

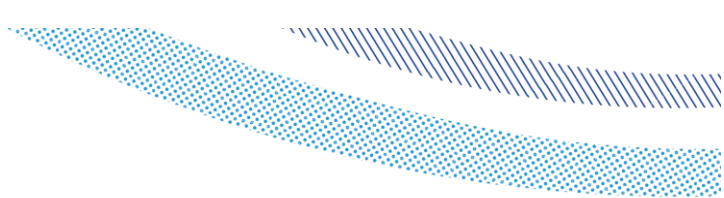
SRN-DDR-027: Supply Resilience Enhancement Programme

Enhancement Cost Evidence Case

28th August 2024
Version 1.0

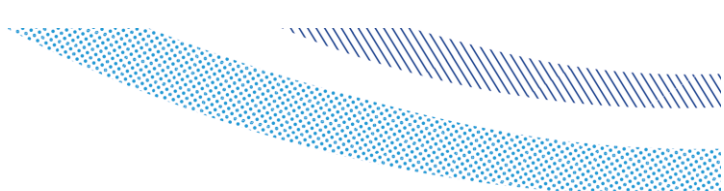


from
**Southern
Water** 



Contents

1.0	Executive Summary	4
2.0	Structure of our response	6
3.0	Summary of the Draft Determination challenges	7
	Need	7
	Best option for customers	7
	Cost efficiency	7
	Customer protection	7
4.0	Our response and supporting evidence.	8
4.1	Need	8
4.1.1	Base overlap	8
4.1.2	██████████	9
4.1.3	██████████	10
4.1.4	██████████	12
4.1.5	██████████	13
4.1.6	Impact of historical expenditure on performance	13
4.1.7	We have not been funded previously for performance.	16
4.2	Best Option for Customers	17
4.2.1	Cost benefit valuation of preferred solutions	17
4.2.2	Engineering justification of solutions	18
4.3	Cost efficiency	22
4.3.1	Demonstrating cost efficiency and a robust cost assurance process	22
4.4	Customer protection	27
4.4.1	Enhanced Engagement and Cost Sharing mechanism	27
4.4.2	Price Control deliverables	28
5.0	Supporting Evidence	29
5.1	Customer Insight	29
6.0	Weir Wood Enhancement case	32
6.1	Executive Summary	32
6.2	Introduction	34
6.2.1	Weir Wood WSW's strategic position	34
6.3	Need for Enhancement	35



6.4	Best Option for Customers	42
6.4.1	Achieving Required Production Capacity – Preferred Pathway	43
6.4.2	Other options considered	44
6.5	Cost Efficiency	45
6.6	Customer Protection	46
6.7	Conclusion	48

7.0 Business Plan Dependencies 48

Table 1:	Breakdown of total base costs in 22/23 and 2017/18 prices showing how we calculated the £518m total base allowance for water network plus excluding the 4 sites	9
Table 2:	Implicit base allowance by site with opex removed	9
Table 3:	██████████ Risk Reduction Profile	11
Table 4:	Ofwat challenges reproduced for ease of reference – ██████████	13
Table 5:	AMP 5 and AMP6 investments	16
Table 6:	Shadow estimate of the 4 sites, excluding risks, indirect costs, and corporate overhead	23
Table 7:	Top 10 cost curves to support our Hot spotting approach to benchmarking	24
Table 8:	Improving the cost certainty at ██████████	25
Table 9:	██████████ Level 2 Net direct works Benchmark Summary	26
Table 10:	Highlighting the cost efficiency when compared to our original plan	26
Table 11:	Proposed PCD for our Supply Resilience Enhancement Programme	28
Table 12:	Top 5 risks impacted if Weir Wood WSW is not in supply	36
Table 13:	Historical base allowance, actual investment, the AMP 7 resilience enhancement need and historical base funding gap. We are not requesting to be funded for the base gap.	40
Table 14:	Strategic review of options to rebuild Weir Wood WSW	43
Table 15:	Breakdown of investment to rebuild Weir Wood	46
Table 16:	PCD Summary for Weir Wood WSW	47
Figure 1:	Key Strategy Components considered in our risk review	14
Figure 2:	Location of Weir Wood WSW and ██████████ and simplified schematic of Sussex North supply system	36
Figure 3:	Output from Weir Wood WSW over last 20 years	38
Figure 4:	Weir Wood WSW Asset base expiration	41
Figure 5:	Asset Development pathways	43

1.0 Executive Summary

In the Draft Determination response to our Supply Resilience Enhancement Programme, Ofwat challenged our submission primarily on the need for enhancement, identifying the best option for customers and cost efficiency. Ofwat has proposed the large schemes gated process for [REDACTED] and [REDACTED]. The most significant challenges were on [REDACTED], where we received a 51% challenge on cost efficiency, and [REDACTED] where we received a 59% challenge on the need.

This document provides additional evidence to support the Supply Resilience Enhancement Programme submitted in October 2023. We have summarised the challenges into 9 key points and developed our response against each point. In addition, we have developed a Supply Resilience Enhancement case for Weir Wood Water Supply Works (WSW) to be considered as part of our Supply Resilience Draft Determination response as an essential pillar to our supply resilience in North Sussex.

Our Draft Determination response

We have invested significantly more than our base allowance. In AMP 5 and AMP 6, we invested £154.9m and by the end of AMP7, we will have invested a further £224m in the original four sites against an implicit base allowance of £62m. This has been focused on resolving the immediate water quality risks identified through our HazRev programme at these sites. The next phase is to resolve long-term asset resilience and provide enhancements to support future water quality needs.

We recognise this programme of works is highly interdependent between traditional Botex and enhancement activities. This is so we can achieve the best possible synergies and cost efficiencies for our customers, given the size of the investment. However, our investments for AMP8 are not like-for-like and customers are not paying twice and the Botex implicit allowance for the assets in the scope of this programme has been removed from the amount requested. These investments are to deliver an enhanced level of resilience by reducing the impact of resilience risks such as risk of [REDACTED], which is not within our control, and to increase resilience to support future growth. Our Botex case (SRN-DDR-020) sets out the wider need for an ongoing sustainable level of Botex for water assets and how the existing backward looking modelling approach does not support the current needs of these assets.

These investments are largely driven by Final Enforcement Orders (FEO) from the Drinking Water Inspectorate (DWI). The solutions we have described are an output of an extensive optioneering process described in Section 1.2. To generate these improvement programmes, we took a risk-based approach and applied a whole-system view for each site, a key step to ensuring best-value investment for our customers.

We engaged extensively with the DWI following a thorough risk-based approach to create a strategic roadmap for each site and identified the sequence of investment needs and appropriate solutions, rather than a set of piece-meal interventions which would not deliver the long-term resilience outcome we are seeking. We sought assurance from an independent expert, [REDACTED], formerly Deputy Chief Inspector of the DWI. [REDACTED] reviewed the reports and provided our Board/Executive with confidence that the final strategies are fit for purpose and will deliver against the objectives. The FEOs that were developed as an output of this process are highly prescriptive in what we must do and how we do it. However, we have taken five steps to ensure the options deliver value by improving confidence in our costs and we have identified further efficiencies.

Our Shadow Estimates show our original costs are 9% more efficient. Furthermore, external benchmarking carried out by Mott MacDonald identified that our original costs are 2.41% more efficient than the benchmarks. We have since carried out detailed design on the programme and identified £13.4m cost efficiency on the [REDACTED] scheme and a cost increase of £8.3m on [REDACTED]. In addition, we have applied a further 5% efficiency challenge on the programme, saving an additional £22m compared to our October submission costs.

Weir Wood Water Supply Works (WSW)

Weir Wood WSW is critical to the resilience of our Sussex North Water Resource Zone as well as to South East Water's customers in the area, having historically supplied 21MI/d at peak capacity.

The completion of this work will reduce reliance on [REDACTED], improve the security of supplies for customers in the region and reduce the risk of water supply interruptions. It is a 69-year-old works that has been infected with bacteria (bacillus) growth following an outage caused initially by a drought. A DWI notice was put in place in 2018 prohibiting its use due to the increasing water quality risks.

Historically, we have not been able to sustain an output greater than 17MI/d and supplies and consequently we have had to rely upon [REDACTED] for the majority of the water in this zone. Having only one major WSW for a major demand centre with major, ongoing developments is not sustainable. We have invested £18.4m at Weir Wood to return it to operation and our Water Resource Management Plan (WRMP) requires us to produce a minimum of 6MI/d from the site by March 2025. [REDACTED], we need to rebuild this site. This makes Weir Wood the 5th site in our strategy to improve the resilience of our region. We have developed a phased delivery strategy to meet the WRMP requirements and improve future resilience and, to that effect we will deliver an enhanced 7MI/d in 2025, 14MI/d in 2027 and, by subsequently integrating these, 21MI/d by 2029.

Large scheme process

Ofwat has proposed [REDACTED] and [REDACTED] as schemes for the large scheme gated process, allowing 6% development costs upfront, which is £13.88m. This is not sufficient for the requirements of the programmes. These programmes are in flight, and we require a total of £60m in transition funding and for the first year of AMP 8 to maintain the pace and progress and avoid negative impacts on the benefits, including meeting our DWI FEO deadlines. We have made progress on the other programmes at [REDACTED] and Weir Wood and delivering these schemes as part of a joint programme ensures we are able to deliver this efficiently. We have built this efficiency into the further 5% efficiency applied as part of our DD response.

We are proposing all five sites for the Enhanced Engagement Cost Sharing (EECS) mechanism.

The Enhanced Engagement and Cost Sharing mechanism enables enhanced cost sharing where you have concerns around cost certainty, and where there is a significant gap between the requested value and your allowance. We have developed our costs further, identified efficiencies and these programmes are in flight, requiring a total of £89.7m in transition funding. Given the nature of the programme and the evidence we have submitted, we believe the five sites qualify for the Enhanced Engagement and Cost Sharing mechanism (as described in our Cost and Efficiency Enhancement Chapter). It avoids the additional resources that would be needed to support the reporting process while ensuring customers are protected from any overspend and benefit from a larger proportion of underspend.

2.0 Structure of our response

This document is in two parts, the first part (1–3 below) focuses on our response to the Draft Determination challenge and our response to the four sites submitted in our Supply Resilience Enhancement Programme.

The second part (point 4 below) is the additional site for the Supply Resilience Enhancement Programme which we are submitting as part of our Draft Determination response.

This document has been structured in the following way:

- 1) Summary of the Draft Determination challenges for the four sites submitted in October 2023.
- 2) Our response and supporting evidence for the four sites submitted in October 2023.
- 3) Enhanced Engagement Cost Sharing mechanism.
- 4) The Supply Resilience Enhancement Programme – our 5th site, Weir Wood WSW

3.0 Summary of the Draft Determination challenges

In Ofwat's draft determination deep dives, we were challenged in the following areas:

Need

1. **Base overlap:** Ofwat challenged the investment need at all four sites, especially [REDACTED] and [REDACTED], where it stated: "the company does not provide sufficient and convincing evidence that there are no overlaps with base allowances and previously funded enhancement schemes".
2. **Impact of historical expenditure on performance:** Ofwat does not consider that there is sufficient and convincing justification for why historical expenditure over the period 2020-2025 has not addressed original regulatory notices which have led to more stringent regulatory FEOs being served.
3. **Previously funded for performance:** Ofwat considers some long-term outage issues at [REDACTED] have been previously funded to deliver the same level of service.

Best option for customers

4. **Cost benefit valuation of preferred options:** Ofwat challenged that we had not provided sufficient and convincing evidence to demonstrate the chosen options were the most cost beneficial in comparison to alternatives.

Engineering justifications: Ofwat challenged that we had not provided sufficient evidence around the certainty of the engineering justification of our most material options.

Cost efficiency

5. **Insufficient evidence that the costs are efficient:** Ofwat said "no cost curves are provided in the business plan and there is no breakdown of cost estimation for individual components".
6. **Cost assurance scope and process:** Ofwat would like us to provide more detail on the scope and rigour of our assurance process and the detailed cost build up.

Ofwat highlighted that some of these challenges (especially under "best option for customers" and "cost efficiency") only apply to [REDACTED] and [REDACTED], but we note similar challenges have been applied to [REDACTED] and [REDACTED] though these are placed in the gated process. Our response addresses the challenges on all sites.

Customer protection

7. **Large schemes:** [REDACTED] and [REDACTED] have been put into the large scheme gated process with a funding allowance of 6% (£13.884m) of the total delivery cost to develop the scheme.
8. **PCD:** the individual schemes are not material for a PCD, but the investments are combined in a single PCD, as proposed by Ofwat at Draft Determination.

4.0 Our response and supporting evidence.

4.1 Need

4.1.1 Base overlap

Ofwat challenged the investment need at all four sites, especially [REDACTED] and [REDACTED], where Ofwat stated: “the company does not provide sufficient and convincing evidence that there are no overlaps with base allowances and previously funded enhancement schemes”.

We have calculated an AMP8 implicit allowance of £73m for the operation and maintenance of all four WSWs. This allowance has been estimated from the historical expenditure at these sites and how this has contributed to the outputs of the botex models.

This money is far less than the amount we have spent recently and in previous AMPs and we anticipate needing to spend more in AMP8, in addition to investments in this enhancement case to address ongoing capital maintenance works at the sites. We must maintain operation of the sites throughout AMP8 whilst we deliver the upgrades and hence our base allowance and enhancement request are separately needed for ongoing maintenance and relieving of the sites to meet future needs. We have invested significantly more than this, £154.9m in AMP5 and 6, and £137m in the first 3 years of AMP7 across the four sites, demonstrating the need to enhance the resilience of our assets that are fast approaching the end of their useful life. We are not making a like for like replacement as highlighted in our Query response (OFW-OBQ-SRN-232), and this investment will lead to resilience upgrades at all four sites and there is no overlap with base. We are requesting the £297.9m in addition to the £73m implicit allowance within base.

How we calculated the £73m implicit allowance

- 1 Using Ofwat’s econometric models, we estimated the implicit allowance for PR24 as £680m (water network plus). This is consistent with how we have calculated the base cost in our business plan submitted in October 2023.
- 2 We then removed the forecast cost drivers for the 4 sites so that we can estimate the allowance for the rest of the business without the four sites. The forecast cost drivers removed were the data related to the four sites which include the number of properties, and treatment complexity which is represented by two variables, weighted average complexity and percentage of treatment in bands 3 to 6. Following that, we re-estimated the allowance without the four sites and arrived at a total base allowance of £518m (for water network plus).

Table 1: Breakdown of total base costs in 22/23 and 2017/18 prices showing how we calculated the £518m total base allowance for water network plus excluding the 4 sites

Total base costs <i>(Net of enhancement opex)</i>	2022/23 Prices			2017/18 Prices		
	Water resources (£m)	Water network plus (£m)	Wholesale water (£m)	Water resources (£m)	Water network plus (£m)	Wholesale water (£m)
PR24	86	802	887	73	680	752
Without 4 sites	71	612	683	60	518	579
4 sites	14	190	205	12	161	173
██████████	4	48	52	3	41	44
██████████	5	58	62	4	49	53
██████████	2	28	31	2	24	26
██████████	4	53	57	4	45	49

- We then removed the opex costs using the capex-opex split of 61.41% (this is the average opex element of botex for all companies at PR19, using Ofwat opex-capex split model). Taking the £161m water network plus implicit allowance for the four sites, we multiplied that by 1-61.41%, which gives £62m (less the opex), in 2017/18 price base and £73.4m in 22/23 price base.
- Breakdown of the implicit allowance is shown below:

Table 2: Implicit base allowance by site with opex removed

Implicit allowance (£m)	
4 sites	73.4
██████████	18.7
██████████	15.0
██████████	17.5
██████████	22.2

4.1.2 ██████████

Ofwat challenged us on capital maintenance activity (including what was judged as end of asset life replacement). £3.1m of scope was disallowed on the basis of being scope covered in base.

Our central challenge is that while some of these activities are capital maintenance, we have not been funded sufficiently in the past to invest in these assets and we now need to enhance them to meet the new requirements. ██████████

██████████. In our original submission in October 2023, we highlighted that ██████████

██████████
 ██████████
 ██████████
 ██████████
 ██████████
 ██████████

[REDACTED]

The evidence submitted in our query “SRN Outbound Query Response OFW-OBQ-SRN-232” shows clearly that we are not investing in the same scope items that we have done before through the additional base investments we have provided. We have spent £47.5m in AMP 5 and 6, and in the first 3 years of AMP 7 we have spent £8.7m. We provided details of our investment in the Query submission.

[REDACTED]. The typical life span of a WSW is 40 years. We are responding to a new treatment challenge to [REDACTED].

On power, we have invested in the past to deliver ongoing maintenance of our power assets, however, given [REDACTED]. These measures are driven by a need to ensure no interruptions to the existing process throughput due to issues with either Distribution Network Operator (DNO) infrastructure, or assets that we own. [REDACTED]

4.1.3 [REDACTED]

[REDACTED] Water Supply Works (WSW) is one of the oldest sites in the Southern Water estate and is also currently the single source supporting 169,000 customers in the North Kent zone. It is critical to meeting demand for water in the wider region. This does not account for the additional customers within the South East Water region, to whom [REDACTED] provides 25% of its output. Our WRMP24 Section 7.2.5 sets out the 10 possible scenarios for bulk exports to SEW in all future scenarios, for which [REDACTED] is a critical component.

As described in our original submission (SRN25 Supply Resilience Enhancement Programme), the WSW was built in stages, the main works was completed in 1973 and [REDACTED]

[REDACTED]

[REDACTED] The site is currently under DWI notice SRN-2022-00001, to achieve improvements to the overall functioning and resilience of the site.

The site needs to be enhanced to produce up to 65 Ml/d of river-derived water until 2050 as driven by these WRMP requirements. This will require major process upgrades to enable more efficient production while also dealing with existing water quality parameters issues such as ammonia and cryptosporidium. There is also a more general need for replacement and reconfiguration of the overall existing process train.

[REDACTED] is a key asset beyond 2050 and it [REDACTED]

Significant population growth (37%) is forecast by 2050 in the Kent Medway West zone, the highest in our region, and this population must be served by a more resilient [REDACTED]. Our zonal assessment also



showed our process losses are currently higher than our WRMP assumes, and so this balance must be addressed to remove the risk to our supply demand balance. A loss of [REDACTED] would result in a substantial deficit to the zone overall given its size and strategic importance in the area.

We have invested £21.9m in AMP 5 and 6, and in the first 3 years of AMP 7 we have spent £17.8m as shared in our Query response (OFW-OBQ-SRN-232). We have taken efforts to address the ability of [REDACTED] to adequately mitigate pesticide, hydrocarbon, taste, and odour risks at this flow rate. With this in mind, any new investments in [REDACTED] are designed to remove the constraints and enhance the asset to **meet future demands of 65 MI/d which we can no longer mitigate through resilience within our system.**

We have assessed the expected risk reductions at [REDACTED] through these targeted investments out to 2030. The figures below was extracted from ARM where risks are scored in a common metric for cost benefit purposes. To ensure brevity, only those areas where a clear risk benefit is observed are detailed below:

Table 3: [REDACTED] Risk Reduction Profile

Burham WSW	All	CRI	Health and safety	Legal compliance	Mitigation cost	Pollution	Property minutes	Taste and odour	Unplanned outage
20/05/2023	48470	4598	792	14942	234	249	25749	879	1026
31/03/2025	-2472	-427	-61	0	0	-138	-1776	0	-70
31/12/2027	-28280	-3378	-348	-6293	-34	-110	-16639	-879	-599
31/03/2030	-1774	-84	0	-77	0	0	-1352	0	-261
01/04/2030	15942	709	383	8572	200	1	5982	0	96
% Improvement (2023-2030)	67%	85%	52%	43%	14%	100%	77%	100%	91%

Ofwat’s challenge on the “Need for resilience enhancement funding” at [REDACTED] is focused on two areas [REDACTED] (totalling £25.6m, or 59% of our proposed investment). We respond on each below.

[REDACTED]

[REDACTED]

[REDACTED]

In May 2022, the business recognised a more resilient solution was required. Our assessment also demonstrated that the [REDACTED]
We have taken this through our Risk and Value process and through collaboration with our contractor to produce the requested allowance for the RGF, aligned to the September 2020 RGF notice. This was updated to a Final Enforcement Order (FEO) in February 2023 to deliver the work outlined above by September 2029, commission by 2030 and decommission the existing RGF assets by 2031. Some of the benefits include:

- Increase in throughput from maximum achievable ~52Ml/d to ~65Ml/d.
- Improvement of hydraulic capacity
- New Intermediate Pumping Station
- Decommission existing RGF (improved resilience of contact tank below)
- New clean wash water tank
- Recovering recycle water from rinse to waste system.
- All new MEICA equipment including new dual (duty/ standby) transformer substation to be ultimately connected to a new Ring Main on site.
- New superstructure to cover filters (existing is uncovered)
- Meet modern standards.

4.1.4 [REDACTED]

The criticality of [REDACTED] WSW is increasing. As per our WRMP, the site will be required to treat up to 91 Ml/d of water sourced entirely from Havant Thicket Reservoir with a different water chemistry to current sources. The surface water stream would struggle, given its current capacity and process technology to treat Havant Thicket Reservoir flows. To reliably treat this volume from a new source the works requires a major upgrade as it currently has [REDACTED]

At PR19 we received no enhancement allowances for these treatment works, with funding only via base allowances. At [REDACTED], £52.5m has been invested in the site during the first three years of AMP7 (and up to June 2023) - over three times the implicit base allowance of £15.8m. This investment is to support increasing water quality challenges.

The actions within the Final Enforcement Orders 57 and 58 dictate that a new, long term pre-disinfection system and wash water recovery is required at [REDACTED]. To achieve this, we have designed a [REDACTED]

Additionally, the [REDACTED] identified below to be replaced are not like for like. We need to upgrade these assets in line with the new requirements at [REDACTED] and the evidence submitted in our query "SRN Outbound Query Response OFW-OBQ-SRN-232" shows clearly that we are not investing in the same scope items that we have done before through base investments. This programme of works is delivering enhanced assets which will enable us to improve the overall resilience of the site and the system.

Ofwat has removed £5.5m of scope (4.58%) in its allowance on the basis that it is in base. We believe this does not fully reflect the level of enhancement being delivered and Ofwat should therefore reconsider this challenge.

██████████ is 85 years old. The convergence of multiple external factors as described above, combined with the fact these assets are at the end of their useful lives, has meant we require atypical expenditure between 2025 and 2030 to maintain supply. This investment is responding to a significant part of our long-term challenge, it is part of our Batch programme of works highlighted in section 1.1. ██████████

4.1.5 ██████████

Ofwat has applied a 27.7% challenge on the need at ██████████. This is a 61-year-old WSW and similar to ██████████. To realise the benefits of the RAPID SRO proposal for Havant Thicket Reservoir, we must upgrade our existing treatment processes at ██████████. The evidence submitted in our query “SRN Outbound Query Response OFW-OBQ-SRN-232” shows clearly that we are in a different set of scope items. ██████████

Table 4: Ofwat challenges reproduced for ease of reference – ██████████

Requirement (Reference SRN25 appendix)	Reason for challenge	Preferred Option Cost Estimate (£m)	Challenge (%)	Challenge (£m)
██████████ ██████████ ██████████ ██████████	██████████ ██████████	13.900	50%	6.950
██████████ ██████████ ██████████ ██████████	██████████ ██████████	16.500	100%	16.500
██████████ ██████████	██████████ ██████████	7.100	100%	7.100

4.1.6 Impact of historical expenditure on performance

Ofwat states that it does not consider that *“there is sufficient and convincing justification for why historic[al] expenditure over the period 2020-2025 has not addressed original regulatory notices which have led to more stringent regulatory FEOs being served. An example is at the ██████████ site, for the replacement of the existing MCC No.5, under regulatory DWI Notice Item 48b. We consider this option is a maintenance activity that should be covered under implicit allowances, and consider the company was previously aware of DWI notices and had historic[al] funding available to address this notice”.*

██████████ is 85 years old, ██████████ is 61 years old, ██████████ is 43 years old and ██████████ is 51 years old, these are our largest, and most strategically important Water Supply Works (WSW) currently in operation. These sites are beyond their asset life. By the end of AMP7, we will have invested £224m in these assets against our base allowance of £62m because these sites are old and have ██████████. We need to enhance these sites and while we have been investing in AMP 7 to keep the sites operating, this is not a sustainable position. ██████████



This is a more beneficial approach for our customers. We have taken a systems approach and developed a holistic approach with support from DWI. The investment needs within our FEOs were generated through this process and we engaged the DWI throughout to ensure the solutions and our approach are fit for purpose. Our analysis was built on 5 key pillars.

- 1) Water Quality Risk review.
- 2) Site reliability review to consider the health of our assets.
- 3) Site resilience review, covering redundancy, power resilience and automation.
- 4) Systems resilience review, considering the wider zonal impact in the event of a failure.
- 5) WRMP assessment, considering our planned intervention within the context of a longer-term plan.

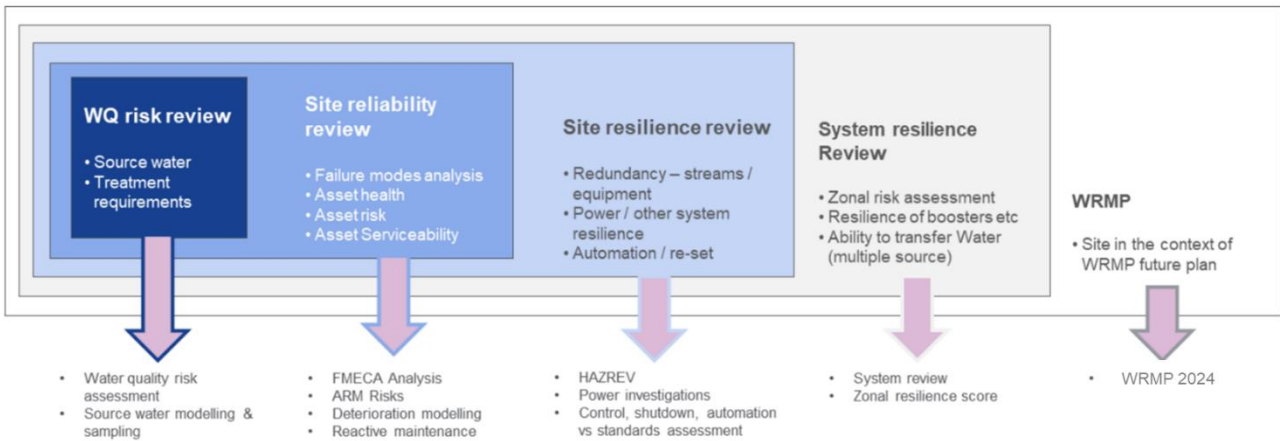


Figure 1: Key Strategy Components considered in our risk review

Given the age of the sites, 85-, 61-, 43- and 51-year-old, this approach enabled us to develop a proactive plan to address the challenges and enhance the sites instead of addressing issues individually leading to potential risk of supply interruptions and increased costs for our customers. The proposed programme of works allows us to address the issues in a much more efficient manner and they were agreed with DWI who provided a supporting letter which we submitted in Appendix K within our October 2023 submission – SRN25 Supply Resilience Enhancement Programme.

Overall, our assessment identified the following key issues below.

1) Common needs identified

Power resilience – power from the grid is becoming less reliable, due to climate change parameters, an ageing electricity grid and more volatile electrical flows from embedded generation. [REDACTED]

Water quality – we need to improve the quality of our drinking water immediately. Short-term mitigations are in place to understand the sources of poor taste, odour, and appearance within the raw water system, but there is a need to provide a permanent solution to these problems and upgrade the sites for the longer term to improve overall treatment quality.

Automation and Control – [REDACTED]

Ageing Assets – the four WSWs are legacy sites and have required an extensive programme of maintenance to keep them in service. Capital maintenance is no longer sufficient to keep the WSWs in operation and many structures require rebuilding to appropriate modern technologies and design.

2) [REDACTED]

- [REDACTED] supplies 187,000 properties in Southampton, Winchester, and the surrounding areas. The combined works abstract water from the sensitive River Itchen chalk stream and from groundwater sources.
- The site needs the ability to expand in a modular process in order to enable increased production from Havant Thicket and water recycling sources in the future to meet water demand.
- T2ST further compounds the need to move towards [REDACTED]. This scheme is planned to be operational post-2030 but requires investment in the short-term to prepare both sites to receive flows.
- By the late 2040s there may also be an additional requirement for the site to supply a [REDACTED].
- The site will need to be able to produce up to 91 MI/d comprising up to 45 MI/d of river-derived water and up to 55 MI/d of groundwater to meet future needs.
- The criticality of [REDACTED] is increasing. Under drought conditions the site will be required to treat up to 90 MI/d of water sourced entirely from Havant Thicket reservoir as part of our WRMP with a different water chemistry to current sources. [REDACTED]. During drought conditions it will also need to supply customers served by [REDACTED] in combination with other WRMP schemes such as the Thames to Southern Transfer (T2ST), with some additional support from Portsmouth Water until T2ST is connected.
- [REDACTED].

3) [REDACTED]

- [REDACTED] supplies 178,000 properties in the Southampton and Isle of Wight areas. Abstraction from the sensitive River Test chalk stream is becoming increasingly challenging in drought conditions, alongside licence reductions and water quality becoming more variable at different times of the year.
- [REDACTED] requires integration with the regional Hampshire water supply grid to meet the increasing demand, whilst also achieving abstraction reductions set by the Environment Agency (EA).
- This WSW is undergoing a significant transformation in light of these new requirements, and this needs to continue to ensure it can flexibly meet a reduced output based on wider system production.

4) [REDACTED]

- [REDACTED] supplies 246,000 properties in West Sussex and the surrounding areas. There are limited interconnections with other water resource zones, and it is often the only source supplying these customers. It also provides support for a Sutton and East Surrey bulk supply at Crawley.
- There are multiple sources of water that [REDACTED] draws from, including groundwater, the River Rother, the River Arun, and a treated Portsmouth Water import. All imports are reduced in drought conditions.
- As well as raw water becoming less available, there are also new treatment challenges that the current process train cannot treat effectively (including cryptosporidium and other micro biologicals).

5) [REDACTED]

- [REDACTED] is a largely conventional site built in 1973 that is critical to supply in the Kent & Medway areas, as well as providing a bulk supply to South East Water (SEW). It supplies 169,000 properties currently within Southern Water's zones alone.
- Whilst the current site can treat for many of the water quality parameters specified by the regulator, there are new treatment processes that need to be added [REDACTED].

[REDACTED] is a key asset beyond 2050 and will need to accommodate a new raw water supply as part of water resource plans (recycling plant), in the face of reducing raw water availability from the river source. The site improvements we are making as part of this upgrade allow for modular additions in the future.

4.1.7 We have not been funded previously for performance.

In Ofwat's deep dive assessment, it was considered that some [REDACTED] had been previously funded to deliver the same level of service. In AMP 5 and 6, we spent £154.9m and by the end of AMP 7, we will have spent £224m on all four sites, this is against a £62m base allowance. We have invested significantly beyond our allowance. The table below demonstrates what we have done.

Table 5: AMP 5 and AMP6 investments

Treatment process	AMP 5 or 6?	[REDACTED] (£m's)	[REDACTED] (£m's)	[REDACTED] (£m's)	[REDACTED] (£m's)	Total (£m's)
abstraction	AMP5	0.3		4		4.3
adsorption	AMP5				0.5	
chemical dosing	AMP5		0.7	1.3		2.0
disinfection	AMP5				0.7	0.7
distribution	AMP5			0.02		0.02
filtration	AMP5	1.9			0.03	1.9
power	AMP5			0.5		0.5
pumping	AMP5			0.06	0.3	0.4
site wide	AMP5	1.6	2.5	2.7	0.7	7.5
waste	AMP5			4.9	0.5	5.3
Capex total - AMP5	AMP5	3.7	3.1	13.4	2.8	23.0
Opex - AMP5	AMP5	5.4	5.2	9.6	6.5	26.7
Grand total - AMP5	AMP5	9.1	8.3	23	9.3	49.7
abstraction	AMP6			2.8		2.8
adsorption	AMP6			0.1	0.2	0.4
chemical dosing	AMP6				3.4	3.4
disinfection	AMP6	2.7	4.8		0.1	7.6
distribution	AMP6	2.2	2.3	3.1		7.6
filtration	AMP6		18.1	0.1		18.3
power	AMP6					
pumping	AMP6			8.2	0.4	8.6
site wide	AMP6	16.2	2.5		4.9	23.6
waste	AMP6			8.2	1.3	9.5
Capex total - AMP6	AMP6	21.2	27.7	22.6	10.3	81.8
Opex - AMP6	AMP6	6.4	12.8	1.9	2.3	23.4
Grand total - AMP6	AMP6	27.6	40.5	24.5	12.6	105.2
Total Capex for AMP5 and AMP6		24.9	30.8	36.0	13.1	104.8
Total Opex for AMP5 and AMP6		11.8	18	11.5	8.8	50.1
Total Totex for AMP5 and AMP6		36.7	48.8	47.5	21.9	154.9

4.2 Best Option for Customers

4.2.1 Cost benefit valuation of preferred solutions

Cost benefit valuation of preferred options: in the draft determination deep dives, Ofwat challenged that we had not provided sufficient and convincing evidence to demonstrate the chosen options are the most cost beneficial in comparison to alternatives.

For most of our investments, we have been mandated by the DWI on the type of interventions, therefore for some of our interventions, we are constrained by our DWI obligations. Nonetheless, we still reviewed these solutions through our optioneering process and, as demonstrated in our Cost efficiency section, we identified an alternative and cost-efficient way to deliver at [REDACTED].

As described in our October 2023 submission (SRN25), DWI Notices at each of the four sites:

- The Notice on [REDACTED] was issued in 2018 after a DWI audit.
- The first Notice on [REDACTED] was issued 2018 after two events and a DWI audit. It has undergone significant changes due to the issues identified on the site during events and compliance breaches.
- A Notice was served on [REDACTED] in 2018 for risks associated with radiation, disinfection, and turbidity.
- [REDACTED] had a Notice served in 2018 after a DWI Audit. Hazard Review (HazRev) actions were added to the Notice in 2020. In April 2022 DWI issued an FEO Consultation under Section 20 of the Water Industry Act.

All four Notices have been updated by the DWI over time due to changes in both solution design and delivery dates. A piecemeal picture of changes to sites was emerging that would not lead to the best long-term solution. This risked investing in temporary spend that did not manage the underlying risk profile appropriately for customers. We raised this concern with the DWI and in the summer of 2022, we finalised our end-to-end site strategy reviews which defined the best long-term solution and roadmap for each site. We sought assurance from an independent expert, [REDACTED], formerly Deputy Chief Inspector of the DWI. This independent assurance was sought in the context of ongoing and escalating regulatory enforcement action by the DWI that included potential further enforcement action at these four sites. [REDACTED] reviewed the development of the strategic reports for each site, to provide our Board/Executive with confidence that the final strategies are fit for purpose and will deliver against the objectives.

Working closely with the DWI, we then reviewed all our Notice commitments for the four sites and proposed new delivery dates and solutions that would deliver the long-term site strategies and produce the best outcome for customers. We have since received Final Enforcement Orders (FEOs) from the DWI in February 2023 at each of the four sites.

The DWI has issued several FEOs across the four sites over multiple AMPs on areas including excess turbidity and deteriorating water quality standards. Addressing these long-term problems and the vulnerability of the sites throughout AMP8 within the context of their wider zones – in some cases low levels of mitigation against a complete loss of production – remains our utmost priority.

Maintenance of our assets is essential. We have no choice about delivering the parts of this investment scope that are covered by DWI notices at the four sites on areas including excess turbidity and deteriorating water quality standards. We have proposed a set of strategic investment projects that will ensure that emerging issues are mitigated, including recent outages, source pressure issues, asset condition and maintaining the criticality of vulnerable assets (in some cases, against a complete loss of production).

To make sure we are addressing the problems and securing the opportunities for our customers in the most value-for-money (VFM) way, we need to ensure the scope of our proposed solutions is right for customers now and in the future, and that our expenditure proposals are as cost efficient as possible. To do that we conducted a detailed optioneering process to make sure we are providing the best outcome for our customers based on the routes available to us and that we have robustly benchmarked our unit costs with appropriate comparators to make sure they are deemed efficient.

Options assessment

We considered a range of possible solutions (not just capex) which might be available to us, including nature-based and opex solutions. We produced a long list of options (as described in Appendix C – Engineering Justification for Options Appraisal within our Original Submission – SRN 25¹) based on the best available information on the current issues facing these sites, taking into consideration the areas of scope highlighted in previous DWI notices that we had addressed at previous price controls, as well as industry best practice information on similar assets we have access to. Where information is known about the sites due to existing studies, this detailed information has been used to cost the delivery elements through the application of our solution hierarchy.

Our optioneering process (as described in our Cost and Option methodology – SRN15)² considered all types of mitigations as referenced in Ofwat’s PR24 Final Methodology³, including redundancy, resistance, reliability and respond and recovery measures. This should provide confidence to customers that we will deliver the best option available. We then evaluated our long list of options against a scorecard of objectives (such as the delivery schedule, cost efficiency etc) and discounted those options not deemed viable for further consideration.

Having reached a short list of options to achieve the desired outcome for the specific intervention, our Cost Intelligence Team (CIT) team used a set of cost curves based on outturn costs of past projects completed to date to price solutions for AMP8. We conducted a full review of all unit costs ahead of this process to reflect our view of what would be needed to represent efficient costs across the four supply works for AMP8 and beyond. We then used this information to select the preferred outcome based on both whole life costs and the wider benefits provided by the intervention.

We applied this process to each of the four sites for the material interventions required during AMP8.

4.2.2 Engineering justification of solutions

Ofwat challenged that we had not provided sufficient evidence around the certainty of the engineering justification of our most material options.

In our October submission (SRN 25 Supply Resilience Enhancement Programme), we provided a detailed engineering justification of our options and here we provide additional justification for our most material solutions to improve certainty that they are the best options for customers. These are solutions that have been agreed with the DWI.

██████████

Clarification – Refurbishment of Clarifiers 1-4 and New DAF Process to replace Clarifiers 5-7

The ██████████ at ██████████ are not compliant with industry best practice and the company asset standard, and there is no practicable means to upgrade them, to deliver the treatment capacity that is required (91Ml/d). They present a significant water quality risk, and the DWI FEO requires RGFs 13-14 to be removed from service permanently.

¹ SRN25 Supply Resilience Enhancement Programme – Appendix C – Engineering Justification for Options Appraisal

² [southernwater.co.uk/media/mjyp0of4/srn15-cost-and-option-methodology_redacted.pdf](https://www.southernwater.co.uk/media/mjyp0of4/srn15-cost-and-option-methodology_redacted.pdf)

³ <https://www.ofwat.gov.uk/publication/pr24-final-methodology-appendix-9-setting-expenditure-allowances/>

The [REDACTED] cannot be removed from service unless new clarifiers are built and operational, with all flows diverted through the upgraded RGFs 1-12, or replacement RGFs 13-14 are constructed and operational. Otherwise, the site will have to operate with only clarification stages I and II in service, limiting flow to a practical maximum of 54 MI/d, which is insufficient to meet any demand above average demand.

The [REDACTED]
[REDACTED]
[REDACTED]

1. [REDACTED]
[REDACTED]
2. [REDACTED]
[REDACTED]
[REDACTED]
3. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Southern Water's internal Risk and Value process determined that [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Within SWS, DAF is utilised at Brede and Beauport WSWs, treating water from Powdermill and Darwell Reservoirs, the water quality is similar to Little Testwood Lake, suggesting DAF would work well at [REDACTED]. We completed a trial which confirmed the suitability of DAF at [REDACTED].

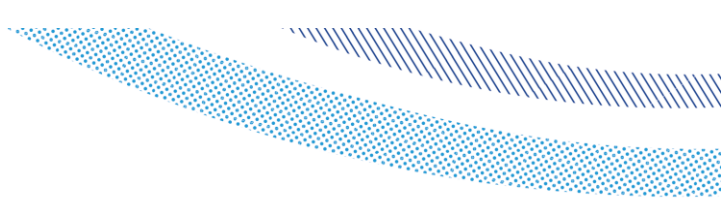
[REDACTED] [REDACTED]
[REDACTED]
[REDACTED] A balanced view was taken with respect to Capex and Whole Life Benefit and the blended solution was selected.

Taste & Odour – [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED] Dose optimisation trials were conducted prior to AMP6 that established that the doses required to effectively manage T&O-causing compounds were higher than the site was able to dose at the time. Improvements were implemented on the existing system to allow a higher dose to be applied, however this could not be utilised without directly impacting the clarified water turbidity coming off the FBCs, and the application of lower doses than ideally required had to be continued.

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]





[REDACTED] is also prone to [REDACTED].
[REDACTED]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]

It is on this basis this, that a strategic investment decision was made to include GAC and to ensure resilient solution for taste and odour removal alongside removal of other parameter such as dissolve organics.

[REDACTED]
Clarification & Filtration – [REDACTED]

There is a need at [REDACTED] to provide a new pre-disinfection process able to treat both the existing surface and groundwater sources and the alternative drought source via the Havant Thicker reservoir transfer. The existing surface water pre-disinfection processes are not compliant with modern design standards, and we have experienced multiple reliance issues with them. [REDACTED]
[REDACTED]

[REDACTED]. Whilst all options resulted in similar levels of risk reduction, the [REDACTED] had the lowest whole life cost and therefore greatest whole life benefit.

The [REDACTED] is preferred as it provides a reliable method of suspended solids and pathogens removal and will provide a more consistent filtrate quality than conventional treatment. This is a new technology for us but extensive pilot trials have taken place to assess and confirm that the solution performs well and responds to the raw water challenges at [REDACTED]

Additionally, the [REDACTED] has a smaller footprint, which is better suited to the spatially constrained WSW site compared to alternative options. [REDACTED] is a very congested site, and the selected option would have to be installed and commissioned whilst the existing process plant is kept operational and maintaining supply – i.e., the smaller footprint of the [REDACTED] makes the solution more deliverable and therefore cheaper and reduces the impact on the environment and our neighbouring customers as we would have to encroach less onto land outside the current operational Works boundary.

Taste and Odour – [REDACTED]

Assessments identified the need for a [REDACTED] due to the newly detected presence of taste and odour [REDACTED]. [REDACTED]
[REDACTED]
[REDACTED]





[Redacted]

Clarification – [Redacted]

The bankside storage reservoir from the river Arun abstraction at Church Farm has [Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]

[Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]

Sludge Treatment – Process Improvements

The overarching need of "improvements in waste handling" is made up of nine separate items, which have been defined against existing asset operational risks. The featured items require enhanced replacements and there are therefore no cheaper/lower risk alternative engineering solutions.

[Redacted]

We have conducted a full water quality review for [Redacted]. From this work, it has become evident that there are several risk parameters which are currently partially treated but require further investment to fully mitigate. Most notable of these is [Redacted]

A 2017 external report highlighted that [Redacted] was at risk from [Redacted] and so pre-emptive measures are required. A [Redacted] to deal with this issue in AMP8.

Alternative options were considered including installing [Redacted]
[Redacted]
[Redacted]
[Redacted]

[Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]

[Redacted]

Taste & Odour – [Redacted]

Problems have been experienced in the past at [Redacted] with carry-over of [Redacted].
[Redacted]
[Redacted]
[Redacted]
[Redacted]

[Redacted] This work will secure longer term resilience of the process and also enable greater capacity of the plant.



Filtration – [REDACTED]

The existing [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED].

[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED] providing a reliable and resilient new plant capable of treating the full Works flow.

4.3 Cost efficiency

4.3.1 Demonstrating cost efficiency and a robust cost assurance process

Owat would like us to provide more detail on the scope and rigour of our assurance process and the detail cost build. It stated: “no cost curves are provided in the business plan and there is no breakdown of cost estimation for individual components”.

An overview of our robust cost assurance process

We have a well-established Cost Intelligence Team (CIT) and we have applied our standard Cost Estimation and Optioneering approaches to ensure the costs are based on robust cost-evidence and represent efficient delivery for our customers.

While developing different schemes to increase the resilience of our key sites we have applied our organisational optioneering process, which is governed by our Decision-Making Framework. This framework allows for a granular level of detailed optioneering and is aligned to our Risk and Value (R&V) process, which manages the full lifecycle delivery of a project. Information on how we have applied this Decision-Making Framework as part of our optioneering for Supply Resilience Enhancement schemes is provided in the following section.

More information on the general approach to cost estimation and optioneering, with all the associated definitions, is provided in the ‘Cost Estimation and Optioneering Technical Annex4.

As set out in the Technical Annex, we separate our capital expenditure into the following four categories:

- Direct Costs (or Net Direct Works)
- Indirect Costs
- Risk
- Corporate Overheads.

⁴ Cost Estimation and Optioneering Technical Annex

Our organisational process builds up the full cost stack by applying cost multipliers for Indirect, Risk and Corporate Overhead cost categories onto the Direct Costs for each scheme. More information on the definitions and rationale for the criteria and detail of our R&V process is provided in the Technical Annex.

The assurance scope

Mott MacDonald has undertaken a 3rd party cost assurance review of the 4 Sites Enhancement Case. The review focused on producing an external benchmark against Mott MacDonald industry cost curves and an independent “shadow estimate” to compare against, highlighting opportunities and giving an indication of cost confidence in the whole or parts of the PR24 estimate.

Independence

As part of the PR24 Enhancement Case Review an independent 3rd Party Cost Assurance was required. The purpose of this was to provide an independent estimate for comparison and to highlight opportunities and give an indication of cost confidence in the whole or parts of the estimates. The original estimates for the 4 Sites were developed by CIT working closely with our Engineering Technical Services (ETS) team. For the 3rd party Assurance CIT engaged [REDACTED] from an independent specialist division of Mott MacDonald to undertake "Shadow Estimates". The [REDACTED] selected have experience in cost estimating across the industry and are independent of the PR24 estimates.

We have addressed the cost uncertainty and efficiency challenge across the 4 sites by taking five key steps:

1. Shadow estimate of original scope
2. External benchmarking
3. [REDACTED] detailed design
4. [REDACTED] and benchmark
5. Efficiency applied across the programme.

1) Shadow estimate of our original scope and efficiency

Prior to PR24 submission in October 2023 and as part of our Risk and Value process, our Cost Intelligence Team (CIT) estimated our initial scope to have a net direct works cost (excluding, indirect costs and overheads) of £147m. We have engaged an independent specialist division of Mott MacDonald to carry out a 3rd Party Assurance. They have developed a Shadow Estimate for 100% of the same initial scope for the four sites to provide further assurance of costs and **on average the shadow estimates indicated that our October 2023 (SRN 25) submission is 9% efficient against the Shadow estimates.** Our Cost Intelligence Team (CIT) concluded that this is typical of benchmarking results and within acceptable tolerance at this early stage of the project life cycle, indicating cost confidence and that costs appear to be efficient. Details shown in Table 6.0 below:

Table 6: Shadow estimate of the 4 sites, excluding risks, indirect costs, and corporate overhead

Scheme	CIT NDW	Shadow Estimate NDW	Delta	% Delta (Shadow/CIT)	Plugged in Costs	Quotations	% of CIT Estimate (Plugged in costs)	% of CIT Estimate (Quotes)	% of Shadow (Plugged in costs)	% of Shadow Estimate (Quotes)
[REDACTED]	£12,159,697.78	£13,789,611.40	£1,629,913.63	13%	£772,536.25	£0.00	6.4%	0.0%	5.6%	0.0%
[REDACTED]	£15,776,494.23	£21,003,334.77	£5,226,840.54	33%	£2,425,078.33	£713,105.00	15.4%	4.5%	11.5%	3.4%
[REDACTED]	£38,909,828.81	£42,177,616.66	£3,267,787.85	8%	£1,328,096.62	£26,551,605.90	3.4%	68.2%	3.1%	63.0%
[REDACTED]	£80,151,541.17	£83,022,900.08	£2,871,358.92	4%	£4,452,099.32	£33,187,140.72	5.6%	41.4%	5.4%	40.0%
Totals	£146,997,561.99	£159,993,462.92	£12,995,900.94	9%	£8,977,810.52	£60,451,851.62	6.1%	41.1%	5.6%	37.8%

2) External benchmarking scope and efficiency

We have since evolved our design moving into the detailed design phase and Mott MacDonald has carried out an external benchmarking of the costs for 4 sites. At PR24 submission in Oct 2023, we carried out function and asset level benchmarking against the full indirect scope and cost of our four sites. In our latest external benchmarking, we have applied a Hot-spotting methodology and identified the Top 10 cost curves that cumulatively attributed the most cost across the scope.

Each curve was aligned with comparators from a database of eight peer companies, ensuring all costs were at the same base date as the Southern Water curves. We ensured the yardsticks were aligned and checked for inclusions and exclusions to ensure likeness when comparing costs. This covered 15.37% of the Net Direct Works in our scope. **This cost curve benchmarking methodology demonstrated our costs are 2.41% efficient against the benchmark.**

Table 7: Top 10 cost curves to support our Hot spotting approach to benchmarking

Curve Name	Scope Benchmarked	Benchmark	Variance
Building (Process)	£4,475,699.75	£4,955,021.66	-9.67%
Pipework (Civil)	£4,303,313.21	£5,123,154.26	-16.00%
Media (GAC)	£2,957,112.05	£2,257,809.63	30.97%
Building (Function)	£2,295,431.59	£2,816,167.79	-18.49%
Backwash Supply Tank	£2,209,279.94	£2,474,132.77	-10.70%
Pipework (MEICA)	£1,816,859.08	£1,650,968.08	10.05%
Cabling	£1,519,521.38	£611,153.25	148.63%
Launder Channels	£1,299,657.64	£1,624,703.16	-20.01%
Demolition of Concrete Tanks	£1,098,906.86	£1,354,632.96	-18.88%
Piling (CFA)	£614,057.32	£280,344.92	119.04%
Total	£22,589,848.82	£23,148,088.51	-2.41%

Both Shadow Estimates and External benchmarks indicate our costs are 9% and 2.41% efficient respectively. However, we have taken further steps to provide cost certainty and efficiency. We have improved our design and costings for [REDACTED], developed a cost-efficient solution at [REDACTED] and applied an overall cost efficiency across the programme considering the variance in our cabling and piling costs. Further details on what we have done are below:

3) [REDACTED] detailed design development

We carried out a deep dive exercise and solution design on [REDACTED] and we have identified some necessary changes in the [REDACTED] scope. We have reflected these changes in our latest cost estimate to improve certainty of cost. **The detailed design development revealed an increase of £8.3m is needed at [REDACTED]**, this however does not lead to an increase in the overall cost of the programme largely due to efficiencies we have identified elsewhere on the [REDACTED] ceramic membrane plant. Detail about the scope and cost changes at [REDACTED] are provided in the table below.



Table 8: Improving the cost certainty at [REDACTED]

Need	Original plan (£m)	R&V 3.2 Solution design (£m)	Scope growth (£m)	Note
[REDACTED]	5	7.5	-	Original estimate had a wide range which was not reflected in the costs submitted in Oct 2023. With more information at solution design, we can be more certain about the cost of delivering the solution.
Enabling works	0.6	5.5	-	Enabling works - additional engineering review highlights that to isolate the treatment works we need [REDACTED]. We cannot deliver the FEOs without the enabling works
Scope Growth				
[REDACTED]	-	-	0.5	[REDACTED]
[REDACTED]	-	-	0.4	[REDACTED]
Total	5.6	13	0.9	8.3 (Delta from original costs submitted in Oct '23)

5) [REDACTED]

We have identified £13.4m efficiency through the detailed design of the [REDACTED]. The original cost for the [REDACTED] in this scheme was £92.6m. With our new design, we can deliver the whole of the [REDACTED] for £158.4m. This scheme is funding half of this combined plant (£79.2m) therefore the saving to this scheme is £13.4m.

What has changed?

The [REDACTED]
 [REDACTED]
 [REDACTED] The construction programme for the Havant Thicket reservoir and specifically the commissioning of the pipeline feeding [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]

Benchmarking the new [REDACTED] costs.

With a newly developed design, we carried out a level 2 cost estimate and benchmark. Our benchmark was carried out against 8 comparable water companies and others we benchmarked against quotations. For the



benchmark against comparable companies (which represents £40.9m of the scope), we achieved 85.3% benchmark coverage at Level 2 and results show that we are 7.20% more efficient than industry costs. When the quotation benchmarks are included, we achieved 92.5% cost coverage and Mott MacDonald, our external benchmarking consultant confirmed the [REDACTED] costs are 3.5% efficient against the industry benchmark.

Table 9: [REDACTED] Level 2 Net direct works Benchmark Summary

Benchmark category	Scope cost (£m)	Scope Benchmarked (£m)	Coverage (%)	Benchmark (£m)	Variance (%)
Benchmark	40.9	34.9	85.3	37.6	7.2
Benchmark incl. quotes	80.15	74.1	92.5	76.8	3.5

6) Efficiency applied across the programme.

We have applied a further efficiency challenge of 5% across the programme to give confidence in our costs and scope, **saving our customers £22m** (when compared to our original plan). We will deliver this efficiency through the use of new technology as demonstrated by our updated design at [REDACTED] and improved ways of working through our delivery. The table below provides the detail of the £22m efficiency and the changes to the costs from our original submission in Oct 2023 to date.

Table 10: Highlighting the cost efficiency when compared to our original plan

		Original plan (£m)		Revised plan (Otterbourne efficiency - £13.4m)		Revised plan Burham change (+£8.3m)		Final Plan with 5% efficiency applied (£m)	
		Total with SEW contributions	Total without SEW contributions	Total with SEW contributions	Total without SEW contributions	Total with SEW contributions	Total without SEW contributions	Total with SEW contributions	Total without SEW contributions
DWI_26	[REDACTED]	111.3	111.3	111.3	111.3	111.3	111.3	105.7	105.7
DWI_27	[REDACTED]	120.2	120.2	106.8	106.8	106.8	106.8	101.5	101.5
DWI_28	[REDACTED]	29.2	29.2	29.2	29.2	29.2	29.2	27.7	27.7
DWI_29	[REDACTED]	58.0	43.5	58.0	43.5	66.3*	49.7	63.0	47.2
	Totals	318.7	304.2	305.3	290.8	313.6	297.0	297.9	282.1

*This includes a £2.1m cost contribution from SEW and we have worked with SEW on this and they have approved these costs for [REDACTED].

4.4 Customer protection

4.4.1 Enhanced Engagement and Cost Sharing mechanism

All our sites are either at detailed design stage or moving close to contract award, largely driven by regulatory dates. We are confident in the scope required, delivery and the costs as shown by the cost efficiency we have been able to deliver on the [REDACTED] scope. Therefore, to enhance customer protection and address cost certainty of the Supply Resilience Enhancement Programme, we propose that all 5 sites (including Weir Wood) are delivered through the Enhanced Engagement and Cost Sharing Mechanism at a cost sharing ratio of 25:25 for the following reasons:

1. [REDACTED] have been put into the large scheme gated process with a funding allowance of 6% (£13.884m) of the total delivery cost to develop the scheme. This is not sufficient to develop the scheme until the next Investment Gate 3 in May 2026. This programme is in flight, and we require £30m in transition funding and £30m in the first year of AMP 8. We are requesting the additional £217.52m in the draft determination allowance is put through the Enhanced Engagement and Cost Sharing mechanism.
2. [REDACTED]: Ofwat has not proposed the large gate scheme for [REDACTED]. We are asking Ofwat to reconsider this decision and put these schemes through the Enhanced Engaged Cost Sharing mechanism. We have carried out a detailed solution design for [REDACTED] to improve our scope and cost certainty and we require £29.5m in transition funding for both sites. Additionally, given that we are developing these as a programme to respond to system challenges, we believe that running this within a similar governance and monitoring framework enables us to take advantage of that consistency.
3. **Weir Wood Water Supply Works (WSW):** as part of our draft determination response, we are submitting a Supply Resilience Enhancement case for the rebuild of Weir Wood WSW at a total cost of £74.3m (details in the [Weir Wood WSW Supply Resilience Enhancement case](#) below). Weir Wood WSW has been experiencing an [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] In addition, based on WRMP, we need Weir Wood WSW to be producing 7MI/d supply by March 2025. This is an early AMP 8 transition funding to improve the overall resilience of our water supply and reduce the risk of supply interruption. We did not submit this in October as we continued to invest in maintenance turnaround and develop a long-term solution to [REDACTED]
[REDACTED] We have appended the full Supply Resilience Enhancement case for Weir Wood to this response document.
4. **Enhancements driven by regulatory dates:** The investments in all 5 sites are to enhance our assets, improve resilience and meet future water quality needs. These enhancements have been encoded in the FEOs with the DWI, and the dates have been formally communicated and agreed with the regulator (DWI). Funding through the large gated mechanism would lead to a pause in the works and a breach of the FEO dates.
5. **Increased risks of delay:** Pausing these works will lead to significant increases in resources, material costs and disruption and it will not protect our customers from the increasing risks of supply interruption.
6. **It reduces the risk of interruption to supply, and our customers support a mechanism that provides a good balance of monitoring and support to ensure the schemes are delivered:**

- i. Our customer insight report highlights that when our customers learn “about the protection mechanisms [that may be available], customers think it is great to see that investment will be protected...This is because Southern Water will be independently held accountable and monitored so the plan will be delivered. As seen with ODIs, there is also some concern that being penalised for not hitting targets will create a downwards spiral.
- ii. Some feel it would be better to learn about what support mechanisms are in place, rather than ‘penalty’ mechanisms”. One household customer said: “*I am very surprised and impressed with this deliverability monitoring. It is showing that SW are taking complete responsibility, but it is also instilling confidence in me as a consumer as it means they truly intend to carry this out and think they can do it.*” Our customers also expressed concern that this will only be delivered with some level of monitoring by Ofwat.

Additional detail on customer insight provided as [Supporting evidence](#).

The Enhanced Engagement and Cost Sharing mechanism avoids the additional resources needed to support the reporting process while ensuring customers are protected from any overspend and benefit from a larger proportion of underspend. Given the nature of the programme, we propose the five sites (including Weir Wood) should be delivered through the Enhanced Engagement and Cost Sharing mechanism.

We propose these 5 sites have a 25:25 cost sharing rate as they can arguably be considered large non-complex schemes. It means we will bear 25% of the cost of any overspend and retain 25% of the benefit from any underspend.

4.4.2 Price Control deliverables

The individual schemes are not material for a PCD. In line with Ofwat’s proposal at Draft Determination, we propose to combine the investment in our proposed four sites into one single PCD. Below we detail our proposed PCD which follows our Conditions for PCD design, detailed in SRN-DDR-052 Price Control Deliverables.

Table 11: Proposed PCD for our Supply Resilience Enhancement Programme

Component	Output
Description	We have developed this investment programme across our four major supply works to both meet the long-term requirements of our customers in terms of providing a safe and resilient supply of water, as well as the issues identified in the DWI’s FEOs.
Output measurement and reporting	Performance milestones will be reported and monitored annually through the existing APR process.
Total cost	£297.9m [AMP8 total only, 2022-23 prices]
Unit cost	£2.979m per percentage point of total programme completion. This is based on assuming full scheme costs (i.e., all 4 sites) are spread over 132 months with 60 months (or 45%) of them in AMP8.
Penalty rate	Penalty rates based on percentage completion. Per site rates are stated below: <ul style="list-style-type: none"> • ██████████ - £1.015m per % completion • ██████████ £1.057m per % completion • ██████████ - £0.277m per % completion • ██████████ - £0.630m per % completion

Component	Output
Materiality of future scope alterations	£2.979m (1% of total costs)
Output delivery date with current scope	By March 2035
Conditions on allowance	Should we receive confirmation from a regulator of a necessary change to the timing or scope of a scheme, or in fact the change of scheme to address the core issue being it, either change in the benefit delivered or the solution being more expensive, the implication of this change would be reflected in the PCD. Where this change leads to a material variance greater than 1% of the original enhancement investment, then the PCD would symmetrically account for this change in a reconciliation at the end of the AMP.
Assessment of PCD	In the event of not delivering the output by the end of AMP8 (i.e., by 31 March 2030), but the need is still required, this PCD remains in place until the end of AMP9 (i.e., 31 March 2035). Ofwat will assess the completion of this PCD by 31 March 2035 as part of the PR34 process.
Late penalty rate	N/A
Measurement	Progress and performance will be reported in our annual performance report (APR) We will report progress on percentage of completion achieved by 31 March each year.
Penalties to be netted off in the event of non-delivery	DWI's FEOs penalties
Assurance	Third party APR assurer will assure that the output and conditions have been met.

5.0 Supporting Evidence

- Customer insight report
- Weir Wood Supply Resilience Enhancement case

5.1 Customer Insight

Customers recognise the most important and fundamental service is the provision of clean, wholesome, and safe drinking water. Perceptions of water quality are high, with most customers satisfied. However, where customer concerns arise, they are most likely to be on taste, appearance, and hardness, rather than safety. Overall, both water quality and resilience are important. Quality is about maintaining high standards for the future and failure cannot occur. Resilience is about ensuring future generations have access to the same plentiful supply of wholesome water while protecting our environment.

There is a strong desire from our customers to improve life and our planet for future generations. Customers see that the water sector has a significant role to play. They want to see best use of investment for the future, rather than cutting corners now which will mean even more money needs to be spent down the line.

"Populations will only grow and there will be a huge bottleneck for future generations if we don't tackle issues now both current and potential. To me that is what sustainability is and being responsible as humans." Household customer

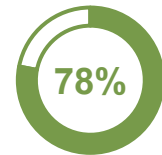
"It is critical to consider future generations as the need / demand will change and if we base our plans on current society then it will become outdated extremely quickly. Overall, that will mean it is a waste of money." Household customer

Customers understand the need for work to be prioritised and are happy to see that Southern Water's current thinking matches their own; however, they also want to see more consideration given to locality and the environment. References to sustainable solutions, use of technology and future generations increases confidence and support. However, customers still have concerns over costs and confidence in Southern Water's ability to carry out work without an increased level of supply interruptions.

Customers support the plan.

Customers feel the Four Site strategy is an essential part of the plan and are supportive⁵. Understanding the risks if work is not undertaken really brings home the need for this work to take place and reinforces customers' support. The main benefits the customers want to see from the plan are enhanced water quality, a more reliable supply of water and improved drought resilience.

Customers feel the approach is well planned and thought our acknowledgment of recent outages in the network adds credibility. Customers are aware of these incidents and happy to see them being addressed.



Support or strongly support investment at water treatment works

"I am 100% supportive of this plan and for Southern Water to progress with this work. Because it is hugely important in terms of people's health. We are talking about something that will affect people's health. So for me, that is hugely important, and I am supportive of this plan." Household customer

Although support for the plan is high, many customers lack confidence in Southern Water to deliver these plans. There was some scepticism around motivations for the work.

It feels like this needs to happen, rather than a nice to have, so customers feel we must find a way to deliver. But this confidence is muted, with many feeling that it will only happen as there will be public scrutiny and Ofwat monitoring. The insight showed if it was just down to Southern Water to achieve, then many lack confidence, due to negative PR and perceptions of Southern Water being reactive and having outdated infrastructure.



Feel not confident or not at all confident that this work will be delivered

"I am really supportive, but in a kind of grudging way -that it has to be done because they have not previously put the required work / upgrading in place." Household Customer

⁵ Four Site Strategy Customer Feedback and Water Futures Wave 4 Quant

Customers want to be engaged as we deliver.

When engaging on the Four Sites strategy, there are several conditions customers wish to hear about:

- ✓ **Measurability and accountability:** Giving more information around targets and how often these will be measured; and demonstrating not just how customer will/will not be impacted, but how Southern Water and shareholders will be impacted – in terms of investment and penalties for failure.
- ✓ **Level of ambition:** There is a sense that Southern Water is doing the bare minimum needed, we need to shout more about where and how we are going above and beyond, vs. Ofwat stipulations but importantly vs. other water suppliers.
- ✓ **Environmental impacts:** Environmental factors such as how any negatives will be mitigated and what enhancements will happen to the environment need to be dialled up much more.
- ✓ **Technology lifespan:** The use of technology is praised and is a significant hook in terms of support, but we need to show how futureproofed this technology is – are we just playing catch up? Will we be behind the times again in 5-10 years?
- ✓ **Costs to the customer and value for money:** Although mechanisms are in place so that no unanticipated costs will be passed on, customers want to know what element of the bill impact previously looked at is covered here. We also need to provide reassurance around the process of gaining value for money from sub-contractors and the processes and new technology procured – are we being sensible?
- ✓ **Lack of a plan B:** While not having a plan B gives confidence of the importance of the work, it can feel naive. We need to explain more around this and what other fail safes are in place – what if it all goes wrong? What if we do not achieve this plan, what happens to our supply?

The protection mechanism adds reassurance.

Learning about the protection mechanism, customers think it is great to see that investment will be protected. The fact customers will not pay if it is not achieved creates a sense of doubt that Southern Water lacks confidence in its own plan. However, once more informed about the mechanism, they are more reassured. This is because Southern Water will be independently held accountable and monitored so the plan will be delivered. As seen with ODIs, there is also some concern that being penalised for not hitting targets will create a downwards spiral. Some feel it would be better to learn about what support mechanisms are in place, rather than 'penalty' mechanisms.

"I am very surprised and impressed with this deliverability monitoring. It is showing that SW are taking complete responsibility, but it is also instilling confidence in me as a consumer as it means they truly intend to carry this out and think they can do it." Household Customer

"That doesn't inspire me at all. It seems to say that if Southern Water doesn't meet its targets, then it will be penalised but somehow that will help it improve its services. It won't, it will just put them further in the mire." Household Customer

The plan is right for the long term.

Customers tell us the Four Sites strategy shows a proactive approach in addressing what are seen to be global current and future challenges, such as climate change, droughts, and population growth/increased demand. The modular and flexible approach feels logical and future thinking. It shows Southern Water is thinking about the future, which helps go some way to challenge perceptions of Southern Water. However, there are those who feel that while these improvements are positive, we are only just catching up with modern times and maybe not going far enough to future proof. Customers want to ensure the following are considered in our decision making on the strategy:

1. Which improvements will have the most significant tangible impact / create more issues if we do not do soon.

2. Undertaking risk assessments and allocating risk levels to every element and which may require planning permission.
3. Looking at which elements are a longer-term fix vs. more temporary measures – which are more future focussed.
4. Customer affordability, cost of implementation and impact of inflation – now and in the future.
5. The logical flow of implementation, which measure will have a positive impact on those implemented later.
6. Level of impact locally upon customers while work is taking place, timing of when this happens e.g., school holidays.
7. Environmental impact and potential for sustainable options.

"I think that Southern Water should look to do the work that will cause the most amount of damage and cost further down the line if it is not done." Household customer

"I would put priority on longer lasting fixes, so they don't have to be revisited. also, anything that needs planning permission so maybe other work could be got on with while that process goes on." Household customer

"This is what I really believe in our generation has been so short sighted and profit orientated we really need to change our attitude and conduct the consequences of what we are doing and the legacy we are leaving our children and grandchildren." Household customer

6.0 Weir Wood Enhancement case

6.1 Executive Summary

When in full operation, Weir Wood Water Supply Works delivers potable water to a population of over 100,000. Weir Wood WSW has suffered from a number of treatment process issues in recent years, resulting in a low level of reliable input to the system. In the last two AMPs we have invested £18.4m in Weir Wood Water Supply Works to reinstate the site and subsequently to prepare groundworks for a new works.

The site is currently out of service due to water quality issues and has a notice (SRN-2022-00002 V2) from the DWI prohibiting its use. We need to rebuild the site to deal with the more complex water quality issues than the original site was capable of dealing with and put it in a stable position where it can use its reservoir source to provide a reliable summer output of 14MI/d, and 21MI/d at peak times. It is a [REDACTED] [REDACTED] which supply two thirds of our customers. Weir Wood also provides water supply to the customers of neighbouring water companies and is key to the long-term supply resilience in our North Sussex water resource zone.

We have a WRMP requirement to deliver a minimum of 6 MI/d by April 2025 from this site, however due to the [REDACTED] it has been decommissioned and we need to rebuild a new works, capable of reliably treating the source water. This decision was based on eliminating the continuous spend on the asset as the [REDACTED]. We have already taken steps to start the rebuild programme. We have developed initial designs, carried out optioneering and developed a modular approach using new technology to deliver the first phase of 7MI/d, through transition funding, ready for summer 2025 (in line with our WRMP requirements).

We did not submit this case in October 2023, due to revaluation of the risks associated with the [REDACTED] and to identify a suitable solution that was most cost effective for improving water quality and

improving value for customers. This evaluation was critical as we need to deliver a solution that forms part of the best value, long term supply solution for this zone.

This Supply Resilience Enhancement business case demonstrates that we have overspent our allowances and spent £18.4m on Weir Wood in recent AMPs due to [REDACTED]. To ensure future resilience for our customers, we require additional investment in AMP8 to secure supplies from Weir Wood Water Supply Works.

Following each intervention, we have discovered additional challenges, [REDACTED]. We wrote to the Drinking Water Inspectorate (DWI) on the 9th of November 2018 to inform them of [REDACTED]. The DWI subsequently issues a prohibition notice (SRN-2022-00002 V2) preventing water to be supplied from the works in October 2022.

[REDACTED] has resulted in the need to demolish and rebuild the works to ensure there is sufficient water for our customers and those of South East Water. It is a key WSW in our North Sussex zone where we are needing to invest in additional new sources, including far higher cost water recycling, to meet growth in demand and mitigate the loss of other sources.

The increased capacity required from the site has arisen from WRMP24 and subsequent iterations. The site's new process design is different to the historical design to treat raw water at an enhanced level and deal with the [REDACTED] that the old plant could not address.

We need Weir Wood WSW to be producing 7 MI/d. of water for our customers and those of South East Water by April 2025. This is a critical part of addressing our supply and demand balance and essential to enable both us and South East Water to provide sufficient water for customers in the South East of England.

Without Weir Wood WSW in operation, we will not be able to deliver on our WRMP plans in the short and long term and it increases our reliance on [REDACTED] which in turns reduces the resilience of our 4 largest sites. This enhancement business case sets out why we need £74.3m to upgrade Weir Wood WSW during AMP8 to provide a resilient water supply for our customers.

Based on our calculation, the implicit allowance for this will be £2.2m. This is not sufficient to deliver current levels of maintenance if we selected this as an option, given we have spent £18.4m in the last two AMPs on turnaround maintenance activities to remove the [REDACTED] on site. By the end of the final phase, the new Weir Wood WSW will have the capacity to fully utilise its abstraction licence of 21MI/d with a new asset life of 40-50 years.

We have considered options for delivering this work which balance pace of delivery against cost. This has resulted in a multi-phased approach to deliver immediate resilience benefit and improve the security of supplies. The first phase of 7 ML/D will be delivered in April 2025, the second phase of 14 MI/d will follow and by 2029 we would have integrated the two phases into one 21MI/d plant.

Summary of Claim	
Name of Claim	Weir Wood
Summary of Case	<p>This Resilience Enhancement Programme is to improve the resilience of our 5 sites, and it sets out the work we need to carry out in order to bring our Weir Wood supply works back into service during AMP8.</p> <p>The work includes a multi-phased approach as follows:</p> <ul style="list-style-type: none"> Phase 1: Provide supply of 7 MI/d using an [REDACTED] Phase 2: Provide supply of 14 MI/d using [REDACTED]



	<ul style="list-style-type: none"> Phase 3: [REDACTED]
Expected Benefits	Completion of this work will improve the security of supplies for customers in our Sussex North Water Resource Zone as well as South East Water's customers in the area and make maximum utilisation of the site and its outputs (21MI/d) which has not been delivered in 20 years.
Associated Price Control	Water Networks+ - Water Treatment
Enhancement TOTEX	£74.3m
Enhancement OPEX	0
Enhancement CAPEX	£74.3m
Is this enhancement proposed for a direct procurement for customer (DPC)?	No – this does not meet the value threshold for DPC

6.2 Introduction

6.2.1 Weir Wood WSW's strategic position

Weir Wood WSW supplies approximately 13,500 properties in West Sussex and the surrounding areas. It is a strategic WSW feeding the Sussex North supply zone. The WSW opened on the 16 September 1955 processing water from Weir Wood reservoir only.

Abstraction from the reservoir is limited by licence to 7,695MI per annum, 21.8 MI/d and 1.0MI/hr. A compensation discharge to the river Medway is made throughout the year (5.46MI/d (May-Oct) and 3.64MI/d (Nov-Apr)). Surface water gravitates from the draw-off tower in the Weir Wood reservoir which usually provides sufficient head to drive the water through the original clarification and filtration processes. An intermediate pumping station was installed in the mid 1990's to re-lift the water through the additional pesticide removal process. The WSW was built in stages to treat 21.8MI/d as provided for in the abstraction licence:

- Weir Wood WSW - the main works was completed in the mid 1950's along with Weir Wood reservoir.
- Pesticide Reduction - the Ozone and GAC plant was completed in the mid 1990's (Ozone is no longer used due to catchment risks being reduced).

Role of Weir Wood WSW in enhancing resilience of our system.

The raw water available to feed this WSW is taken directly from Weir Wood reservoir, a substantial impounding reservoir offering a reliable source of water, particularly during peak demand conditions. [REDACTED]

[REDACTED] It is expected that 17MI/d would be available from this reservoir during a maximum period of demand (Peak Deployable Output) and in a 1-in-200-year drought scenario. However, this raw water resource cannot be utilised by any other production facility in the region except Weir Wood WSW, and it is key to meeting the current and future water demand and reducing reliance on [REDACTED]



Increasing challenge in our system.

Weir Wood WSW is 69 years old and has reached the end of its life. The core processes of the WSW are 65 years old, and the [REDACTED]

A DWI prohibition notice was put in place surrounding the proliferation of this substance and this has led to an ongoing Peak Week Production Capacity (PWPC) outage. [REDACTED]

[REDACTED] This has ultimately resulted in reduced resilience in the Sussex North zone.

The WSW is subject to a DWI notice issued in 2018, mandating major asset improvement works to reduce water quality compliance risks to customers, and we have spent £11m in AMP 6 and a further £7.4m in AMP 7 to recover this site. The only way to achieve this is to replace the existing assets with suitable assets to treat the deteriorating raw water quality and reduce the risks of interruption to supply.

6.3 Need for Enhancement

In this section, we cover the reasons why a rebuild of the Weir Wood WSW is needed for supply resilience enhancement and what we need to do:

- 1) The criticality of Weir Wood to the rest of our system
- 2) Weir wood as a key part of our long-term strategy
- 3) Increasing water quality risks, WRMP and DWI commitments
- 4) Asset Life expiration
- 5) What we need to do.

1 - The criticality of Weir Wood to the rest of our system

Weir Wood WSW is one of only eight surface water treatment works we operate across our region. It plays a critical role as part of a system with our largest four sites to provide supply resilience to our customers. During normal operation Weir Wood supplies enough water to feed c100,000 people (at 130 litres/head/day).

At its peak licence rate, it can supply enough water for c168,000 people. The historical licence for Weir Wood WSW permitted a maximum daily abstraction of up 21.8 MI/d. In drought, the annual average daily output from the reservoir is 5.4 MI/d.

The water from our Weir Wood WSW is fed into our Sussex North Water Resource Zone and also into South East Water's network, supplying 40,000 of their customers. The site forms a core component of both Southern Water's and South East Water's long-term strategy for water supply by 2050.

Our Baseline risk assessment in our Asset Risk Management (ARM) system, which was validated through our Risk and Value process, assesses the risk of not having Weir Wood WSW in supply as a £32m risk for the business. The top 5 risks associated to this base line risk assessment are:

Table 12: Top 5 risks impacted if Weir Wood WSW is not in supply

Top 5 Risks impacted	Risk of not having Weir wood in supply	Priority
	Property Minutes Interruptions (>3hrs) WN03	1
	Discharge Failure	2
	Mitigation impact prevention	3
	Unplanned outage	4
	Legal compliance	5

The volume of water available for use (WAFU) in Sussex North is expected to reduce in increasingly with more challenging drought conditions.

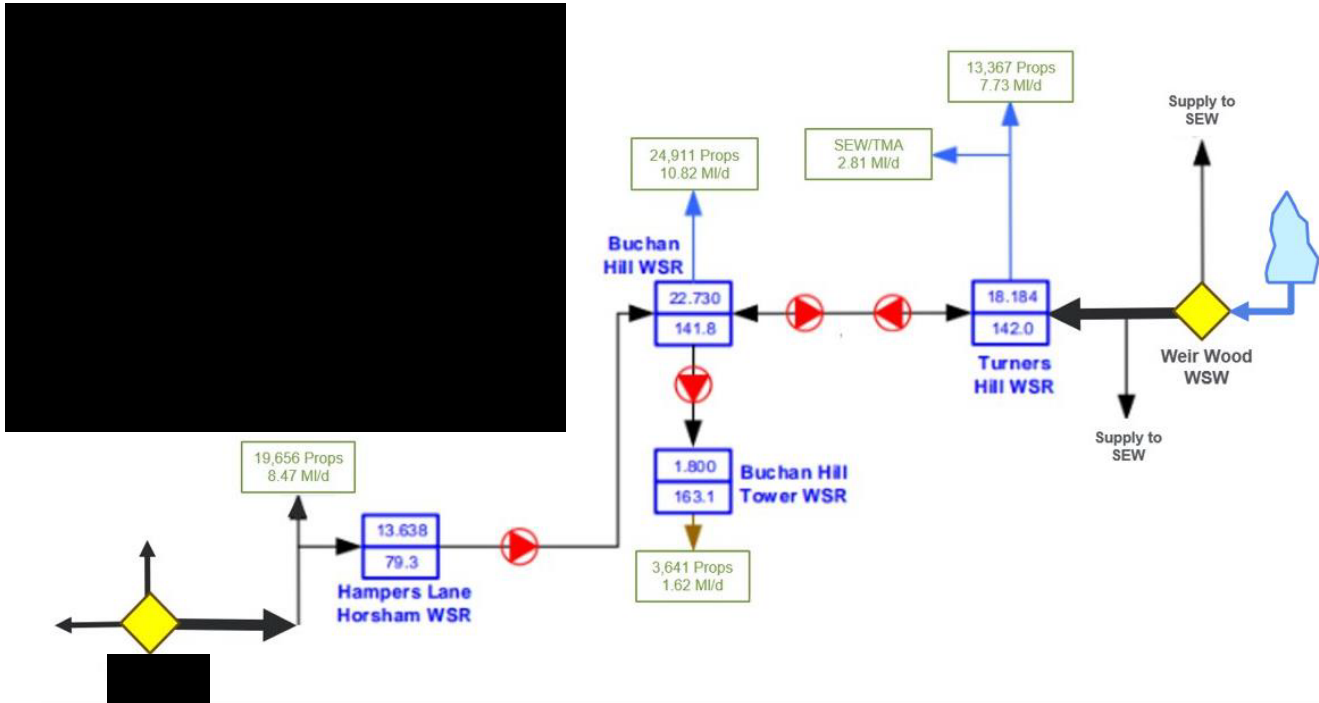


Figure 2: Location of Weir Wood WSW and [redacted] and simplified schematic of Sussex North supply system

2 – Weir Wood as a key part of our long-term strategy

Weir Wood WSW is a key part of our Long-Term Delivery Strategy (LTDS – SRN02⁶) and WRMP24 and is required until at least 2050. [REDACTED]

[REDACTED] The DWI have issued a notice (SRN-2022-00002 V2) for us to build a new plant at Weir Wood, as a long-term solution to the site being out of use due to the [REDACTED]. This is a response to that commitment. We will use the connectivity of the existing distribution system to generate redundancy in the current network and reduce the criticality of existing assets, specifically [REDACTED]

Our Water Resources Management Plan (WRMP) requires that the following quantities can be abstracted from the site:

- April 2025 – 7 MI/d total site output
- April 2027 – 14 MI/d total site output
- April 2029 – 21 MI/d total site output

There is insufficient water available at Weir Wood reservoir to sustain a constant daily output of greater than 7 MI/d during severe drought conditions without a specific operating plan or further raw water augmentation. However, during normal years and less severe droughts, the increased distribution input of up to 20 MI/d can provide increased resilience in the North Sussex WSZ. This will reduce reliance on [REDACTED] and may also provide opportunities to limit the need to use Sutton and East Surrey Water's (SES Water) rezoning options in the Crawley area which are expensive to operate. Furthermore, it may also reduce risks associated with FEO delivery at [REDACTED] (SRN-2022-00010) and the other 3 major surface water sites which have linked delivery programmes in AMP8.

Weir Wood WSW is required in addition to the other WRMP schemes planned for Sussex North. The WRMP currently utilises flow from Weir Wood in future AMPs. There are also likely to be conjunctive use schemes, such as water recycling, in future AMPs which utilise Weir Wood Reservoir and treatment capacity during extreme droughts.

3 – Increasing water quality risk, and DWI commitment

Over the last 20 years, there has been a continued reduction in the production output at Weir Wood WSW, initially due to a drought and outages experienced in 2004.

1

Pre 2004

Prior to the drought in 2004, we were able to produce a peak licence capacity of 21MI/d and an average of 14MI/d. As a result of the drought, we experienced some site outages in 2004 which led to subsequent issues of water quality risks and since then, we have not been able to sustain an output greater than 17 MI/d. This investment will enable us to sustain the 21MI/d needed for future resilience.

⁶ Chapter SRN02 – [Long Term Delivery Strategy](#)

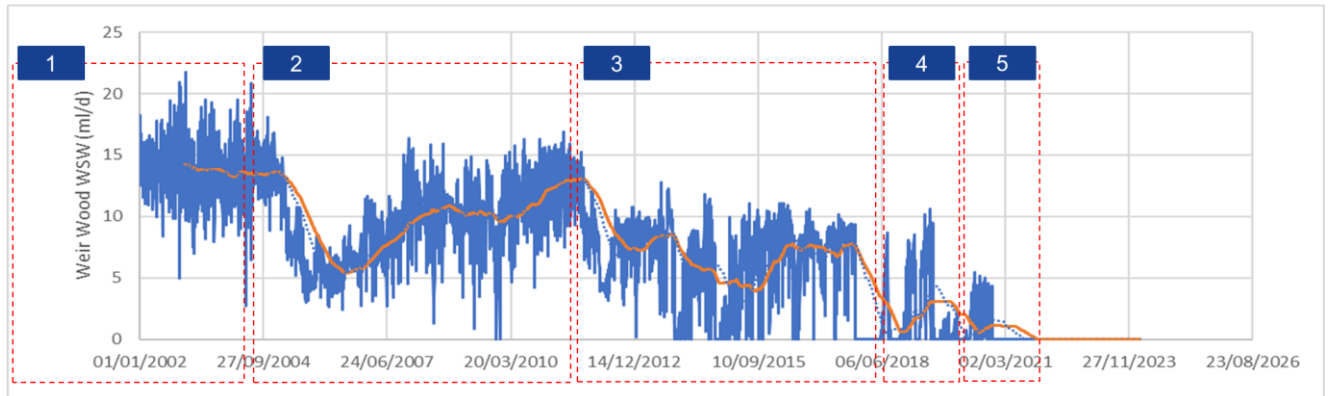
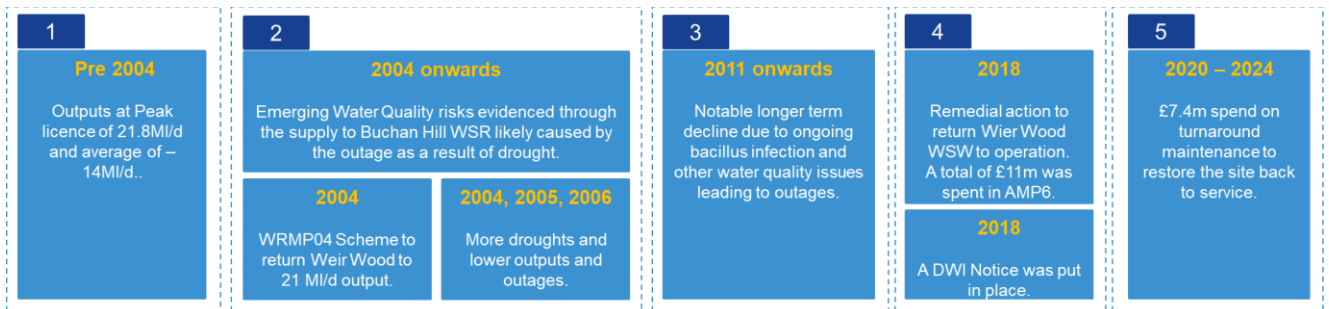


Figure 3: Output from Weir Wood WSW over last 20 years

2 2004 Onwards
 From 2004, there have been ongoing water quality concerns. Our water quality assessment has highlighted emerging water quality issues, some of which were evidenced through the supply to Buchan Hill Water Service Reservoir (WSR). At the time, our understanding was the water quality issues were as a result of the outages caused by the initial drought event in 2004 and then in 2005 and 2006, which resulted in lower outputs from the works and provided an environment for the bacteria growth, even though we were taking steps to mitigate the risks.

3 2011 Onwards
 As a result of the outages linked to the original drought and water quality issues, we experienced [REDACTED], and we saw a notable decline in outputs despite our efforts to restore the site to full operation. The works continued to experience low outputs and we were not able to deliver the original peak licence output of 21.8 MI/d.

4 2018
 The asset is 69 years old and [REDACTED] at Weir Wood WSW and we have carried out turnaround maintenance and refurbishments to return the works to operation. We carried out a risk and value assessment to determine interventions that will support a return to operation, and we invested in and completed construction works [REDACTED].
 [REDACTED] These new processes resulted in a maximum output from the site limited to 5MI/d in 2020. Overall, in AMP6, we invested £11m of Capex to provide important improvements to contact tanks and the provision of Bisulphite dosing to improve production outputs. Our aim was to reduce outages because of water quality issues and return to output levels on a par with the licence allowance. Unfortunately, the presence of [REDACTED] and as can be seen in Figure 3 above, the historical output from the reservoir has decreased significantly over the past 20 years.

The site has continued to experience problems and test results have indicated the [REDACTED]. This is largely due to the age of the asset and the intermittent operation of the WSW, originally because of the 2004, 2005 and 2006 droughts. This has promoted the establishment and continued presence of [REDACTED].

Investments	Description	Costs (£m)
AMP 6	Multiple improvement activities including (but not limited to): Installations of de-stratification system, valves, sludge connections on the clarifiers, individual turbidity monitors, RGF backwash valves repair, Recoating, and replacement of GAC's, new banded chemical delivery area and repairs to contact tanks.	£11
AMP 7	Initial interventions to improve water quality, responding to DWI's initial notice – SRN 2020_00001 to return the site to compliance, we carried out installation of Amazon filters, Bypass of contact tank, contact main and a UV reactor and subsequent early demolition works, to prepare the site for rebuild.	£7.4
Total		£18.4

Table 3:0 – AMP 6 and AMP 7 investments in Weir Wood WSW.

DWI Notice

Despite significant efforts over the last three Asset Management Periods (AMPs), Weir Wood WSW is currently unable to meet these standards. The works is currently under DWI improvement notice SRN-2022-00002 V2 which prohibits the use of the site “until such time the company confirms the risk from the biological growth observed at the treatment works is mitigated”. This includes prohibition of supply.

The notice also identifies the reduced resilience in the Sussex North Water Supply Zone (WSZ) equating to a no supply risk. To mitigate this risk, the notice commits Southern Water, by 31st March 2025, to:

- Construct new water treatment processes.
- Commission new water treatment processes.
- Complete asset integration of the new water treatment processes.
- Train operational staff on the operation and maintenance of the new water treatment processes.
- Supply water from Weir wood WSW into the downstream supply network.
- Provide confirmation the site has run into supply.

One month before 30th April 2025, we are required to confirm to the DWI that we are on track to bring the supply back to work via a Regulation 15 submission and provide evidence to confirm the biological growth is no longer a risk.

Therefore, this investment is a new regulatory obligation, the assets are life expired, and the need is above and beyond base maintenance.

5

2020 - 2024

Since 2020, we have invested £7.4m on returning the site to service compliance and undertaking general improvements to respond to the DWI notice. This is significantly more than our implicit base allowance of £2.2m. With the costs increasing and the water quality risks failing to diminish, we took a decision to rebuild the site in 2022-23. This is the safest and most economical way to provide safe,

clean water to meet industry standards. We are rebuilding the site in three stages to deliver our DWI and WRMP requirements by April 2025.

Table 13: Historical base allowance, actual investment, the AMP 7 resilience enhancement need and historical base funding gap. We are not requesting to be funded for the base gap.

Funding	AMP 6 (£m)	AMP 7 (£m)	AMP 8 (£m)
Base allowance	2.2	2.2	2.2
Actual investment	11	7.4	-
AMP 8 resilience enhancement need (this case)	-	-	74.3
AMP 8 Total <i>(Base and resilience enhancement)</i>	-	-	76.3
Base funding gap	8.8	5.2	-
Total base funding gap*	14		

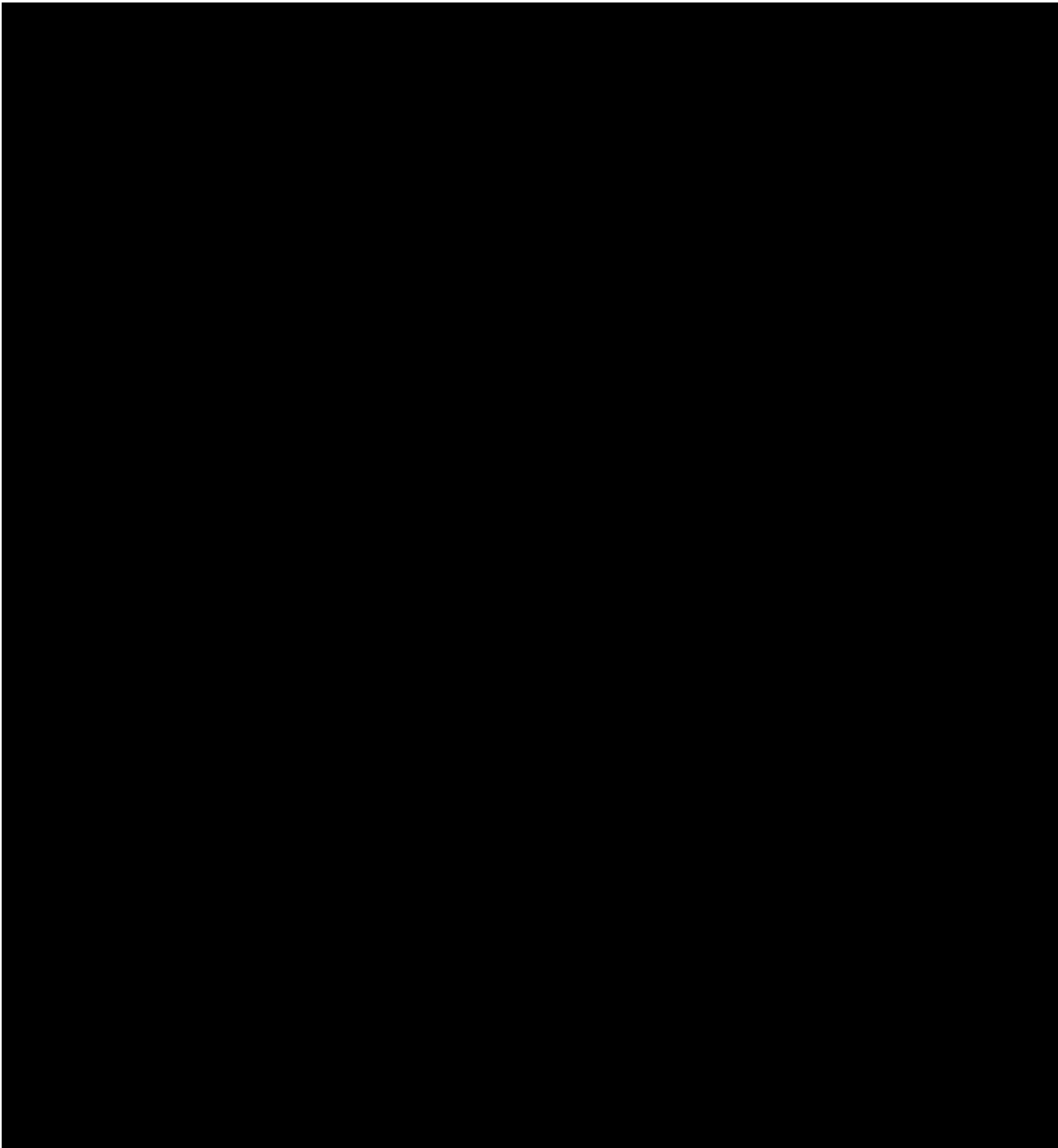
*We are not requesting to be funded for the base gap.

Since the [REDACTED] growth was encountered in the contact tank in 2018, the return to service has been put on hold so the issue could be fully understood. There has been extensive specialist resource involved in significant investigations over many years, with sequential asset improvement. To date, this has been unsuccessful in preventing the growth [REDACTED] in the treatment processes in a sustainable and consistent manner. This, added to the deteriorating water quality, the asset life of 69 years and the DWI notice (SRN-2022-00002 V2), means we need to build a new site to provide resilient water supplies for our customers in the future.

4 – Asset life expiration

This WSW is 69 years old, and the increasing risks are out of our control. A resilience enhancement allowance is required to ensure we mitigate the risk of no supply within the Sussex North supply zone.

Our asset assessment shows that [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]



Weir Wood WSW has suffered from treatment process issues in recent years, resulting in a low level of reliable input to the system. During AMP6, £11m was invested at this site to provide important improvements and maintain production but we have not been able to rely on this site to produce more than 17MI/d in the last 20 years.

While the DWI notice led to a total PWPC outage of the WSW, the investment allowed us to complete construction works to install [REDACTED], bypass the original contact tank structure, and provide disinfection via UV reactors and a new contact main. These new processes resulted in the maximum throughput of the site being limited to 5MI/d. However, the presence of [REDACTED] remained a problem after these interventions were commissioned, resulting in zero available output from Weir Wood WSW. Production

at [REDACTED] has been used to supply the deficit to Turners Hill WSR (normally supplied from Weir Wood WSW) via Buchan Hill transfer.

As demonstrated, we have been spending beyond our implicit allowance over the last two AMPs and rebuilding the site to meet the new water quality challenges at the site gives us an opportunity not only to meet WRMP and DWI commitments but also to deliver this in the most economically viable way.

What we need to do

We need to rebuild a compliant Weir wood WSW so it can provide a daily volumetric output of at least 14MI by April 2027 (with the necessary design and infrastructure including civils, electricals, space for future expansion etc) to allow the process plant to achieve the abstraction licence by 2028.

Reuse and decommissioning of any assets will be appraised to ensure there is no potential detrimental impact to regulatory compliance including health and safety. [REDACTED]
[REDACTED]
[REDACTED]

To meet our DWI and WRMP commitments, this will be delivered in phases, and it will allow us to use novel technologies and build in efficiencies.

The future treatment process will need to satisfy several factors, i.e., being able to:

- Treat the varying raw water quality from the existing Weir Wood reservoir source.
- Treat existing pesticide and meet dissolved organics challenges.
- Ramp flow rates up and down dependent on demand and make water available for use to a production capacity of at least 14MI/d
- Have the available supply demand balance, provide flexibility and redundancy within the zone to meet demand, maintain supplies during maintenance periods and to meet bulk supply commitments.
- Enable additional treatment stages to be easily incorporated if required in the future to process additional throughput (up to 21MI/d), emerging contaminants or new raw water sources.
- Have an asset life of 25 years with the expectation that conversion to Water Factory standards would occur after AMP11. It should be noted that this modular approach may be an appropriate Water Factory option for this type of raw water.

6.4 Best Option for Customers

As described in the Needs section, we will need to develop this in phases to deliver our DWI and WRMP commitments. To achieve that, we first evaluated our strategic level options through our Risk and Value process, once an option was selected, we re-evaluated the rebuild itself through different options.

Table 14: Strategic review of options to rebuild Weir Wood WSW

Option	Description	Total cost (£) 22/23 prices	Pros/Cons	Risks/Opportunities	Decision
Option – 1 WRMP Baseline	Ph1 – 6.0 MI/d modular Ph2 – 13.0 MI/d conventional Ph3 – 21 MI/d extension	£115m	<ul style="list-style-type: none"> Most expensive option. Meets WRMP expectations. Maximises flow during/after emergencies. 	<ul style="list-style-type: none"> Network upgrades required to use full capacity. Uncertainty over abstraction license. Reuse modular plant elsewhere in business once redundant 	Considered
Option – 2 Two Phases to maximum output	Ph1 – 6.0 MI/d modular Ph2 – 21 MI/d conventional	£105m	<ul style="list-style-type: none"> More cost efficient way to meet future WRMP. Possible deficit from mid AMP8 to 2029. 	<ul style="list-style-type: none"> Network upgrades required to use full capacity. Uncertainty over abstraction license. Reuse modular plant elsewhere in business once redundant 	Considered
Option – 3 Intermediate flow	Ph1 – 7.0 MI/d modular Ph2 – 14.0 MI/d conventional Ph2 – 21.0 MI/d Integration	£74.3m	<ul style="list-style-type: none"> Tried and tested technology at South West Water, need to develop understanding of the maintenance requirements of modular ceramic plant License uncertainty reduced 	<ul style="list-style-type: none"> Integration of plant into singular unit to deliver 21 MI/d during a severe drought Design life 40-50 years 	Preferred
Option – 4 Three phase modular	Ph1 – 6.0 MI/d modular Ph2 – 12.0 MI/d modular Ph3 – 18.0 MI/d modular	£90m	<ul style="list-style-type: none"> Need to develop understanding of the maintenance requirements of modular ceramic plant Not compliant with MEDs 	<ul style="list-style-type: none"> Use alternative modular equipment supplier to reduce costs (£20m to £30m benefit) Accelerated delivery possible Unknown design life 	Considered
Option – 5 Minimum flow	6.0 MI/d Modular plant	£30m	<ul style="list-style-type: none"> Least cost solution. WRMP baseline not met. No extra output during/after emergencies. Need to develop understanding of the maintenance requirements of modular ceramic plant License uncertainty reduced 	<ul style="list-style-type: none"> Poor water supply resilience Use alternative modular equipment supplier to reduce costs. 	Considered

Our preferred option is **Option 3 - Intermediate flow option** as we are able to deliver a Phase One 7MI/d plant using new technology and later integrate this with a conventional plant. This delivers a long-term solution that is more economical and reduces the risk of no supply, therefore meeting our DWI and WRMP commitments. Option 5 was considered but it does not meet the future resilience requirements and the legal output required.

We have developed the phased approach and delivery pathways.

6.4.1 Achieving Required Production Capacity – Preferred Pathway

Weir Wood WSW Phase 1 is the first part of a 3-phase delivery programme and recommends the development of a 7 MI/d modular plant. This is a higher output than the 6MI/d required by the WRMP however providing a higher capacity in Phase 1 maximises the short-term capacity achievable considering all three pathways.

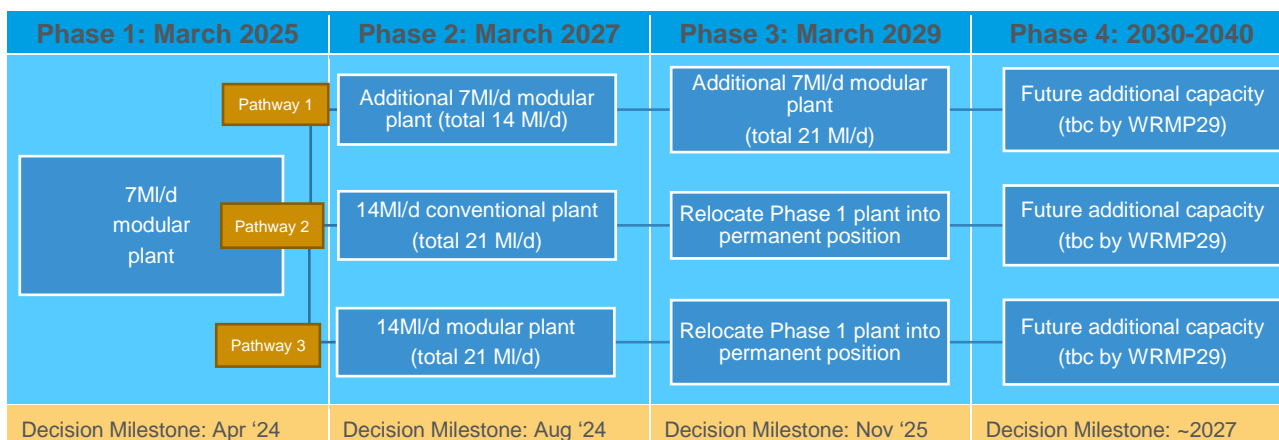


Figure 5: Asset Development pathways

Our preferred pathway is pathway 2 as it delivers on the short-term need while creating an asset with an extended life of 40-50 years, making it more economical than pathway 3.

It consists of a conventional treatment plant with a distribution input of 14 MI/d in Phase 2 delivering the following benefits:

- [REDACTED]
- [REDACTED]
- The 13 MI/d conventional plant has already been designed to 85% and site enabling works are complete to facilitate its construction.
- Planning permission has been granted for the 14 MI/d conventional plant, de-risking the delivery programme.
- The location of the existing GAC building and ozone contactor could be used to site the modular plant in the longer term.
- Phase 2 assets are developed in accordance with SW Technical Specifications including a longer asset design life and process plant redundancy in comparison to the initial modular plant.

Additionally, Option 1 Pathway 2 uses [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

6.4.2 Other options considered

Graduated replacement

The serviceability of the treatment works at Weir Wood WSW could be provided by an ongoing gradual AMP by AMP approach, replacing and refurbishing equipment sets as and when required. This would be an inefficient approach and would ultimately leave the business operating strategic WSW plant that is currently not suitable for service. It would be under a prohibition notice with time-expired assets that retain significant CRI and water quality risks and would become operationally inefficient to operate or maintain. Due to the condition and status of the existing plant, this is not considered a feasible option.

Replacement with a modular alternative

The option to replace the treatment process with a modern modular alternative, such as an ultrafiltration (UF) membrane plant, as the main physical removal process should be considered. UF membranes have been employed in the UK drinking water industry for a number of decades, often using hollow fibre polymeric membrane technology. However, they exhibit several drawbacks “such as poor, long-term stability, easy fouling and short lifetime” (Z. He, et al, 2019) ⁷. “Compared to polymeric membranes, ceramic membranes have the technical advantages including narrow and well-defined pore size distribution, higher porosity, better separation and a higher flux; higher thermal, mechanical and chemical stability and longer membrane lifetimes; and higher hydrophilicity, high fluxes at low pressures and lower fouling” (Z. He, et al, 2019)⁶.

⁷ Z. He, et al., Ceramic-based membranes for water and wastewater treatment, *Colloids and Surfaces A* 578 (2019)

Advances in ceramic membrane technology have brought water industry attention to ceramic membranes and they are now becoming an advantageous cost-effective option for municipal drinking water treatment. With this development, the use of ceramic membranes may offer a more flexible, robust, and reliable treatment stream option. In this process configuration, water would pass through a coagulation and flocculation process before being fed directly onto a UF membrane plant which would act as the main physical removal process, removing particulate material and cryptosporidium. A UF membrane has a pore size of 2-50 nm so would also contribute to the processes of downstream disinfection.

6.5 Cost Efficiency

Our standard enhancement solution costing approach, described in Part B of the Optioneering and Costing Methodology for Enhancements annex (in our October submission⁸) was followed to determine the costs of this work. This approach involves pricing solutions based on the best available information for the expected scope and the cost of that scope, and applying standardised allowances based on analysis of historical data for indirect costs, risks, and overheads.

The level of design development completed determines the granularity of scope available and therefore the specific costing approach to use. Costs are predicted using our libraries of standardised and regularly updated cost models developed from historical cost data augmented with industry information where required. These cost libraries are benchmarked internally and externally by our Cost Intelligence Team (and Mott MacDonald) to understand the relative cost efficiency.

For Phase 1, the cost involves the development of a new modular plant to deliver 7MI/d by March 2025. The current level of development is at early-stage design, but we have engaged with potential suppliers and received a quotation of [REDACTED] in 22/23 prices) from [REDACTED] in April 2024, excluding any Southern Water indirect costs. We are refining the level of design maturity and cost with [REDACTED], and our latest estimate is a total cost of £18.95m including Southern Water indirect costs.

For Phase 2, the cost involves construction of assets associated with a [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

We have carried out a market exercise and received two construction quotations, one at [REDACTED] and a revised cost at [REDACTED]. Both exclude an early works and design cost of [REDACTED]. We have taken the first quotation of [REDACTED] forward and our Cost Intelligence Team (CIT) has benchmarked 86% of the Net Direct Works (NDWs) and 78% of the indirect costs and they suggest the indirect costs consisting of Design, Contractor Fee, Management and Supervision are within acceptable CIT benchmarks against smart targets and the Direct costs. **The total cost of phase 2 is £46.9m (including the early works and design cost), which is £52.38 when converted into 22/23 prices.**

Our phase 3 cost is £3m which involves the cost of integration of the modular site and the conventional site in phase 2 to deliver a 21MI/d site by 2028. We have been able to keep this cost low due to the planned use of existing infrastructure on site such as buildings and Mechanical, Electrical, Instrumentation control, and Automation (MEICA) equipment.

⁸ [SRN15 Cost and Option Methodology](#)

therefore most appropriate to protect customers from non-delivery in this area using Price Control Deliverables (PCDs) linked to the delivery of these schemes.

Details of the PCD which will protect customers against late or non-delivery of this work are shown below in Table 16. The structure of this PCD follows the Conditions for PCD design we set out in SRN-DDR-052 Price Control Deliverables.

Table 16: PCD Summary for Weir Wood WSW

Component	Output
Description	Investment in Weir Wood supply works to both meet the long-term requirements of our customers in terms of providing a safe and resilient supply of water, as well as the issues identified in the DWI's FEOs.
Output measurement and reporting	Performance milestones will be reported and monitored annually through the existing APR process.
Total cost	£74.3m [AMP8 total only, 2022-23 prices]
Unit cost	£0.743m per percentage point of total programme completion. This is based on assuming full scheme costs (i.e., all 4 sites) are spread over 132 months with 60 months (or 45%) of them in AMP8.
Penalty rate	Penalty rates based on percentage completion. Per site rate is stated below: <ul style="list-style-type: none"> Weir Wood: £0.743m per % completion
Materiality of future scope alterations	£0.743m (1% of total costs)
Output delivery date with current scope	By March 2035
Conditions on allowance	Should we receive confirmation from a regulator of a necessary change to the timing or scope of a scheme, or in fact the change of scheme to address the core issue being it, either change in the benefit delivered or the solution being more expensive, the implication of this change would be reflected in the PCD. Where this change leads to a material variance greater than 1% of the original enhancement investment, then the PCD would symmetrically account for this change in a reconciliation at the end of the AMP.
Assessment of PCD	In the event of not delivering the output by the end of AMP8 (i.e., by 31 March 2030), but the need is still required, this PCD remains in place until the end of AMP9 (i.e., 31 March 2035). Ofwat will assess the completion of this PCD by 31 March 2035 as part of the PR34 process.
Late penalty rate	N/A
Measurement	Progress and performance will be reported in our annual performance report (APR) We will report progress on percentage of completion achieved by 31 March each year.
Penalties to be netted off in the event of non-delivery	DWI's FEOs penalties
Assurance	Third party APR assurer will assure that the output and conditions have been met.

Delivering the preferred solution

We have taken steps to develop the preferred solutions. We have:

- Identified a procurement pathway that will enable us to deliver at speed and meet our WRMP requirements.
- We have worked with our supply chain partners to ensure that the modular technology selected for phase 1 is viable. As part of that process, we have reviewed and discussed implementation case studies elsewhere to improve our confidence in the effectiveness of the solution.
- Our supply chain partners have delivered the same modular technology elsewhere.
- We have engaged our supply chain partners on outline design and confirmed a preferred supplier to deliver this works.

6.7 Conclusion

This scheme will deliver a completely new process plant at Weir Wood WSW, with the aim of delivering potable water to customers with [REDACTED] – the primary driver for the project. Furthermore, the site will be able to abstract and treat up to 21MI/d and an average of 14MI/d. Completing the works will also [REDACTED]. Delivery of this project will result in us upholding our WRMP requirements and the commitment to DWI (SRN-2022-00002 V2).

7.0 Business Plan Dependencies

Links with other Business plan documents include:

Draft Determination response chapter	SRN-DDR-006 Enhancements
Business cases	
Technical annexes	SRN15 Cost and Option Methodology (Oct 2023) SRN-DDR-021 Sustainable Botex Technical Annex
Enhancement cases	SRN25 Supply Resilience Enhancement Programme (Oct 2023)
Cost adjustment claims	
Ofwat test areas	
Assurance	
Other – please specify	

Data Tables impacted by the representation:

Table/s Impacted	Data Lines Impacted
CW3	118-120 – Resilience