

November 2020

Reporting of sludge liquor treatment costs

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1. Introduction

- 1.1 Sludge liquors are by-products of the sludge handling and treatment processes which must undergo further treatment before being discharged to the environment. Although the activities related to these liquors sit within the bioresources price control, the assets used to treat them often fall within the wastewater network plus price control meaning that companies must recharge the cost of treatment back across to the bioresources control.
- 1.2 We have observed significant variation in the way companies quantify these recharges, which in turn leads to wide variation in cost and a potential distortion of the bioresources market.
- 1.3 In response to this issue, we commissioned Jacobs to develop a standard methodology for the quantification of sludge liquor treatment costs which could be included within our Regulatory Accounting Guidelines (RAGs)¹.
- 1.4 This document sets out our proposals on implementing the standard methodology designed by Jacobs and responds to key issues raised by companies. In summary, we are proposing that:
 - The standard methodology will be implemented for reporting year 2021-22. Companies will shadow report the cost of internal recharges for liquor treatment based on this until the end of Asset Management Plan period (AMP) 7, in order to avoid material financial impact resulting from a mid-AMP change. The methodology will be fully implemented from AMP 8 onwards.
 - Companies use the standard methodology when agreeing sludge trades from reporting year 2021-22 onwards. The difference between the standard methodology and current liquor treatment recharging practice could lead to excess revenues being generated by companies. We consider that this excess revenue should be passed in full to customers.
 - For the purpose of 2020-21 reporting, we request that companies report an indicative shadow cost as far as they are able to, following the guidelines in RAG 2. At a minimum this should include estimated operating costs, capital costs and overheads.
 - Companies continue using their current methodology for accounting for liquor treatment costs for the remainder of AMP 7. Companies must clearly state this methodology within the 2020-21 accounting methodology statement that is submitted

¹ <https://www.ofwat.gov.uk/regulated-companies/company-obligations/annual-performance-report/>

to us and continue to use it, unchanged, for each remaining year of AMP 7. This is in addition to using the standard methodology to shadow report.

Responding to this publication

- 1.5 In developing its recommendations, Jacobs held discussions with the companies during the development of the standard methodology, and incorporated comments received. We welcome feedback and comments on this proposed approach and ask that we receive those comments by 8 January 2021, and will update our guidance as appropriate.
- 1.6 Please email any comments to Connor.Ryan@ofwat.gov.uk.

2. Current guidance

- 2.1 The introduction of the separate bioresources control at Price Review 2019 requires companies to report separately costs related to bioresources from those of the other wholesale wastewater activities, which are referred to as wastewater network plus activities. The accurate allocation and reporting of cost information is key to the transparent development of the market.
- 2.2 One of the key costs is the cost of treating sludge liquors. Sludge liquors are by-products of the sludge handling and treatment processes, which must undergo further treatment before being discharged to the environment. However, the assets used to treat sludge liquors are often sewage treatment assets within the wastewater network plus control. Therefore, in order to ensure cost reflectivity, our RAGs require WASCs to quantify the cost of treating sludge liquors in sewage treatment and recharge this to the bioresources control.
- 2.3 The allocation of liquor treatment costs is governed by RAG 2, as it involves an internal recharge from wastewater network plus to bioresources. RAG 2 states that capital costs must be included when allocating costs across price controls and that liquor cost quantification should take into account:
- Volume flow,
 - % of solids
 - Biochemical oxygen demand(BOD),
 - Chemical oxygen demand (COD) and;
 - Ammonia.
- 2.4 RAG 5 contains guidelines on transfer pricing for services between appointed and non-appointed arms of a company. In a sludge importing situation the non-appointed arm of the bioresources business will need to pay the appointed business for use of the assets required to treat sludge liquors. Under RAG 5, this payment must be determined by market testing if possible. For sludge liquor costs however, there is no appropriate market on which to base a transfer price. Although the characteristics of sludge liquors bear some resemblance to trade effluent, trade effluent treatment is ultimately not provided within a competitive market and so cannot be used to set an appropriate transfer price.

- 2.5 As an appropriate transfer price cannot be determined through market testing, RAG 5 stipulates that recharges for liquor treatment costs should be allocated based on cost, as in RAG 2.
- 2.6 We have observed large variations in the costs of liquor treatment reported by WASCs. This is caused by the variation in the methods employed to quantify these costs. The high degree of variation in approach and estimated cost can hinder the efficient development of the market, as variation in sludge treatment costs between companies could reflect differing approaches to the calculation of sludge liquor costs rather than true cost differentials between companies.
- 2.7 Jacobs has highlighted the range of approaches in their final report (see table 2.1 below). The table shows that as well as varying in the costs that are considered in scope, companies also differ in the determinants they use to generate cost and how these are estimated.
- 2.8 To help to resolve this issue, in September 2020 we commissioned Jacobs to develop a standard methodology for the quantification of sludge liquor treatment costs that could be included within the 2020–21 RAGs. We are publishing Jacobs’ final report alongside this document.

Table 2.1: Summary of responses from companies around how they monitor liquors, what determinants they monitor and which costs they include

Company	Monitoring		Determinants			Costs in scope				
	Regular, routine sampling	Ad hoc or diagnostic sampling	BOD	COD	Ammonia	Marginal energy cost	Variable Opex	Variable & fixed Opex	Opex & apportioned annualized Capex	Opex, overheads & apportioned annualized Capex
A	--	✓	✓	-	-	-	-	-	✓	-
B	-	✓	✓	-	✓	-	-	✓	-	-
C	-	✓	✓	-	-	✓	-	-	-	-
D	-	✓	✓	-	-	-	✓	-	-	-
E	-	✓	-	✓	-	-	-	-	✓	-
F	✓	-	✓	-	✓	-	✓	-	-	-
G	-	✓	✓	-	✓	✓	-	-	-	-
H	✓	-	✓	-	-	-	-	-	-	✓
I	-	✓	✓	-	-	-	✓	-	-	-
J	-	✓	-	✓	-	-	-	✓	-	-
Total	2	8	8	2	3	2	3	2	2	1

3. Standardised methodology

- 3.1 Jacobs have proposed a standard methodology for the quantification of liquor costs which, after review, we have decided to adopt. In summary the standard methodology:
- includes an allocation of variable and fixed opex, an allocation of annualised capex, and an allocation of the site's allocation of corporate overheads. Capital costs are to be calculated as a net modern equivalent asset value (MEAV) for each site;
 - uses Biochemical Oxygen Demand (BOD) load and ammonia load (where the relevant site has an ammonia consent) as determinants of cost;
 - requires a minimum rolling average of 12 evenly spaced samples;
 - requires BOD (kg/day) and ammonia loads (kg Amm-N/day) loads in liquor treated to be reported in the APR.
- 3.2 Companies should apply the standard methodology separately to each site where sludge liquors are treated, as cost will vary between sites. However, total £m cost at the company level should be reported in the RAGs.
- 3.3 A full description of the methodology is located in appendix 1.

4. Industry feedback and our response

- 4.1 Jacobs engaged with the companies when designing the standard methodology. In discussions, the industry was broadly supportive of the proposed methodology from a technical basis. However, companies raised some concerns, which we have addressed in this section.

Implementing the methodology

Shadow reporting for 2021-25

- 4.2 Wastewater network plus recharges the cost of liquor treatment to the bioresources control. A change now in how the liquor treatment cost is calculated could increase or decrease the payment paid to the wastewater network plus control from the bioresources control from the cost companies assumed when submitting their business plans for the 2019 price review. This could therefore affect the relative cost performance of the wastewater network plus and bioresources controls. The 2020-25 cost sharing rates differ between the two controls. Companies share the effects of cost under or outperformance with customers in wastewater network plus, but incur the full effect in bioresources. This means that there could be a negative financial impact on companies from transferring costs from the wastewater network plus control to the bioresources control within the 2020-25 period.
- 4.3 Some companies considered that a change in methodology midway through AMP 7 could cause significant change in their assumed cost of treating sludge liquors. With no mitigations this could therefore have a material financial impact on companies in AMP 7. Jacobs estimated that the effect of the change in methodology could range from £30 million to £100 million for an average company (based on the liquor charge ranging from around 7.5% of the bioresources budget to around 25%).
- 4.4 One company also considered that the proposed change in approach could incentivise companies to invest in liquor treatment capacity in bioresources to minimise the costs in this price control. We do not consider that, on its own, the move to the standard methodology would create these incentives. Companies will still be incentivised to minimise overall costs in the wastewater control, whether they are in wastewater network plus or the bioresources control. Therefore, they are only likely to build liquor treatment capacity if this is the most efficient approach.
- 4.5 We have decided not to fully implement the standard methodology designed by Jacobs in the 2020-21 RAGs. Our proposed approach is to fully implement in the 2021-22 RAGs, with a period of shadow reporting for the remainder of AMP 7 alongside companies

maintaining their current costing methodologies for the purposes of reconciling AMP7 performance.

- 4.6 The standard methodology requires twelve samples to be taken in order to generate a representative cost. Given this, we recognise that companies will be unable to shadow report accurately using the standard methodology in July 2021. However, we request that companies report an indicative shadow cost as far as they are able to in July 2021, based on the guidance in RAG 2. At a minimum, this should include estimated operating costs, capital costs and relevant overheads. This is to be reported in APR table 8C.
- 4.7 From reporting year 2021-22 until 2024-25, we propose that companies shadow report the cost generated by the standard methodology. This is to be reported in APR table 8C.
- 4.8 This will ensure that changes in the RAGs do not have a material financial impact on companies during the remainder of this period and the market will gain full benefit from accurate costing from 2025. Companies will also be able to factor the change in methodology into their investment and long-term trading decisions.

Application to sludge trades

- 4.9 We also propose that companies apply the standard methodology when agreeing trades. This applies to all trades agreed from reporting year 2021-22 onwards. This is so that companies and third parties interested in trading sludge can benefit from a level playing field. Liquor costs are a significant part of sludge handling and treatment, and so it is important for the market that any distortion being caused by inaccurate accounting be removed as quickly as possible. This should also improve market information available to companies and third parties, thereby improving market entrant certainty.
- 4.10 We recognise that using the standard methodology to agree sludge trades and current practice to set internal recharges could lead to excess revenue being generated from trading. Use of the standard methodology will increase the costs of treating sludge liquors for most companies. In an AMP 7 trade situation, these costs will be passed on to exporters, however the importing company will only report the cost determined by their current liquor charging practice. In most cases this cost is below the cost that will be passed on to exporters, meaning companies could generate windfall profits.
- 4.11 RAG 5 requires the non-appointed business to share a portion of profits with the appointed business's customers, based on the risks taken by both parties². Companies will not have taken on any extra risk to generate the profits arising from methodology

² <https://www.ofwat.gov.uk/wp-content/uploads/2017/11/RAG-5.07-Guideline-for-transfer-pricing-in-the-water-and-sewerage-sectors.pdf>

changes. Therefore, we propose that the element of profit arising from methodology changes be passed on in full to customers. Companies should include this profit within line 2M.7 in the Annual Performance Report.

Statement of current practice

4.12 Given the variety of approaches companies use to calculate the costs of treating sludge liquors, we propose that companies continue using their current methodology for accounting for liquor treatment costs for the remainder of AMP 7. This should be reported in table 4E, as in previous years. Companies must clearly state this methodology within the 2020-21 accounting methodology statement that is submitted to us and continue to use it, unchanged, for each remaining year of AMP 7. This is in addition to using the standard methodology to shadow report.

Link to trade effluent charging

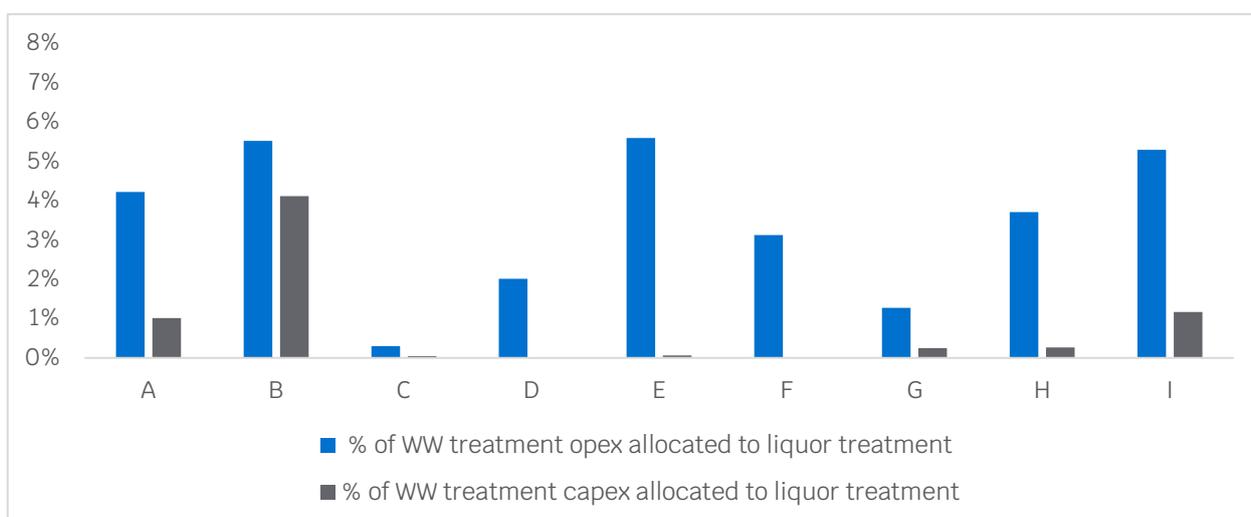
- 4.13 One company suggested that on the basis of RAG 5, the Mogden formula, typically used to establish trade effluent charges, should be used to charge for liquor treatment costs. It suggested that introducing the standard methodology could lead to trade effluent customers being able to cherry pick which methodology is used to charge them.
- 4.14 We recognise that there is a degree of similarity between trade effluent and sludge liquors. However, the regulatory accounting guidelines already treat trade effluent and sludge liquors separately. For liquors the standard methodology sets out an accounting internal charging rule which is cost reflective for a particular site. Trade effluent charges are set at the regional level and don't vary across sites. While trade effluent charges are also required to be cost reflective, they are not determined in a competitive market. As trade effluent services are not provided in a competitive market, they cannot be used to generate an internal transfer price for sludge liquors.
- 4.15 Because of this, the development of the standard methodology for liquor treatment costs does not inhibit or supersede the use of the Mogden formula for trade effluent charges. The two methodologies should be considered separate. We view the Mogden formula as an appropriate methodology to calculate trade effluent charges and do not consider that it needs revising at this time.
- 4.16 There is a risk that, for charging purposes, sludge liquors could be considered equivalent to other trade effluents and be charged on the basis of the Mogden formula. To ensure consistent treatment across all water companies, we consider that the standard methodology should be used as a basis for charging for the treatment of all sludge liquors in wastewater network plus, regardless of whether they are from the same appointees sludge treatment works, or from a different appointee.

Impact on wastewater network plus RCV

- 4.17 Jacobs have suggested using a net modern equivalent asset valuation (MEAV) approach to calculate the capital costs of treating sludge liquors in wastewater network plus. The gross MEAV is what it would cost to replace an old asset with a technically up to date new asset with the same service capability allowing for any difference both in the quality of output and in operating costs. The net MEAV is the depreciated value taking into account the remaining service potential of an old asset compared with a new asset, and is stated gross of third party contributions³. One company fed back that this would result in the whole of the RCV discount for wastewater network plus attaching to the sewer network. The company stated that this would mean wastewater treatment accounting for about 5% of wastewater MEAV, but representing c.36% of the RCV under a focused valuation. The company indicated that this would also have implications for the charges paid by other wastewater customers. It was suggested that an alternative would be to model the efficient cost required to undertake liquor treatment within a sludge treatment centre.
- 4.18 First, it is important to recognise that the standard methodology does not require the network plus RCV to be reallocated across wastewater network plus and bioresources controls. The standard methodology simply requires a recharge of capital and other costs from wastewater network plus to bioresources controls.
- 4.19 Second, we do not consider that the capital cost charge from wastewater network plus to bioresources would be excessive. The net MEAV approach reflects the capital costs that would be incurred if existing assets treating sludge liquors had to be replaced (net of depreciation). This is the basis for the RCV allocated to the bioresources control, and reflects the costs faced by an entrant in the market. While we acknowledge the significant RCV discount applies to the assets in wastewater network plus, sludge liquor treatment capital costs will only be a small proportion of total wastewater treatment capital costs, which themselves are a small proportion of overall wastewater network plus capital costs. Data for 2013–14 shows that the average proportion of wastewater network plus net MEAV made up by sewage treatment was approximately 6%. Figure 4.1 indicates that even for companies that are currently allocating capital costs to liquor treatment, these costs only make up approximately 4% of sewage treatment capex. Given this, and the significant positive impact use of MEAV would have in helping promote a level playing field, we consider its use is warranted.

³ [Ofwat RAG 1.04](#)

Figure 4.1: the percentage of wastewater treatment opex and capex allocated to sludge liquor treatment by the nine of the main wastewater companies. One company has been excluded due to a data issue.



4.20 Third, we do not consider that the proposal to model the hypothetical efficient cost of liquor treatment within an integrated sludge treatment centre would provide a more robust or cost reflective approach. Some companies have wastewater treatment sites without ammonia consents meaning a different hypothetical approach to treating liquors would be considered than at sites with ammonia consents. So, the efficient cost of liquor treatment would be open to interpretation. This could be harmful to the objective of creating a level playing field if different market participants have different interpretations of efficient costs.

4.21 One company suggested that the use of net MEAV to calculate capital costs could have an adverse impact on trade effluent charges. We do not consider that this would be the case. Regardless of the approach used to calculate the capital costs for treating sludge liquors, companies would still recover the same overall level of costs for trade effluent. It is just that some of these costs would be recovered through the bioresources control rather than the wastewater network plus control. Consequently while this could result in some elements of trade effluent charges being lower, trade effluent charges also include a sludge term which would pick up any increase in sludge related costs. We are therefore not convinced that there would be a material impact on trade effluent charges.

Sampling

4.22 One company commented that increased sampling of liquors would add significant cost pressure to the bioresources control and that the benefits of this need to be weighed up carefully. The company also highlighted the wide range of potential cost for ammonia

removal and stated that several years will be required to establish a credible baseline for this.

- 4.23 We recognise that the sampling required will represent a cost for companies. However, this is a necessary cost that companies must incur to allocate costs accurately and therefore comply with RAG 2.
- 4.24 We propose that, for 2021-22, companies sample liquor returns 12 times over the year. This is the minimum number of samples recommended by Jacobs in order to determine a representative sample of BOD₅ and ammonia concentrations. These estimates can be updated by quarterly samples in subsequent years and a rolling average used for calculating appropriate charges.
- 4.25 We are proposing that companies shadow report the costs of liquor treatment according to the standard methodology for the remainder of AMP 7. This period of shadow reporting will allow companies time to address issues with the variability of ammonia samples in time for regular reporting from 2025.

A1 Appendix 1: Details of standard methodology

A1.1 In summary, the standard method to calculate the annual cost of liquor treatment is as follows:

- 1) Commence sampling liquor returns. These should be monthly for the first year and quarterly from then on. Sample BOD only where there is no ammonia consent, and BOD and ammonia where there is one.
- 2) Identify the assets in scope for each site. These are the ones which treat liquors. This varies depending on where the liquor returns are.
- 3) Calculate the cost in scope:
 - a) The capex element is the annualised cost of capital and depreciation on the net MEAV of the assets. It also includes a fraction of the cost of capital and annual depreciation on shared assets. Apportion this using area.
 - b) The opex element is the annual operating cost of the assets in scope, including overheads. Ignore the opex of shared assets unless it is likely to constitute at least 10% of the site opex. If it meets this threshold, apportion it to the assets in scope using the ratio of known opex of the assets in scope to total wastewater site opex.
- 4) Calculate the liquor cost:
 - a) Use a mass balance approach to calculate liquor volume.
 - b) Use the latest running average sample data for liquor strength
 - c) Find the fraction of the cost in scope which is the liquor cost. If the site has an ammonia consent, use the BOD and ammonia formula, otherwise use the BOD-only formula.

BOD-only formula:

$$C = W \frac{BOD_l V}{BOD_h I}$$

BOD and ammonia formula:

$$C = W \frac{(BOD_l + 4.57A_l)V}{(BOD_h + 4.57A_h)I}$$

Where:

- C is liquor cost
- W is the total wastewater cost in scope.
- BOD_l is the weighted average BOD on the liquor return(s)
- BOD_h is the BOD at the head of the works (crude sewage pre-liquor returns)
- V is the total liquor volume returned
- I is the wastewater influent volume excluding liquors
- A_l is the weighted average ammonia concentration on the liquor return(s)
- A_h is the ammonia concentration at the head of the works (crude sewage pre-liquor returns)

A1.2 Further information can be found within Jacobs' final report, which we are publishing alongside this document.

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Ofwat
Centre City Tower
7 Hill Street
Birmingham B5 4UA

Phone: 0121 644 7500
Fax: 0121 644 7533

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