost (£m) | Preferred Option | Reason |
| 1. | Construct New Treatment Works at Whitfield with final effluent discharge via Broomfield Bank treatment works | <p>A new wastewater treatment works at Whitfield for the Whitfield Development requiring land purchase</p> <ul style="list-style-type: none"> • Preliminary treatment • Settlement treatment • Biological treatment • Treated effluent pumped to existing long sea outfall | £54.632m | Yes | <p>A new treatment works site would be close to the development meaning that conveyance of raw sewerage for treatment is relatively simple requiring less network infrastructure.</p> <p>A new treatment works would be designed to meet a new site-specific Environmental Permit requirement which would enable efficient construction.</p> <p>The solution makes use of Broomfield Bank WTW treated effluent discharge to the existing long sea outfall (LSO). This mitigates the risk associated with applying for a discharge permit for a new LSO.</p> |
| 2. | Treat at Broomfield Bank Treatment Works: Expand Existing Treatment Capacity | <p>Increased treatment capacity and network capacity</p> <ul style="list-style-type: none"> • Provision of new storm treatment capacity at the WTW • Increased odour control requirement • New preliminary treatment including a new building • Increased biological treatment capacity • Network capacity increase to take flow from Whitfield to Broomfield Bank WTW | c.£53.4m | No | <p>This solution provides treatment capacity at an existing Southern Water site and is considered a viable solution. However, it has two significant risks:</p> <ol style="list-style-type: none"> 1. A significant increase in network capacity is required in and around the port of Dover and associated strategic infrastructure, i.e., the M2 and Eurostar; 2. Expanding Broomfield Bank treatment works will be complex as the site is built into an existing hillside in a designated Area of Outstanding Natural beauty. |
| 3. | Construct New Treatment Works at Whitfield with final effluent discharge via a new sea outfall | <p>A new wastewater treatment works at Whitfield for the Whitfield Development requiring land purchase</p> <ul style="list-style-type: none"> • Preliminary treatment • Settlement treatment • Biological treatment • Treated effluent discharged to sea via new sea outfall | c.£57m | No | <p>As Option 1 but with its own long sea outfall, which is considered high risk. The route from Whitfield to the coast for the long sea outfall is very uncertain due to having to pass through the Kent Downs Area of Outstanding Natural Beauty and settlements along the coast, as well as marine construction considerations. Additional discharges to coastal waters are not supported by customers.</p> |
| 4. | Treat at Dambridge, Wingham Treatment Works: Expand Existing Treatment Capacity | <p>Increased treatment capacity and network capacity</p> <ul style="list-style-type: none"> • Increased storm treatment capacity • Increased odour control • Increased preliminary treatment • Increased biological treatment capacity • New network connection via a new rising main to take flows from Whitfield to Dambridge >12 km | £69.5m | No | <p>High cost and high risk option.</p> <p>A totally new sewerage infrastructure requirement to take flows from Whitfield to Dambridge; a distance of over 12 km as the crow flies.</p> <p>Archaeological and ecological surveys required over a wide area.</p> <p>Large scale modification/replacement of existing assets at Dambridge treatment works to provide the required treatment capacity</p> |
| 5. | Do nothing | No scope | Not applicable | No | Not considered a viable option due to environmental, customer and public health impacts if not delivered in AMP8 |

Sellindge WTW

We assessed four options to accommodate the new garden town at Otterpool Park.

The preferred solution is to provide a new process stream at Sellindge WTW to service the Otterpool Park development.

Sellindge WTW is near to the Otterpool Park site with enough room available to be able to construct the new assets needed to be able to service the entire planned Otterpool Park development. This has been chosen as the most cost efficient, least impact and lowest risk preferred solution. The challenge for this site is that the phosphorous and nitrogen permits will already be at Technically Achievable Limits (TAL), leading to atypical costs. The preferred solution is effectively a new treatment works adjacent to the current treatment processes.

We have also considered the possibility of phasing some of the development of the WTW across AMPs (beyond AMP8) in line with the possible development trajectories of housebuilding at the locality; however, to minimise complexity of the work and the associated whole life cost, our base proposal is to fully construct the WTW in AMP8.

SWS considered the four options in Table 14 below and carried our feasibility exercises when selecting the preferred option to serve Otterpool Park.

Table 14: Otterpool Park solution options

| Otterpool Park | | | | | |
|----------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Option | Description | Scope | Investment cost (£m) | Preferred Option | Reason |
| 1. | Treat entire Otterpool Park development at Sellindge wastewater treatment works | New capacity for the entire Otterpool Park development at Sellindge wastewater treatment works: <ul style="list-style-type: none"> Preliminary treatment Settlement treatment Biological treatment Network: New wastewater pumping and rising main (1km) | £20.467m | Yes | Following indication from the Environment Agency that the expansion of Sellindge wastewater treatment works was an acceptable option to receive the entire Otterpool development, this option is the least risk option requiring limited new network infrastructure. |
| 2. | Treat at West Hythe wastewater treatment works | Increased treatment capacity and network capacity <ul style="list-style-type: none"> Increased preliminary treatment Increased biological treatment capacity New network connection via a new rising main to take flows to West Hythe >8 km | Not costed because not a viable solution | No | Not considered a viable solution due to the high complexity of the scheme. It requires a new 8km rising main to take flows to West Hythe WTW. Complexity is due to the distance to the WTW requiring a large infrastructure project, which crosses areas of outstanding natural beauty, M20 and Channel Tunnel Rail Link. Not costed once the Environment Agency indicated that Option 1 was an acceptable option. |
| 3. | Treat flows using existing spare capacity headroom at Sellindge wastewater treatment works up to 2028. | Minor treatment capacity modifications Network: New WPS and RM | Not costed because not a viable long term solution | No | Not a viable long-term option for servicing the Otterpool Park development as there is currently limited capacity at Sellindge wastewater treatment works. Sellindge wastewater treatment works is currently designed to treat a population equivalent of 6000 people. A long-term solution would still be required. Considered as an earlier option due to initial uncertainty that the Environment Agency would agree that treating all flows at Sellindge wastewater treatment works would be acceptable. |
| 4. | Do nothing | No scope | Not applicable | No | Not considered a viable option due to environmental, customer and public health impacts:if not delivered in AMP8 |

Thornham WTW

The Thornham catchment is forecast to experience large amounts of growth over the next AMP period and beyond.

Southern Water's operation at Thornham has strong environmental permit conditions attached to it. The discharge location is into Chichester Harbour and the Solent, with Chichester Harbour classed as an Unfavourable Declining SSSI. The environmental constraints require Total Nitrogen to reduce to below Technically Achievable Limits (TAL) in order to maintain water quality and support shellfish beds in this area. The more flow that is treated at the Thornham wastewater treatment works the greater the importance of providing the right type of treatment for the permit requirements.

Southern Water has reviewed solutions to provide capacity for this growth and assessed four options. The preferred solution requires a totally new treatment process at Thornham WTW, replacing the current filter beds with activated sludge processes. This option has been chosen as it provides the treatment capacity for this growth, whilst also providing the best long-term solution for ensuring the strict permit requirements at Thornham are met.

Table 15: Thornham WTW solution options

| Thornham | | | | | |
|----------|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Option | Description | Scope | Investment cost (£m) | Preferred Option | Reason |
| 1. | A totally new treatment process at Thornham wastewater treatment works | Replace the existing biological filter beds with a new Activated Sludge Plant biological treatment process | £18.169m | Yes | Best option for accommodating growth and meeting environment requirements. As the site discharges into Chichester Harbour, a designated sensitive area for nutrients, the solution will provide robust nitrate removal and ensures that water quality permit requirements are met. |
| 2. | Additional treatment capacity at Thornham wastewater treatment works | Provide additional treatment capacity with additional biological filter beds and treatment capacity | c.£11m | No | Lower cost option but does not address the nutrient neutrality requirements in Chichester Harbour, designated sensitive area for nutrients. |
| 3. | Additional treatment process at Thornham wastewater treatment works | Provide an additional Activate Sludge Plant biological treatment process to treat a proportion of flows in addition the current biological filter bed treatment process | c.£11m | No | Lower cost option but does not address the nutrient neutrality requirements in Chichester Harbour, designated sensitive area for nutrients. |
| 4. | Do nothing | No scope | Not applicable | No | Not considered a viable option due to environmental, customer and public health impacts:if not delivered in AMP8 |

Direct procurement for customers

The investment required for all three schemes is significantly below the mandatory £200 million threshold for direct procurement and therefore unlikely to be considered suitable for direct procurement. We do, however, recognise that there may be opportunities to explore alternative delivery mechanisms to drive innovative approaches. We are exploring these to ensure the best value solution.

5. Customer Protection

Using the symmetrical adjustment approach that Ofwat used at PR19, we estimated the adjustment related to network and treatment growth above industry average results in lower botex allowances for the sector as a whole. As such, and consistent with the approach taken by Ofwat at PR19, no specific customer protection measures are required for this component of the claim.

For the costs with Whitfield, Sellindge and Thornham schemes, in our early June 2023 submission we proposed a scheme-specific Price Control Deliverable (PCD), based on the additional capacity provided, to protect customers against late or non-delivery. However, since then we assessed the benefits for customers from the two measures already in place, the environmental performance measure impact, by the Environment Agency (EA), and financial penalties from the discharge permit compliance performance commitment.

Exceeding DWF at a site for 3 years out of a 5-year rolling period would result in that WTW being classed as failing, leading to enforcement from the EA for non-compliance with an Environmental Permit condition – a legal obligation Southern Water is required to meet. Failure to comply with this obligation would result in enforcement, prosecution, and significant detrimental impact to reputation.

Customers are also protected through our discharge permit compliance performance commitment. If performance expectations are not met as a result of failing to invest in assets due to population growth, we will recompensate customers through outcome delivery incentives underperformance payments. Please see our Methodologies for Performance Commitments Technical Annex for details on quantification of benefits from investment to accommodate growth at treatment works.

We have, therefore, removed our proposed PCD from this claim as we consider that customers are already sufficiently protected through a performance commitment and a regulatory obligation enforced by the EA.

References

- 1 Ofwat, 'Econometric base cost models for PR24', April 2023, p.13
- 2 Regeneration: Whitfield (dover.gov.uk) ([link](#))
- 3 Otterpool Park - Proposed Garden Town ([link](#))
Nutrient neutrality: Chichester District Council ([link](#))
- 5 Ofwat, 'Econometric base cost models for PR24', April 2023, p.28-29
- 6 Ofwat, 'Final Determination, Securing Cost Efficiency, Technical Appendix', p.26
- 7 Ofwat, PR24 Cost Assessment Master Dataset, Wholesale Wastewater Base Costs v4, April 2023 ([link](#))
- 8 Anglian Water Services, Limited, Bristol Water, plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, Final Report, March 2021, paragraph 4.878
- 9 Core Strategy Review – Folkestone & Hythe District Council (folkestone-hythe.gov.uk) ([link](#))
- 10 WF2030 Quant Wave 3, 1,010 customers across the region, March '23
- 11 ONS household projections for England, released 29 June 2020 ([link](#))

Appendix 1

Identification of atypical wastewater treatment works growth schemes in AMP8

Table 16: Identification of atypical wastewater treatment works growth schemes in AMP8

| Schemes | Budget (Em) | PE 2022 | Forecast PE 2040 | Forecasted growth in PE to 2040 | Forecasted growth rate (%) | Cost per additional PE (E/PE) | Growth above 40% | Above £1,000/PE | Atypical solutions required |
|-----------------------------|-------------|---------|------------------|---------------------------------|----------------------------|-------------------------------|------------------|-----------------|-----------------------------|
| Whitfield WTW | 54.63 | - | 18,715 | 18,715 | n/a | 2,919 | Yes | Yes | Yes |
| Sellindge WTW | 20.47 | 5,241 | 21,299 | 16,058 | 306% | 1,275 | Yes | Yes | Yes |
| Paddock Wood WTW | 7.62 | 10,435 | 21,221 | 10,786 | 103% | 707 | Yes | | |
| Northfleet WTW | 24.56 | 55,743 | 105,680 | 49,937 | 90% | 492 | Yes | | |
| Lenham WTW | 1.30 | 3,120 | 5,784 | 2,664 | 85% | 487 | Yes | | |
| Hawkhurst North WTW | 2.07 | 1,788 | 3,171 | 1,383 | 77% | 1,500 | Yes | Yes | |
| Whitewall Creek WTW | 9.07 | 37,665 | 63,034 | 25,369 | 67% | 358 | Yes | | |
| Stoke WTW | 3.50 | 3,064 | 4,435 | 1,371 | 45% | 2,554 | Yes | Yes | |
| Charing WTW | 1.74 | 2,336 | 3,380 | 1,044 | 45% | 1,670 | Yes | Yes | |
| Ludgershall WTW | 3.67 | 3,887 | 5,540 | 1,653 | 43% | 2,219 | Yes | Yes | |
| Bishops Waltham WTW | 2.46 | 13,708 | 19,486 | 5,778 | 42% | 425 | Yes | | |
| Thornham WTW | 18.17 | 20,473 | 29,026 | 8,553 | 42% | 2,124 | Yes | Yes | Yes |
| Faversham WTW | 9.93 | 28,513 | 37,555 | 9,042 | 32% | 1,098 | | | |
| Goddards Green WTW | 0.60 | 62,825 | 78,541 | 15,716 | 25% | 38 | | | |
| Staplehurst WTW | 4.95 | 5,710 | 6,969 | 1,259 | 22% | 3,932 | | | |
| Ham Hill WTW | 6.65 | 68,307 | 83,320 | 15,013 | 22% | 443 | | | |
| Horsmonden WTW | 1.54 | 7,669 | 9,136 | 1,467 | 19% | 1,049 | | | |
| Wivelsfield WTW | 2.22 | 1,604 | 1,897 | 293 | 18% | 7,575 | | | |
| Leeds WTW | 0.01 | 4,443 | 5,210 | 767 | 17% | 13 | | | |
| Dymchurch WTW | 10.75 | 6,969 | 8,124 | 1,155 | 17% | 9,304 | | | |
| Wateringbury WTW | 8.37 | 9,849 | 11,362 | 1,513 | 15% | 5,532 | | | |
| Gravesend WTW | 4.28 | 63,118 | 72,353 | 9,235 | 15% | 463 | | | |
| Motney Hill WTW | 31.13 | 267,494 | 306,059 | 38,565 | 14% | 807 | | | |
| Park Road Handcross WTW | 1.34 | 1,178 | 1,347 | 169 | 14% | 7,943 | | | |
| Ford WTW | 10.84 | 136,363 | 155,757 | 19,394 | 14% | 559 | | | |
| Loxwood WTW | 3.14 | 3,550 | 4,030 | 480 | 14% | 6,544 | | | |
| Willow Wood St Lawrence WTW | 3.98 | 285 | 319 | 34 | 12% | 116,274 | | | |
| Sandhurst WTW | 2.91 | 1,075 | 1,208 | 128 | 12% | 22,737 | | | |
| Tonbridge WTW | 10.91 | 50,906 | 56,435 | 5,529 | 11% | 1,973 | | | |
| Lydd WTW | 0.13 | 3,836 | 4,190 | 354 | 9% | 379 | | | |
| Chale WTW | 0.01 | 562 | 612 | 50 | 9% | 196 | | | |
| Fullerton WTW | 25.65 | 67,183 | 71,382 | 4,199 | 6% | 6,108 | | | |
| Milford Road Pennington WTW | 18.70 | 54,962 | 57,020 | 2,058 | 4% | 9,083 | | | |
| Newnham Valley Preston WTW | 3.41 | 7,287 | 7,400 | 113 | 2% | 30,086 | | | |

Source: Southern Water asset internal tool

Appendix 2

Industry average unit costs for growth at treatment works

Table 17: Unit cost for growth at treatment works per new population equivalent (PE) served

| Company | Total growth expenditure (£m) ¹ | New PE served (000s) ² | Unit cost (£/new PE) |
|-----------------------|--------------------------------------------|-----------------------------------|----------------------|
| Anglian Water | 180.08 | 609 | 295.53 |
| Hafren Dyfrdwy | | | |
| Northumbrian Water | 47.74 | 18 | 2,648.29 |
| United Utilities | 143.61 | 681 | 210.98 |
| Southern Water | 53.23 | 609 | 87.40 |
| Severn Trent Water | 111.83 | 196 | 570.02 |
| South West Water | 47.36 | 116 | 408.47 |
| Thames Water | 350.57 | 1,491 | 215.88 |
| Dwr Cymru | 54.16 | 200 | 235.10 |
| Wessex Water | 120.51 | 390 | 309.02 |
| Yorkshire Water | 13.54 | -76 | -177.64 |
| | | Median | 283.44 |
| | | Upper quartile | 180.08 |

Sources: Ofwat base cost models consultation dataset, April 2023.

Notes:

¹ Expenditure in growth at wastewater treatment works (S3021CAS_21).

² The difference between the PE served in one year and the next, summed across 2011/12 to 2021/22.

Appendix 3

Forecasted number of new connected properties in 2025

Table 18: Forecasted number of new connected properties in 2025 based on ONS household growth rate, by company

| Company | Number of properties connected in 2022 (nr) | ONS household growth rate | | | Forecasted number of properties connected in 2025 (nr) |
|-----------------------|---------------------------------------------|---------------------------|--------------|--------------|--------------------------------------------------------|
| | | 2022-23 | 2023-24 | 2024-25 | |
| Anglian Water | 2,851,726 | 0.90% | 0.90% | 0.80% | 2,926,514 |
| Dwr Cymru | 1,489,622 | 0.60% | 0.50% | 0.50% | 1,513,583 |
| Hafren Dyfrdwy | | | | | |
| Northumbrian Water | 1,297,352 | 0.30% | 0.30% | 0.30% | 1,309,063 |
| Severn Trent Water | 4,261,077 | 0.70% | 0.70% | 0.70% | 4,351,187 |
| South West Water | 774,449 | 0.80% | 0.70% | 0.70% | 791,612 |
| Southern Water | 2,029,520 | 0.90% | 0.90% | 0.90% | 2,084,812 |
| Thames Water | 6,027,274 | 1.00% | 0.90% | 0.90% | 6,197,616 |
| United Utilities | 3,414,162 | 0.50% | 0.40% | 0.40% | 3,458,738 |
| Wessex Water | 1,276,413 | 0.80% | 0.80% | 0.80% | 1,307,293 |
| Yorkshire Water | 2,348,783 | 0.50% | 0.50% | 0.50% | 2,384,191 |

Sources: Ofwat base cost models consultation dataset April 2023⁷ and ONS household projections¹¹