Appendix – APR Supporting Commentary

Annual Performance Reporting 2023-24

from Southern Water

Annual Performance Report 2022-2023 Supporting Commentary

This document contains additional technical commentary and narratives on performance associated with Southern Water's 2023-24 Annual Performance Report (APR) data tables, and commentary addressing specific narrative requirements from Ofwat's Regulatory Accounting Guideline 3.14 (RAG 3.14) and the rational for publishing our APR data tables.

Publishing Rationale

All annual report data for Southern Water, including downloadable copies of our submitted data can be found on the Our Annual Reporting section of the Southern Water Website. Our APR table data is now available in two formats, a consolidated excel file and – new this year for open data – a comma separated values (.csv) file which has the data reformatted to be machine readable for analysis. This .csv file has been implemented in collaboration with other water and sewerage companies who will also publish this same .csv format to maximise the utility of this dataset for cross sector comparisons.

Links to our APR data will also be available alongside other companies from the Stream open data website. Stream is a water sector group dedicated to making further progress in open data. We also continue to work collaboratively with other water and sewage companies to collate all published data for internal industry comparison purposes and are working with them and WaterUK to understand the benefits of making this combined data set publicly available.

Our commitment to open data has continued with the adoption of a company open data strategy, collaboration on a sector wide open data strategy, improvements to Beachbuoy (becoming rivers and seas watch) , the adoption of an open data licence (which we will be applying to existing publications such as our reservoir level data) and a new dataset of annual drinking water quality data at sample level available on the Stream website.

Required additional commentary – Narrative on costs

4.23 The lines in Tables 4L and 4M generally correspond to the standard lines in the PR19 business plan tables WS2 and WWS2 respectively. Where lines from the business plan tables have no corresponding lines in Tables 4Lor 4M it is because these lines were either not used by companies or by just one or two companies. Tables 4L and 4M have lines for companies to insert their own expenditure purpose categories. If companies would have allocated expenditure to any of the standard lines in the business plan tables that have not been copied across to RAG4.09 tables, they should instead allocate the expenditure to these 'freeform' lines. If these lines have been used, companies should provide commentary to explain them.

In table 4L, and additional line has been used for impounding reservoirs. In table 4M, we have used additional lines for the following:

- WFD Manage uncertainty Special case
- AMP 6 Bathing Water enhancement
- NEP - Groundwater schemes
- NEP - Flow 1 schemes

Plus the following with a nil balance:

- AMP7 WINEP3 Chemicals NDLS Permits

4.24 Companies should provide commentary to explain whether any costs have been proportionally allocated between expenditure categories in tables 4L and 4M or between enhancement and base expenditure. Companies should include details of how much has been subject to proportional allocation and which cost drivers they have used.

N/A. No proportional allocation has been applied.

4.25: In table 6A.13 to 6A.27 companies are required to report water treatment works that have not been used in the year but have not been decommissioned. Companies should provide commentary on any instances where this is the case

The following are water treatment works that have not been used in the year as result of demand management and ongoing works but have not been decommissioned, with the only change from 2022-23 being the addition of Gore Hartlip Hill WSW:
Deal Low Level WSW, Gore Hartlip Hill WSW, Keycol WSW, Lewes Road Brighton WSW, Lord of the Manor WSW, Minster IOT WSW, Shalcombe WSW, St Lawrence WSW, Ventnor New WSW, and Weirwood Forest Row WSW.

4.26: Companies should provide commentary on how they have calculated population and household growth in table 4R including how they have taken account of the 2011 census.

We continue to use a population forecast created by Experian Analytics which takes account of the 2011 census and the Office for National Statistics' updated population projections. Each year the forecast is then compared against the latest published Office for National Statistics mid-year forecast to check accuracy.

4.27: Companies are encouraged to provide commentary on how they interpret 'structurally refurbished' in completing line 7C.15. If a company is unable to identify the actual length of rising main that has been replaced or structurally refurbished, then it should submit an estimate and fully explain the methodology used and the assumptions made in the accompanying commentary.

Structural refurbishment of rising mains comprises a permanent solution such as pipe replacement or bespoke in-pipe renewal such as lining with an expected design life exceeding 50 years. Refurbishment of part can be claimed but only where the affected length is greater than 50m in accordance with the Structural Sewer Rehab Policy document. Six rising main replacements have been completed and post documentation provided during 2023-24, an increase on the two in 2022-23.

4.28: Companies should explain the basis of its estimate for line 8A.4 of all the untreated sewage sludge (primary, secondary, tertiary) produced by in-area wastewater treatment processes in the report year, and which is produced as a result of treating non-appointed liquid wastes through appointed wastewater treatment assets

The calculations for sludge Total Dry Solids (TDS) generated from non-appointed liquid wastes treated through our treatment works are based on the following:

- For domestic tankered waste a Population Equivalent (PE) has been established from the volumes received. These PEs have been applied to the receiving site's sludge make/PE to calculate the amount of sludge arising from these imports.
- The commercial tankered waste annual BOD data has been used and converted to a PE for each receiving site, assuming 60 gms/BOD/day. The calculated PE for these wastes has been applied against the sites' sludge make/PE to generate the amount of sludge from these imports.
- Other 3rd party imports are recorded via instrumentation. An assumed dry solid of 3% is used in the absence of data from process sampling.

4.29: In lines 8A.10 and 8A.13 we ask for a measure of intersiting work done by tanker. In line 8A.11 we ask for a measure of intersiting work done by truck. In lines 8A.15 and 8A.18 we ask for a measure of work done in sludge disposal operations by tanker. In line 8A.16 we ask for a measure of work done in sludge disposal operations by truck. If actual road distances are not available companies should estimate the road distance and state in the commentary if this is the case.

Radial mileages for all data sets relating to haulage movements are taken from the actual radial mileage distances submitted by our waste and recycling contractor. These are converted to ‘actual kms’ by utilising a conversion factor from miles to km and then a factor of 1.6 to convert from radial distance to ‘actual’. This is in line with previous reporting years.

4.30: In table 8A where both the incumbent and a third-party service provider undertake different stages of sludge treatment, e.g., dewatering followed by lime stabilisation, sludge quantities should not be doubled-counted and should be reported either in line 8A.1 or line 8A.2, not both. Where this situation occurs, the companies should report on the quantity involved and the line to which it has been allocated in the commentary.

N/A. Southern Water undertakes all its sludge treatment and dewatering activities.

4.31 Companies should explain the basis of their estimate of total sewage sludge produced from non-appointed liquid waste treatment reported in line 8A.4.

See commentary in 4.28 above.

4.32 The default assumption will be that the population equivalents reported in lines 7D.17 to 7D.20 will be served by sewage treatment works (STWs) at which the required output has been delivered primarily by a capex solution. Where this is not the case companies should report the population equivalent benefitting from (primarily) Opex solutions in their commentary.

As part of our reporting process, we check if schemes are delivered via capex solutions as opposed to Opex solutions. Anything delivered via an Opex solution is discarded from the reported figure and only population equivalent for capex solutions is included in these lines.

No WINEP schemes for tightened permits were required to be delivered for these drivers this year, so Southern Water were only required to complete Opex analysis and obtain new permits.

4.33 Where companies have used a different methodology to calculate non-resident population in table 4R they should provide details in their commentary.

N/A

Required additional commentary – Supply-demand balance and metering

4.34 Tables 4L, 6D and 6F require companies to provide details of their expenditure and benefits delivered in the area of improvements to the supply-demand balance and development of strategic regional water resource solutions. We expect companies to include narrative commentary to report on progress and deliverables in these areas. This should include explanation of any variances from their business plan and water resources management plan proposals.

Since the publication of our current Water Resource Management Plan (WRMP) WRMP19, the supply and demand picture across our region has changed dramatically and we are aware that this year represents a key transition point from WRMP19 to WRMP24, In contrast to 2022-23, 2023-24 was a warm but wet, meaning that we were ale to maintain a more stable supply-demand balance and did not need to apply any temporary use bans or similar measures. Recognising we are not meeting some of the broad ranging and complex schemes set out in our WRMP19, we remain focused on delivering our plan, and continue to make progress with to close out our current plan in the best possible position as we transition into the next AMP.

This year has seen a significant effort in the reduction of leakage, customer consumption, and unplanned outage, and whilst customer usage and unplanned outage both continue to fall thanks to our ongoing T100 water efficiency programme and operational improvements, we recognise we are not where we or our customers expect us to be in terms of leakage. This year leakage levels have reduced by 1.0Ml/d, below the level of leakage forecast in our Turnaround and WRMP. Our ambition is to prioritise higher leakage volume reduction to ensure the most effective and efficient use of resources to achieve leakage targets and, as a result, the average leak size repaired and more detail on this can be found in section 4.35 below.

Our three-year rolling average Per Capita Consumption (PCC) for the 2023-24 reporting year was 129.6 litres per head per day (l/h/d) and is above the target set out in PR19.

This represents an ongoing reduction in customer usage meaning we are already meeting our end of AMP Turnaround Plan Target and remain committed to driving down water usage. Whilst COVID-19 led to an increase in household demand at the beginning of the AMP, PCC has reduced as people have returned to the workplace following the lifting of pandemic restrictions.

As the report by Artesia, ‘AR2604 Impact of shocks to PCC’, concluded, “the ongoing impact of the pandemic and most notably working from home is likely to persist for the foreseeable future.”. As a result of these ongoing changes to customer usage patterns across our region, we are have introduced a continual review of our T100 programme, working closely with our Bluewave team to trial innovative and effective schemes including working with developers to incentivise building more water efficient homes, looking at water recycling opportunities for both household and non-household customers, and using this and our home visits, educational initiatives and communication campaigns to drive long term behaviour change and safeguard the supply of water into AMP8 and beyond.

As detailed in our Annual Report and Financial statement, we delivered 13,500 homes providing behavioural advice, helping customers reduce their consumption and identify leaks, engaged over we have engaged 81,000 pupils in schools visits both online and in person, and with Portsmouth Water engaged with stakeholders to help build understanding of what recycled water is, and what it isn’t with events on-line, in public spaces and with audiences at council events.

Further information on our supply demand situation, our action plan, our implementation of supply-demand measures across our region, and our progress with company specific schemes and actions can be found in our Southern Water’s Water Resources Management Plan Annual Review 2023-24 published in June.

4.35 Table 6B requires companies to report their total annual leakage. This figure should be derived from the same leakage data that is used in both leakage performance reporting (as an input to the three-year average calculation) and annual water resources management plan reporting. Companies should include explanation of any variances from their business plan and water resources management plan proposals.

In the main Annual Performance Report, and section 4.40 of this document, we have given details of the measures being used to reduce leakage. Whilst the 1Ml/d reduction in 2023-24 was below expectation, we have an ambitious plan to drive further leakage reduction through the guidance of the PALM model and as mentioned above our ambition is to prioritise higher leakage volume reduction have set ourselves the ambitious aim of a weekly spot level of 77.6 Ml/d for the last week of 2024/25 in order to align our starting point of leakage with the new WRMP24.

4.36 Table 6D requires companies to provide detail of their smart metering programmes. We understand that several alternative smart meter technologies can be adopted by companies. Companies should include narrative commentary explaining the smart metering technologies it is utilising and the capabilities and benefits these provide.

Following trails of clip-on devices in 2022-23 and into 2023-24 in 1,500 homes across Southampton, Andover, Midhurst, and Brighton, we demonstrated that data offered by smart meters helps household customer reduce their consumption by 3 - 5%. These trails are now complete and have given us valuable insight that has fed into our ambitious smart metering plan for AMP8. Challenges presented by COVID-19 and a global semi-conductor shortage have hit the supply- chain that manufactures our water meters. As a result, we have deferred the increase in household meter penetration from 88% to 92% to AMP8. In our PR24 submission we finalised our plan to replace all our Visual Meter Read (VMR) and Automated Meter Read (AMR) meters with AMI meters (1.36 million households) by 2030, delivering smart meters at 30% of our households by 2027, 60% by 2028 and 90% by 2029. This aligns to the metering penetration targets set out in the WRMP. This will improve the frequency and accuracy of meter readings and provide customers with more information to help monitor and is expected to deliver an average estimated 4% reduction in household demand. Further information on this can be found in our PR24 business plan.

4.37 We expect companies to include narrative commentary to explain how the metering and leakage figures reported in Table 6D relate to their business plan and water resources management plan forecasts.

Please see above commentary on 4.35 on leakage, and 4.36 on smart metering.

4.40 Common performance measures

Mains repairs:
Southern Water remains fully compliant with the guidance with all elements of the RAG at green.

Water supply interruptions:
Southern Water remains fully compliant with the guidance with all elements of the RAG at green.

Unplanned outage:
Southern Water remains fully compliant with the guidance with all elements of the RAG at green.

Internal sewer flooding:
Southern Water remains fully compliant with the guidance with all elements of the RAG at green except for 5. Neighbouring properties. This remains at amber as whilst property checks are carried out, these are manually recorded and therefore subject to error.

Sewer collapses
Southern Water remains fully compliant with the guidance with all elements of the RAG at green.

Leakage and Per Capita Consumption (PCC):

In line with Ofwat's instruction to maintain reporting in line with the baseline methodology, there has been no change to the RAG provided to Ofwat in association with the restatement of our leakage and PCC values for 2020-21, and in association with query number SRN_APR_IP_001 provided in August 2021.

All water balance data submitted in the APR has been produced in a way that is entirely consistent with the three-year rolling average baseline. We continue to run parallel reporting internally with amendments being done on the remaining amber elements. This parallel reporting is aligned fully to the AMP8 methodology and whilst we are yet to be fully compliant, further changes are being introduced to this shadow reporting with the aim of being fully compliant by the end of 2024-25.

Our RAG for the PR19 baseline remains red because of the water balance gap of 3.60%, and whilst this is a reduction from our 2022-23 outcome of 3.98%, it remains above the RAG threshold.

This reduction is predominantly from the previously identified ca. 36k household connections that are potentially new connections to our network but are not on our billing system. We have initiated a validation programme to add these properties to our billing system. Ca. 15k properties were added up to the year ending 31/03/2024. These have initially been added as unmeasured void properties. They will be converted into billed properties following site visits to confirm supply type and occupant details.

We are working to identify areas for further improving the robustness and accuracy of both the data and processes used to calculate the water balance to bring this below the recommend level of 2% in AMP8. These include:

- Following on from detailed reviews by two independent consultants, we are working on an alternative approach to estimating unmeasured household consumption which will make the year-on-year trend more consistent with the measured household consumption. We are also testing out ways to improve data granularity that feeds into estimation of unmeasured household consumption.
- Improving the calculation of night-use allowances for bottom-up leakage calculations with more accurate data.
- Independent review of key inputs including water taken unbilled and distribution system operational use and their inputs
- A further review of our end-to-end reporting process

Below are the water balance calculations for 2023-24 under both methodologies:

Ovarro method - consistent with baseline

Component (Ml/d)	Pre MLE	Post MLE	Adjustment
Household consumption (metered)	273.79	277.73	3.9
Household consumption (unmetered)	51.75	54.73	3.0
Non-household consumption (metered)	99.02	101.87	2.9
Non-household consumption (unmetered)	3.66	3.87	0.2
Distribution system operational use	3.00	3.17	0.2
Water taken unbilled - legally	10.73	11.34	0.6
Water taken unbilled - illegally	4.58	4.98	0.4
Total leakage	103.03	107.48	4.5
Distribution Input	549.54	565.16	15.6
MLE error (Ml/d)			20.55
MLE error (%)			3.60%

Per capita consumption (litres/head/day)	Pre MLE	Post MLE	Adjustment
Unmeasured PCC	155.9	164.9	9.0
Measured PCC	119.5	121.2	1.7
Overall PCC	124.1	126.7	2.6

Additional lines	Pre MLE	Post MLE	Adjustment
Leakage upstream of DMA	2.4	2.533	0.1
Distribution main losses	80.7	84.201	3.5
measured households excluding void properties	16.5	17.163	0.7
unmeasured households excluding void properties	2.1	2.148	0.1
measured non-households excluding void properties	0.7	0.724	0.0
unmeasured non-households excluding void properties	0.1	0.057	0.0
void measured households	0.5	0.484	0.0
void unmeasured households	0.1	0.061	0.0
void measured non-households	0.1	0.102	0.0
void unmeasured non-households	0.0	0.008	0.0

Convergence method – PR24 methodology

Component (Ml/d)	Pre MLE	Post MLE	Adjustment
Household consumption (metered)	273.8	277.6	3.8
Household consumption (unmetered)	48.2	50.9	2.7
Non-household consumption (metered)	99.0	101.8	2.8
Non-household consumption (unmetered)	3.7	3.9	0.2
Distribution system operational use	3.0	3.2	0.2
Water taken unbilled - legally	10.7	11.3	0.6
Water taken unbilled - illegally	4.3	4.6	0.4
Total leakage	107.43	111.95	4.5
Distribution Input	550.08	565.28	15.2
MLE error (Ml/d)			20.00
MLE error (%)			3.51%

Per capita consumption (litres/head/day)	Pre MLE	Post MLE	Adjustment
Unmeasured PCC	145.3	153.4	8.2
Measured PCC	119.5	121.1	1.7
Overall PCC	122.7	125.2	2.5

Ofwat	Pre MLE	Post MLE	Adjustment
Leakage upstream of DMA	2.4	2.5	0.1
Distribution main losses	85.1	88.7	3.6
measured households excluding void properties	16.5	17.1	0.7
unmeasured households excluding void properties	2.1	2.1	0.1
measured non-households excluding void properties	0.7	0.7	0.0
unmeasured non-households excluding void properties	0.1	0.1	0.0
void measured households	0.5	0.5	0.0
void unmeasured households	0.1	0.1	0.0
void measured non-households	0.1	0.1	0.0
void unmeasured non-households	0.0	0.0	0.0

Information on the Reporting and Assurance requirements (PSR Reach and PSR Data-Checking) for Table 3F

Having already reached the end of AMP commitment for PSR reach in 2022-23, (8.26%), we have continued to increase the number of customers on the register, having reached 11.74% in 2023-24. PSR registrations held steady at around 6000 a month throughout the year.

The main variances from this were where we experienced a water supply outage as this led to a significant increase in sign-ups. We also verified the importance of our contact centre in promoting the PSR – however following the cyber incident in February we were struggling to manage the inbound call volumes, so we removed the PSR element (and other "non-essential" elements from agents' scripts), this led to a large decrease in registrations for the few weeks that measure was in place. This has now been reinstated and we expect to see a similar year-on-year increase in 2024-25.

PSR membership breakdown:

a) communication - 12,207
b) mobility and access restrictions - 91,702
c) water supply interruption - all households on the PSR
d) with security - 269 (assumed to be those households with a password on the account)
e) other needs - 131,273

Households added to the PSR - 84,14
Households removed from the PSR - 4845

It has been highlighted that our total households figure contains a number of customers who are billed by South East Water on our behalf, and we will be seeking further guidance from Ofwat on the inclusion of customers registered by South East Water, or the potential removal of these customers from our household total in the coming year, as this may impact the historically reported figures for PSR reach.

Data trends, anomalies, and additional commentary in relation to non-financial data

Table 2N Number and value of GSS and other payments to household customers by type in the reporting period

Although this data has been given a confidence grading of C5 and is being reported to Ofwat for the first time this AMP, the process of verifying and reporting Guaranteed Service Standards (GSS) failures has consistently been reported internally for many years, using the same core reporting systems set up in AMP6. The reporting of good-will payments, broken down by service is a new requirement and new improved reporting will be developed to split these from water supply, sewer flooding and miscellaneous into the more granular level for improved data quality in 2024-25 and beyond.

5A Water resources asset and volumes data

5A.9 Number of impounding reservoirs - Difference of 1 site as Bewl Water SWR classed as pumped and so removed from 5A.9 and added to 5A.10.

5A.18 Total number of water reservoirs - Increase of 1 for Sandown Bankside Storage SWR which has been included this year due to process review of the guidance stating “All reservoirs used for holding raw water. This line shall include impounding reservoirs, pumped storage reservoirs and bank side storage facilities.

5A.19 Total volumetric capacity of water reservoirs - Last year, the total capacity was 44745.67 ml, but 1060.67 ml of this was due to WSR's being included. Following our internal process review mentioned above these sites have now been excluded from the capacity calculation resulting in the reduced volume of 43685 Ml.

6D Demand management – metering and leakage activities

All our metering costs are capitalised. Most of our customers were metered as part of our Universal Metering Project from 2010 to 2015. As a result of this, the number of new optant meters installed each year is relatively small. We do not record the costs of these installations separately from the overall meter renewal programme. To complete the table, we have pro-rated the cost of meter installation across the number of meters installed, resulting in broadly the same derived unit cost for each activity.

Table 6F WRMP Annual Reporting

Ofwat guidance, in RAG 4.12, states that the classification of the Water Resources Management Plan (WRMP) schemes delivered should be one of the following four categories, and that their expenditure should reconcile to the same categories in Table 4L:

- Supply-side improvements delivering benefits in 2020–25
- Demand-side improvements delivering benefits in 2020–25 (excluding leakage and metering)
- Internal interconnectors delivering benefits in 2020–25
- Supply-demand balance improvements delivering benefits starting from 2026

However, we do have several schemes that fall within those categories that do not form part of our WRMP, therefore a reconciliation is required to Table 4L.
Demand-side improvements do match and so do not form part of the reconciliation below.

	20-21	21-22	22-23	23-24
Supply demend balance improvements delivering benefits starting from 2026				
Table 6F	8.371	0.647	1.186	1.227
Table 4L	8.477	0.954	2.004	1.390
Difference	**0.106**	**0.307**	**0.818**	**0.163**
Reconciling Items, Supply Demand Balance Improvements (SDBI)				
Reclassification of pipelines between SDBI and Internal interconnectors	0.023	-0.023	0.000	0.000
AIM related costs that sit in SDBI but not related to WRMP	0.061	0.165	0.100	0.000
WQ Directive costs that sit in SDBI but not related to WRMP	0.021	0.004	0.063	0.002
Increase SE Water Bulk Supply costs that sit in SDBI but not related to WRMP	0.000	0.012	0.409	0.000
WRSE costs that sit in SDBI but not related to WRMP	0.000	0.149	0.352	0.416
Imports from Gaters Mill, previously in Strategic Regional Water Resources	0.000	0.000	-0.107	-0.255
Total	**0.106**	**0.307**	**0.818**	**0.164**
Supply-side improvements delivering benefits in 2020-2025				
Table 6F	0.071	0.480	2.982	7.265
Table 4L	2.270	-0.011	6.010	11.377
Difference	**2.199**	**-0.491**	**3.028**	**4.112**
Reconciling Items, Supply-side improvements delivering benefits (SSIDB)				
Reclassification of pipelines between SSIDB Internal interconnectors	0.000	0.016	0.000	0.000
WRMP14 related costs that sit in SSIDB but not related to WRMP	0.099	0.539	0.875	0.457
Metering costs that sit in SSIDB but not related to WRMP	0.572	-0.170	2.347	3.654
Reclassification of Impounding Reservoirs	1.020	-1.020	0.000	0.000
Groundwater licence variation, 1in500 year event, in SSIDB but not related to WRM	0.070	0.143	-0.193	0.000
Strategic modelling reclassified to Strategic Regional Water Resources	0.438	0.000	0.000	0.000
Total	**2.199**	**-0.491**	**3.028**	**4.113**
Internal interconnectors delivering benefits in 2020-2025				
Table 6F	0.023	0.606	3.061	12.918
Table 4L	0.000	0.613	3.061	12.919
Difference	**-0.023**	**0.007**	**-0.000**	**0.001**
Reconciling Items				
Reclassification of pipelines between SDBI and Internal interconnectors	-0.023	0.023	0.000	0.000
Reclassification of pipelines between SSIDB Internal interconnectors	0.000	-0.016	0.000	0.000
Total	**-0.023**	**0.007**	**0.000**	**0.001**
Demand-side improvements delivering benefits in 2020-2025 (excl leakage and metering)				
Table 6F	0.180	2.841	2.283	3.015
Table 4L	0.180	2.845	2.282	3.014
Difference	**-0.000**	**0.004**	**-0.001**	**-0.001**

There has again been a significant change in the forecast costs reported for the period after 2024–25. In previous years we were still investigating potential options, and so most of our forecast costs were related to studies and investigations. We now have more details of the proposed projects and associated costs for each of these categories.

7F Wastewater network+ -WINEP phosphorus removal scheme costs and cost drivers

Following the submission of our 2022-23 APR, we received an Ofwat query, SRN-APR-CA-009 on 29 September 2023, in relation to table 7F. We responded to this query on 11 October 2023, with a revised table 7F and supporting long dataset. We have used this updated response as the basis for our 2023-24 table 7F.

Capital expenditure has been updated to reflect actual costs for 2023-24, 2024-25 and the costs reported for 2025-26 onwards reflect our latest forecasts.

For operating expenditure, we maintain the approach of using estimates based on design criteria, as we do not have cost recording processes sufficient to isolate costs at equipment set level. These estimates are consistent with the update in our query response, reflecting increased chemical and power costs. We have updated a small number of entries for previous years, for those schemes with a December 2021 delivery date, totalling £0.104m in 2021-22 and £0.061m in 2022-23.

Population equivalent served entries have been updated for 2023-24 actuals. Forecasts for later periods remain per our October 2023 query response, consistent with our PR24 submission.

Historically we have separately reported two schemes, with phosphate removal included as part of a wide remit, under their own heading of ‘WFD Manage Uncertainty Special Case’ in Table 4M. The cost associated with these schemes has decreased significantly since 2021-22 (2021-22 £12.2m; 2022-23 £0.8m; 2023-24 £0.2m; forecast 2024-25 £0.2m).

We confirm that 7F is reported in 2022-23 FYA CPIH deflated prices, as specified in RAG4.12 paragraph 7.15 and reiterated in the 2023-24 APR Query Log (to 2 July 2024) issued by Ofwat.

8C Bioresources energy and liquors analysis 8C.15 & 8C.16

There has been a slight increase in the sludge liquor return volumes in comparison to last year, with a 12% increase. We introduced a new step in our reporting process as mentioned in 2022-23 to have a Subject Matter Expert (SME) review the volumes and liquor concentration for all sites against the AM410 - the standardised Southern Water document for site capacity assessment, including the mass balance approach and process loading calculations for each site and arranged a monthly review.

Through the monthly review meetings which were set up following last year's submission several errors were found on the calculations within the spreadsheets where operators input the raw data (standard spreadsheets) all of which have now been moved to no longer requiring a rebuild every 6 months. There are still issues and concerns with the input of some of this data and on several sites the process units will run without an operator present for a few days and therefore are unable to record gather and record data used in the calculations, although these are the smaller sites and therefore the total impact is less.

To resolve the issue of calculations relying on several flow meters and daily samples being taken by the operators, funding has been requested within AMP 8 to install flow meters directly on the liquor lines such that the data can be pulled directly from telemetry, thus removing manual input and the errors that this can attract.

This year 14 process streams needed to use theoretical sludge liquor values from the AM410 for the liquor volumes as the flow data for calculating the sludge liquors did not have flow readings for all the days or gave such a difference to the theoretical values for the individual streams that its validity was brought into doubt. The reasons for this lack of data varied - Flow meter failure, temporary equipment being run by contractors and not logged, operator time/understanding of the data required. This is an improvement on last year which had 24 process streams needing to use theoretical data.

The AM410s varied in terms of the population data used in its calculations with some using the most up to date 2023 data and others using 2022 or 20-21 data. These sites were Broomfield Bank (Centrifuge and Primary liquors 2023), Canterbury (Centrifuge liquors 2023), Chickenhall (Centrifuge liquors 20-21), Ford (Centrifuge liquors 2023), Gravesend (Primary liquors 2023), Horsham (Centrifuge liquors 2023), Motney Hill (Centrifuge liquors 2023), Portswood (Centrifuge liquors 2023), Scaynes Hill (Centrifuge liquors 2022), Shoreham (Centrifuge liquors 20-21), Weatherlees B (Centrifuge and Primary liquors 2022).

The monthly review meetings also looked at the sample results and the number of samples being collected. The rolling average result each month was used for calculating the concentrations for the year and where the result was missing for a given month the rolling 3 points where figures were available prior to this has been used to fill the zero's and therefore not impact on the rolling average calculation.

Table 8C Bioresources energy

Our bioresources electricity sub-metering programme is now complete.

From 23-24 Ofwat have asked us to add total energy consumption (MWh and £m) for electricity, heat and biomethane for both 8C.1 and the shadow values in 8C.18. To remain consistent with both APR and PR24 data previously supplied, we have not included heat in the total £m figure as this theoretical calculation has a significant material effect on the total consumption figure.

11A Greenhouse gas emissions

In line with Ofwat guidance, the company is using the Carbon Accounting Workbook (CAW) v18.3 (AR5). This uses Global Warming Potential values for 100-year time horizon from the IPCC Fifth Assessment Report AR5 throughout.

The REGO certificate from one electricity supplier was sold in 2023-24. This has impacted market-based Scope 2 emissions in by increasing them compared to 2022-23 when 100% of SW electricity was REGO back. Operational emissions have slightly increased compared to last year for location-based emissions due to Scope 3 emissions including business travel, chemicals, disposal of waste; However, market based operational emissions are more than double comparing to last year due to the selling of REGO's.

Gross Operational emissions (LB) FY22-23: 229,830.354 (tCO2e)

Gross Operational emissions (LB) FY 23-24: 231,394.792 (tCO2e)

Gross Operational emissions (MB) FY22-23: 117,856.550 (tCO2e)

Gross Operational emissions (MB) FY 23-24: 281,163.386 (tCO2e)

Regarding embedded emissions, both capital projects and purchased goods and services have decreased compared to last year. Whilst this suggests an improved efficiency in year 4 due to a reduction in carbon intensity for both capital projects and purchased goods and services, we recognise this is more likely due to:

- Variability in the sample projects between the years meaning there is a greater spend on lower carbon intensity projects, therefore reducing the overall carbon intensity of year 4 investment.

- Change in methodology and the data source for the carbon intensity values for purchased goods and services from Emission factor from the Quantis tool to Defra UK Emission factors. Whilst the Quantis Evaluator tool was based on a global dataset, last updated in 2013, the Defra carbon footprint data is based specifically on information from activities in England, leading to more accurate, country-specific carbon outputs. Also, to obtain carbon values from the Quantis Evaluator tool, the carbon reporting costs needed to be converted from pounds sterling (GBP) to U.S. dollars (USD), which required a suitable exchange rate conversion to be applied, whilst the Defra carbon footprint data is already in pounds sterling.

Whilst it does not result in certification, Jacobs are engaged annual to assure and verify both our reporting process and the values of operational and embedded emissions.

We are currently developing an approach to implement a consistent business-as-usual process for whole life carbon management to be in place at the start of AMP8. The APR capital carbon table in this year's reporting has needed to be populated whilst the business-as-usual approach to carbon management is still in development, therefore this reporting has relied on spend based approach using carbon intensities (in tCO2e/£M) that were developed from a sample of 43 projects with spend within year 4 of AMP7 spend based carbon intensity approach.

Southern Water has engaged PAS2080 high level principles, and the 2022 UK Framework for embodied carbon. Regarding ISO 14064, this is not limited to embedded emissions, similarly SBTi. The company does not have a specific commitment with the latter. However, the company is aware of the principles of these standards.

We recognise that the reporting of 2024-25 emissions will likely follow a similar process to this year, with the priority being to improve data quality for capital projects. We therefore acknowledge these suggestions form part of a continual improvement process to continue throughout AMP8.

Southern Water Greenhouse gas emissions SWOT assessment

Strengths	**Operational emissions:** Southern Water has a clear and strong procedure on how to collect and analyze carbon data and identify opportunities to reduce emissions. We do quarterly data checks to ensure not only that data is correct but also monitoring any change in emissions, causes and potential solutions. We have already developed and published a net zero business plan to 2050 for Scope 1 and 2 emissions, mainly focusing on wastewater treatment, sludge treatment, and electricity use. The plan primarily addresses emission reductions between 2022 and 2030, based mainly on PR24 projects and UK Grid decarbonisation. The next step would be to incorporate Scope 3 emissions in the Net Zero Business Plan. **Embedded emissions:** The sample size of projects has been selected to cover all 4 workstreams and size of projects from small, medium, and large value projects. The year 4 analysis has been able to use a sample of 43 AMP7 projects which include spend in AMP7 year 4. In contrast, the previous Year 3 report relied on AMP6 data and only 20 projects.
Weaknesses	**Operational emissions:** We are aware that we would need further research and innovation opportunities to reduce process emissions, and look for initiatives to reduce chemicals, and other Scope 3 emissions. **Embedded emissions:** The sample size is limited in scale due to availability of project data and time available to complete assessments. The representativeness of sample projects does cover all four workstreams Waste Infrastructure (SI), Waste Non-Infrastructure (SNI), Water Infrastructure (WI), Water Non-Infrastructure (WNI). However, the carbon intensity for the WI workstream had to be substituted for the one calculated for the SI workstream due to an outlier result.
Opportunities	**Operational emissions:** Southern Water could implement new initiatives for reducing carbon emissions, potentially setting targets for further reductions through generating more renewables and adopt green technologies. We can also explore new technologies or approaches for reducing carbon emissions, potentially leading to cost savings or other benefits. **Embedded emissions:** Year 5 reporting could further increase the coverage of projects by year 5 spend. It could then pro-rata a project's carbon estimate based on the project's spend in year 5 compared to other years to approximate the spend in that particular year of a multi-year project.
Threats	**Operational emissions:** Regulatory changes such as landbank availability for sludge disposal may require incineration which could significantly increase emissions. WINEP, WRMP and PR24 are expected to increase the company's emissions. We may face increases in emissions due to the impacts of climate change e.g., droughts would require the transportation of water from other areas. **Embedded emissions:** There is a risk that that there is insufficient data to improve coverage in next year's APR if gateways and the data capture processes are not followed. If carbon management is not incorporated into business-as-usual at SW, the next year's projects could be carried out without additional carbon assessment.

Embedded emissions reporting criteria		
Category	**Description**	**Status**
Green	Provision of embedded emissions data as it relates to capital projects (cradle-to build). We anticipate good practice in this area being for companies to provide cradle-to-gate as well as cradle-to-build based data.	**Met**
	Clear evidence of external verification and certification by an appropriately qualified party as it relates to the use of standards and frameworks, and quality of data.	Not met
	Engagement with one or more recognised standard, framework, or approach for managing and reporting on embedded emissions.	**Met**
	Provision of insights into embedded emissions as they relate to construction and maintenance activities.	Not met
	Complete and detailed SWOT analysis referring to embedded emissions.	**Met**
	Provision of embedded emissions data as it relates to purchased goods and services (in addition to chemicals).	**Met**
	Evidence of both internal and external stakeholder engagement and education on its GHG emissions management and reporting approach.	Not met
Amber	Provision of embedded emissions data as it relates to capital projects (cradle-togate or cradle-to-build).	**Met**
	Clear evidence of external verification by an appropriately qualified party as it relates to the use of standards and frameworks, and quality of data.	**Met**
	Engagement with one recognised standard, framework, or approach for managing and reporting on embedded emissions.	**Met**
	Complete and detailed SWOT analysis referring to embedded emissions.	**Met**
Red	No provision of embedded emissions data as it relates to capital projects.	NA
	Incomplete SWOT analysis as it relates to embedded emissions.	NA
	No demonstrable engagement with recognised standards, frameworks, or approaches for managing and reporting on embedded emissions.	NA

Southern water has an overall status of Amber and is working towards Green status for the introduction of the AMP8 Operational GHG performance metrics.