Wessex Water Services Ltd Response to Ofwat's PR19 Draft Determination – August 2019

Representation reference: **Cost Assessment C4**

Representation title: **WINEP: Sanitary parameters**

Summary of issue

We remain concerned that Ofwat's cost assessment enhancement feeder model for sanitary parameters is based on information which is not properly representative of the true scope and costs of this work across the water and sewerage companies. Additionally, we have identified discrepancies with our allocations of population which has resulted in an understatement of the population equivalent for three of our planned schemes.

WINEP: Sanitary parameters	£m
PR19 business plan	32.962
Draft determination	19.356
Representation request	32.962

Change requested

On the basis of the evidence provided in this representation, we request that Ofwat allow the full costs for sanitary parameter removal, as submitted in our business plan in September 2018.

Rationale (including any new evidence)

In developing this representation we have sought to understand the reasoning between the difference of over 40% between Ofwat's assessment and our own estimates for our WINEP sanitary removal obligations. Our representation covers four main areas:-

i) Population misallocation
ii) Ofwat's interpretation of source information in the WINEP
iii) Robustness of Ofwat's model
iv) Additional evidence (Shepton Mallet and Yeovil STWs)

i) Population misallocation

We have identified discrepancies with our population allocations in Data Table WWn4. Where sites had more than once scheme/driver we had apportioned the costs to the relevant capital/operating expenditure lines in Data Tables WWS2 and WWS2a. We had, however,

misinterpreted the allocation of population equivalent and only placed the population equivalent against the primary cost driver in Data Table WWn4.

This has resulted in an understatement of population equivalent (p.e.) against various lines, including line 23, as shown below:

Table 1: Amendments to population equivalents for WWn4 Line 23 (Current population equivalent served by STWs with tightened/new sanitary parameter consents)

WWn4 April 2019 Line 23 p.e. (2020-2025)	Originally Included Sites	Amendment	Revised WWn4 August 2019 Line 23 p.e. (2020-2025)
89,027	Gillingham (14,505) Keynsham (20,310) Shepton Mallet (39,107) Wells (15,105)	+ Castle Cary (4,099)* + Radstock (25,523)* + Yeovil (56,807)*	175,457

*Castle Cary, Radstock and Yeovil p.e. originally only assigned against Line 18 (Current population equivalent served by filter bed STWs with tightened/new P consents)

We have updated our population equivalents stated in data table WWn4 as above. No alterations have been made to other tables in relation to this.

ii) Ofwat's interpretation of source information in the WINEP

We remain concerned regarding Ofwat's interpretation of the number of sites/schemes requiring improvement, as raised in our response to IAP (in particular, page 32 and Table 2-13 of "Appendix 4 – Protecting and enhancing the environment: Response to IAP").

We reviewed the WINEP with a view to assessing the number of sanitary improvements and contrasting that with the figure on number of relevant sites used by Ofwat in its modelling. The table below, which reproduces Tables 2-13 of our IAP response document, sets out our finding. As shown, our estimate on the number of sites is not always aligned with that of Ofwat. In the case of Anglian Water, for example, we have identified from WINEP that there are 9 relevant sites whereas Ofwat has set 24 sites against that company for the purposes of its cost assessment modelling."

Table 2: Assessment of sanitary removal improvements identified in WINEP (copy of Table 2-13 from IAP response document)

Company	Ofwat Model	Our assessment from WINEP					
		Permit change (or addition of UWWTD conditions)				Improvement needed	
		AmmN	BOD	UWWTD	Other	Number of Lines/ Schemes	Number of Sites
Anglian Water	24	6	3	16		9	8
Northumbrian Water	3	3				3	3
Severn Trent Water	73	53	19		1	73	62
South West Water	8	11	4	1		15	11
Southern Water	16	11	2	6		13	12
Thames Water	17	8	1	8		9	8
United Utilities	19	17	10			27	18
Wessex Water	10	7	3	1		10	7
Yorkshire Water	5	8	6			14	12

The Environment Agency's line definition for those schemes with a U_IMP1 driver is:

> "U_IMP1 Schemes to improve discharges that, through population growth, have crossed the population thresholds in the UWWTR and therefore must achieve more stringent UWWTR requirements. This includes newly qualifying discharges (from agglomerations >10,000pe) within existing sensitive areas."

As we stated in our response to the IAP: "The majority of the sites identified in the WINEP with Urban Waste Water Treatment Directive (UWWTD) drivers for sanitary parameters requirements will already be operating to a tighter Water Framework Directive (WFD) permit standard. In these cases, the UWWTD driver relates to a change in sampling methodology rather than process improvements."

UWWTD conditions are shown in the table below. WFD permits are site specific, depending on the size of works and sensitivity of the receiving waterbody. Generally, the concentrations for WFD requirements are more stringent than those to satisfy the UWWTD, as can be seen by comparing the WFD permits in the table above with the UWWTD permits in the table below.

Table 3: UWWTD requirements

Parameter	Concentration			Minimum percentage removal rate
	≥ 2,000 p.e.	≥10,000 p.e.	≥ 100,000 p.e.	
BOD	25mg/l (95%ile)			70-90
COD	125mg/l (95%ile)			75
Phosphorus*		2mg/l (mean)	1mg/l (mean)	80
Nitrogen*		15mg/l (mean)	10mg/l (mean)	70-80

* Requirements for discharges from urban sewage treatment works to designated sensitive areas. Wessex Water's U_IMP1 improvement driver relates to nitrogen removal at Wareham STW.

We cannot reconcile the number of sites used in Ofwat's model with our interpretation of the WINEP. By way of example, we list below an extract of the WINEP for Anglian Water:

Table 4: Extract of sanitary removal schemes identified in WINEP for Anglian Water

WINEP ID	Site Name	Driver Code	Population Equivalent*	Current Permit 95%ile	WINEP Permit 95%ile
7AW200243	Bardney STW	U_IMP1	2,076 (2,201)		
7AW200244	Hollowell STW	U_IMP1	1,416 (1,762)		
7AW200245	Stibbington STW	U_IMP1	1,925 (2,086)		
7AW200246	Sutterton Wigtoft STW	U_IMP1	1,971 (2,152)		
7AW200184	Fingringhoe STW	U_IMP1	1,874 (2,033)		
7AW200185	Gazeley STW	U_IMP1	1,818 (2,019)		
7AW200186	Great Leighs STW	U_IMP1	2,554 (2,709)		
7AW200187	Kirton (Drunkards Lane) STW	U_IMP1	1,862 (2,044)		
7AW200188	Langham STW (Essex) STW	U_IMP1	1,650 (2,120)		
7AW200189	Manea-Town Lots STW	U_IMP1	1,663 (2,149)		
7AW200190	Mundford STW	U_IMP1	1,910 (2,143)		
7AW200191	Shipdham-Carbrooks Rd STW	U_IMP1	1,865 (2,116)		
7AW200192	Shotley Overhall Fm STW	U_IMP1	1,792 (2,680)		
7AW200193	Stretham STW	U_IMP1	1,705 (2,072)		
7AW200194	Weeting STW	U_IMP1	1,844 (2,064)		
7AW200195	Wickhambrook STW	U_IMP1	1,566 (1,829)		
7AW202154	Uppingham STW	WFD_ND (BOD)	4,318	20	5
7AW202159	Corby Glen STW	WFD_IMPg (BOD)	959	12	5
7AW202213	Oakham STW	WFD_ND (AmmN)	10,515	20	9
7AW300469	Oakham STW	WFD_ND (BOD)	10,515	40	20
7AW200291	Winslow STW	WFD_ND (AmmN)	5,550	5	3
7AW200300	East Harling STW	WFD_ND (AmmN)	2,768	13	5.5
7AW300464	Brackley STW	WFD_ND (AmmN)	30,016	3	2
7AW300465	Hanslope STW	WFD_ND (AmmN)	2,309	n/a	7
7AW300466	Over STW	WFD_ND (AmmN)	12,454	4	3

*Values in brackets are forecast population equivalent at 2027.

From publicly available records of discharge permits for Anglian Water's sites with U_IMP1 drivers, most of the above sites are already operating to more stringent BOD final effluent discharge concentrations. Improvements other than changes in sampling regime would then not seem a requirement at all their 16 sites with U_IMP1 drivers, and for those few sites where the U_IMP1 driver does necessitate a tightening of permit, there is the potential that the site is already performing to this lower limit and thus limited improvements are required.

We appreciate Ofwat's statement that its model uses its "best estimate from WINEP3 and/or company plans" but, given the above assessment, it would seem inappropriate for Ofwat to use the full 24 sites used in its model. As previously highlighted in our IAP response, we remain concerned that Ofwat have not fully considered the subsequent implications on the modelled allowances.

If Ofwat intend to continue to use its sanitary parameter model, our recommendation is that it undertake a further review of the WINEP and company proposals to ensure that the model inputs are consistent and comparable.

iii) Robustness of Ofwat's model

We acknowledge the work that Ofwat has done to refine the models for use for the draft determination in response to comments from us and other companies. Ofwat have made changes to its sanitary parameter feeder model used for the IAP to make it more robust, in particular regarding the stringency of permit changes.

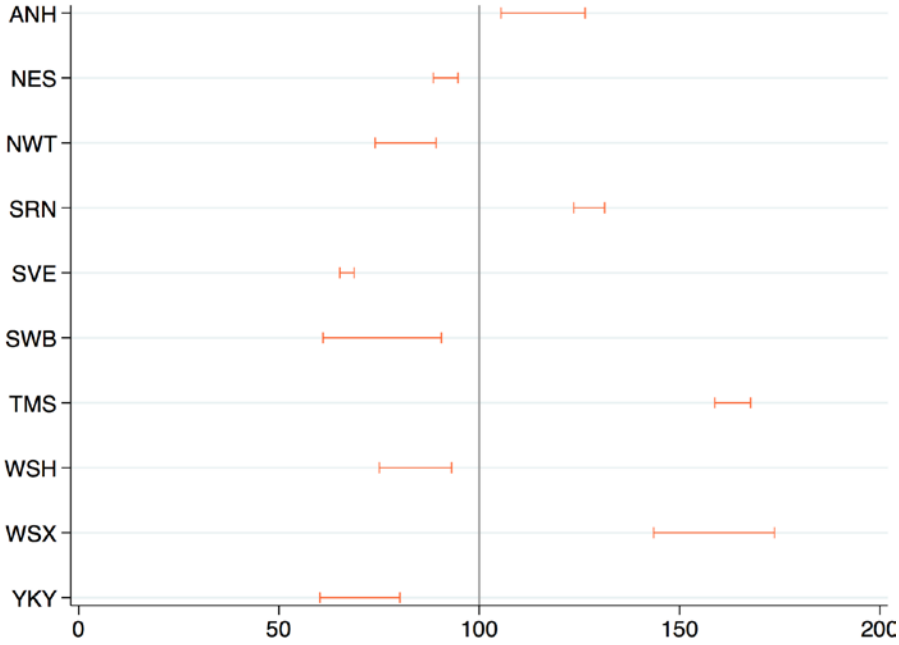
Ofwat's updated cost assessment for draft determination for sanitary parameters is based on taking the average of the costs predicted from two econometric different models:

- Model 1: Regression of [Totex] on [Number of sites with new or tightened sanitary parameter consents] and on [Pop. equivalent treated at works with new or tightened sanitary parameter consents], all variables in logarithms
- Model 2: Regression of [Totex] on [Number of sites with new or tightened sanitary parameter consents] and on [Change from 2019/20 to 2024/25 in load treated at works with ammonia consent at or below 3mg/l], all variables in logarithms.

Notwithstanding comments made above regarding the interpretation of source information, we remain concerned, regarding the lack of allowances in the models for any variable that controls 'how much tighter' the permit is to become, as raised in our response to IAP (in particular, pages 32-32, Table 2-14 and Figure 2-7 of "Appendix 4 – Protecting and enhancing the environment: Response to IAP"). Of our seven sites requiring improvements in the WINEP (for either BOD or AmmN), one is moving between two size bands, four are moving one size band and the remaining three are moving within a size band.

Figure 1 shows, for each company, how the efficiency scores – calculated as Business Plan totex divided by predicted totex – varies across the two Ofwat models. The Wessex Water figures have been revised to reflect the updating of the population equivalent data as detailed above, on the assumption that Ofwat accept the revision to our data, and leave its approach to the assessment otherwise unchanged.

Figure 1: Sanitary parameters: range of efficiency score under Models 1 and 2



For most companies the results of the two models are not too divergent, reflecting the point that the two models differ only in respect of the choice of variable used to pick up the tightening of consents – one based on change in load at works with consents at or below 3mg/l, the other based on PE at new or tightened consents. The wide range of efficiency scores for Wessex Water, however, does bring into doubt the suitably of using the models to triangulate an appropriate result.

A narrow range in the modelled costs across the two models does not imply that the predicted costs from either are statistically precise. To explore this, we have calculated the 95 per cent confidence interval for the modelled costs of each company under each of the two models. It is calculated from the confidence interval of the predicted values from the econometric regression results. These intervals give an idea of the precision with which the predicted costs are estimated by the model. The results are shown in Figure 2.

Figure 2: Sanitary parameters: 95 per cent confidence interval of modelled costs (£ million)

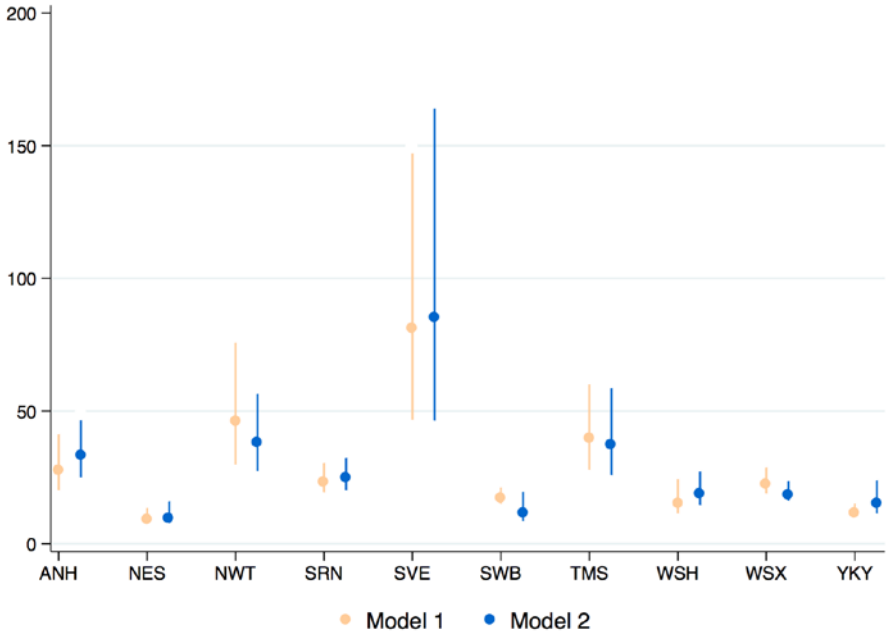


Figure 2 shows that, for most companies, the confidence interval is similar across the two models, including for Wessex Water. However, it does show a very wide confidence interval for the estimate of Severn Trent Water's modelled costs. For Model 1, this ranges from £42 million to £157 million. The width of this interval matters. As shown in the earlier figure, Severn Trent Water performs relatively well in Ofwat's cost assessment of this category, with an efficiency ratio of 67%. Its modelled allowance is £28 million below its totex (after reallocations), and this difference is a big part of what contributes to Severn Trent Water being an upper quartile company at the WINEP-wide level, and therefore plays a determinant role in setting the WINEP-wide upper quartile adjustment. In the light of the wide confidence interval around the estimates for Severn Trent Water's modelled costs in this category, we are concerned on the weighting that this has on the WINEP-wide adjustment.

Furthermore, a Severn Trent Water IAP query response led Ofwat to reallocate the costs and PE from discharge relocation into three other lines, including £22.4m to sanitary parameters. Whilst these schemes may be related to sanitary parameter removal, they can only really be considered on a site-by-site basis. For all our 7 sites with tightened permits, we have considered the potentially cheaper opportunity for discharge relocation and it was either not cost effective or could not be pursued due to local river conditions requiring our discharges to maintain river levels in low flow conditions, to prevent deterioration of the waterbody.

We would expect Ofwat's allowances to take all the above into consideration, in respect to the sanitary parameters model related to this representation and also Severn Trent Water's influence on the WINEP 'in-the round' adjustment, which we provide a representation on in C8: WINEP: In the round efficiency challenge.

iv) Additional Evidence (Shepton Mallet and Yeovil STWs)

Subsequent to the challenges from Ofwat to our plans in its IAP in January 2019 and our response at that time in April 2019, we appointed Stantec to undertake a high-level independent review of a number of proposed STW schemes to confirm (or challenge) our selected business plan option and its technical scope. Stantec are international engineering consultants.

The schemes were chosen for external review based on site-specific complexities and where we had particular concerns that their costs had not been adequately represented through Ofwat's IAP modelling approach. They also covered those schemes where, in our response to the IAP, we had invited Ofwat to review or take a deep dive into those programmes or schemes.

We selected Yeovil and Shepton Mallet STWs from the set of Sanitary parameter schemes, as these are the two largest schemes, together representing over 51% of the combined totex value in this area.

We have included Stantec's full report in Appendix C1.1: Third party report - Stantec. Stantec were asked to identify any immediate scope challenges as well as any opportunities for consideration in outline and detailed design. Their main conclusion is included below:

The finding of the report is that overall for all 14 sites reviewed, the solution described in the Business Plan is appropriate and a good fit to both Wessex Water design standards and wider industry benchmarks. For example, application of the "Pearce" model demonstrated that the process design approach applied for trickling filters is equal to or more aggressive than that of other UK water companies.

The challenge process applied by Stantec has developed many potential challenges some of which are recommended to be applied in delivery, these comprise optimisation opportunities as outputs of the Pearce model and drive reduced process risk, but not capital efficiency.

In no case was there any radical challenge as alternative unit processes or process trains promoted as a preferred solution after the risk analysis step.

The default approach by Wessex Water was to remain compliant with their in-house asset standards for wastewater process design. No significant positive deviations were identified through the gap analysis process i.e. examples of significant over provision of asset were not found. Conversely there were multiple examples of negative deviations i.e. examples of risk or potential under provision being proposed. These were driven by factors such as footprint constraint and the modular nature of process assets.

Wessex Water design standard sets out design horizons for new projects, dependant on the size of the STW as shown below: -

- *Population >10000 10 year horizon*
- *Population < 10000 20 year horizon*

In our view, this is a common and efficient approach with the longer design horizon for smaller STWs based on the very small marginal cost increase involved in constructing slightly larger process units for the longer term at these STWs.

There was evidence that Wessex Water were willing to take risks regarding the reuse of ageing assets either in their current or enhanced functionality or repurposed.

Where existing process assets are not embraced, modified or repurposed, a clear argument is given as to why an alternative is adopted. The theme in this case was the replacement or augmentation of trickling filter sites with the Activated Sludge process.

For many of the sites, the improvements required are manifold, for example at Hurdcott STW, Compton Bassett STW and Great Wishford STW. At these sites, simultaneous application of the load standstill principle regards sanitary determinants, and updating FTT for historic, and future growth to the design horizon is applied. This span of requirements across quality and flow mostly precludes the classical solution of solely adding tertiary or quaternary unit processes. Typically for the nine sites the whole process train from inlet to outfall requires quality and hydraulic upgrades and/or asset replacement.

Stantec's conclusion with regards to Shepton Mallet was,

> *"The results of the gap analysis conducted on the proposed solution consisting of new Activated Sludge Plant (ASP), demonstrate that the proposed solution will meet the proposed tightening of the current [ammonia and phosphorus] consent and new Zinc permit.*
> *A potential challenge to install a Biological Nutrient Removal ASP rather than a conventional ASP should be costed and reviewed due to the whole life cost benefits."*

Their conclusion with regards to Yeovil was,

> *"The results of the gap analysis conducted on the proposed solution consisting of a new Activated Sludge Plant (ASP), final settlement tanks (FST) to replace the existing secondary biological filters, indicate that the proposed solution will meet the proposed tightening of the current [phosphorus, BOD and ammonia] consent.*
> *A potential challenge to this solution would be to convert the ASP into a biological P removal ASP while still maintaining a chemical dosing plant downstream to ensure that the tightened P permit of 0.65mg/l is met. This solution would reduce the reliance on chemicals. However, it would need to be looked at in line with the sludge strategy for this site."*

Whilst not explicitly reviewed for Shepton Mallet or Yeovil, we had assessed biological nutrient removal (BNR) ASPs for other schemes in PR19, the largest being Holdenhurst (refer to pages 225-226 of Supporting document 5.1 – Protecting and enhancing the environment) and Dorchester (in anticipation of a nitrogen permit, although we have continued to work with the EA on our catchment offsetting approach for PR19, removing the need for an N permit in AMP7 – refer pages 62-63 of Supporting document 5.1 for details). We had also considered BNR for phosphorus removal in PR14 for a number of sites, including Taunton STW (an activated sludge plant serving 88,000 p.e.) and also smaller

sites, such as Cheddar, and found it not cost effective. For Taunton it was shown that the whole-life cost of the BNR option was 73% higher than the chemical dosing option.

By inspection, BNR options for both Shepton Mallet and Yeovil would require a similar or potentially larger sized activated sludge treatment process to that currently proposed. We had thus discounted BNR plants as options for either Shepton Mallet or Yeovil.

Sludge from Yeovil STW is pumped to the nearby Yeovil (Vale Road) Sludge Treatment Centre for processing, which also receives sludge imports from other STWs (approximately 22% and 78% respectively). As noted by Stantec, any modifications at Yeovil STW need to take due consideration of the sludge strategy for the site. Should Yeovil STW become a BNR process, there would need to be a significant change in our sludge management and treatment practice at Yeovil STC, with associated significant investment. This provides further weighting against a BNR process at Yeovil STW.

Notwithstanding our above responses to their potential challenges, Stantec have confirmed that our proposals for both Shepton Mallet and Yeovil are the most appropriate technological solution to meet the requirements of the WINEP. As detailed in Supporting document 8.11 – Assessing the costs of our enhancement programme (Sept 2018), cost estimates have been prepared by our experienced in-house estimating team, who also estimate live projects during the current price control period. We have carried out extensive external benchmarking of our cost estimates, which has demonstrated that our cost estimates are robust and efficient when compared with the external marketplace.

Why the change is in customers' interests

The change will enable us to construct the seven sanitary schemes listed in the WINEP, and to continue to target 100% compliance with environmental sanitary standards for sewage effluent. This level of performance is valued by customers and our other stakeholders.

Specifically, at our Yeovil and Shepton Mallet STWs, the proposed change will enable us to continue with a strategic approach to development at these sites. As explained in our Business Plan Supporting Document 5.1 (Annex E and Annex H), by selecting relatively small footprint solutions we are able to fit the required extensions within the boundaries of the existing sites and to put off extending the sewage works into other potential development areas.

Links to relevant evidence already provided or elsewhere in the representation document

- PR19 business plan submission (September 2018)
    - Supporting document 5.1 – Protecting and enhancing the environment
        - Section 3.3

        - Annexes E and H
    - Supporting document 8.11 – Assessing the costs of our enhancement programme

- Response to Initial Assessment of Plans (April 2019)
    - Appendix 4 – Protecting and enhancing the environment: Response to IAP
        - Section 2.5
        - Annexes E and H

- Response to Draft Determination (August 2019)
    - Representation C8: WINEP: In the round efficiency challenge
    - Representation Appendix C1.1: Third party report - Stantec