

### Leakage and PCC

Version: 3

Tables, lines, and blocks assured:

3A.3-4

3F.4-6

6B.4-15, 29-39, 58-67

6D.22-25

Originator: Simon Beal

Report completion date: 21/05/2024  
01/07/2024

Reviewer: Graham Hindley

Review date: 22/05/2024  
03/06/2004

Key to RAG assessments	No material concerns	Non-material observations(s) on supporting information	Minor concerns	Material concerns	Activity not complete	Not required/not started
	G	B	A	R	W	N/A


Test	RAG	Comments
Review the company's methodologies and procedures for identifying, analysing and recording data and, on a sample basis, test the application of those methodologies and procedures.	G	<p>We have focused this feedback on the calculation of the PCs of Leakage and PCC in Tables 3A and 3F.</p> <p>We reviewed the lines in Tables 6B and 6D during the audit, with additional checks post-audit and found no issues.</p> <p>The Company has robust methodologies in place for recording data that feeds into the water balance. Much of the data is reviewed weekly with challenge of any values that appear outliers.</p>
Review relevant elements of Anglian Water's approach in the context of Ofwat's investigation into Welsh Water,1 including approach to trunk mains leakage, service reservoirs and unmeasured consumption and occupancy rates.	B	<p>We note that the company uses occupancy cohorts when deriving the PHC. We initially coded this as 'Amber' and asked the company for more evidence on the materiality of the use of occupancy.</p> <p>The company confirmed that the impact of this adjustment is not material (0.1 ML/d change to leakage and 0.1 l/head/day on PCC). However, we consider this in not consistent with the latest interpretation of the guidance. We therefore recommend that the company reviews the PHC calculation as part of the wider water balance review and use of smart metering data that it is currently discussing with Ofwat.</p>
Review the level of senior leadership and Board oversight and awareness of leakage trends, and broader company culture, and the impact of these factors on the company's reported figures	G	<p>On 16 May 2024 Graham Hindley met with Dave Ward to discuss and review Anglian's arrangements for responsibilities, accountabilities, governance of leakage and water balance reporting. The objective was to seek assurance that the culture of the Company allows transparency of leakage activities</p>


Test	RAG	Comments
		<p>and reporting from “on the ground” through to the Executive Management, CEO and Board of Directors.</p> <p>Dave Ward is Anglian’s Director of Water Distribution. He has overall responsibility for the IMR Alliance, oversees capital investment on the water distribution system, is responsible for operational management of the distribution system and oversees leakage / network delivery partner contractors Kier and Clancy. Sean McCarthy (Head of Leakage) reports to Dave, in turn Dave reports to Ian Rule (Director of Water Business Stream). Dave is directly accountable for leakage performance to Ian Rule and upwards to Peter Simpson and the Board. Dave is a Chartered Civil Engineer.</p> <p>Dave outlined the step change from earlier AMPs (circa 4 and 5) where there were no Performance Commitments and leakage was typically reported at a continuous level. With the introduction of PCs with incentivised targets in AMP6, the glide path to reduce leakage became steep and Anglian recognized that it needed a greater level of interventions in order to achieve the leakage PC. This required a different form of governance involving more of the Anglian business and its supply chain. The Leakage Steering Group was established which includes Executive Directors as members of the group.</p> <p>Dave explained Anglian’s Cell structure and its Silver and Gold Commands to ensure strong leakage performance and reporting. There are currently up to 9 Cells overseeing, for example, performance and activities or the supply chain, materials/logistics, network repair times. There is an overall co-ordination Cell. The Cells feed in to the Silver Command which meets monthly as a minimum. Silver Command members include Dave Ward, Ian Rule, Subject Matter Experts (e.g. Sean McCarthy) and management Board members, (e.g. Strategy Director). The Silver Command’s remit is to assess how the Cells are performing and ensure escalations are implemented, e.g. for weather events as occurred twice in 2022 (extreme heat and a winter freeze thaw). The Cell structure is dynamic and promoted decision making at a collective level. Silver Command is the pre-cursor to the Gold Command where Dave Ward and Ian Rule attend the Management Board to report leakage and network performance.</p> <p>We discussed the Water Performance Interventions Group which assesses inputs to the process for leakage performance (e.g. find and fix activities) and is clearly not just focused on outputs. Third party consultants are occasionally engaged to make</p>


Test	RAG	Comments
		<p>recommendations on elements of the water balance, however ownership of the data and leakage clearly sits with Anglian Water.</p> <p>In our opinion, Anglain's arrangements for responsibility, accountability of leakage activities and performance are solid with a clear line of sight from the technical and operational activities up through the Company to the Executive Management and Board of Directors/Chairman level. We are satisfied that there is an open and transparent culture within the Company under robust management where leakage performance can be reported through the business. We found that leakage reporting and monitoring for the APR is shared on a weekly basis internally and is used to drive operational activity These are sufficiently agile to respond to changing circumstances and tightening regulatory targets.</p>
High-level review the process for all component of the water balance.	B	<p>The team has robust understanding of the water balance components. We note that in the coming years significant changes will be required to reflect the additional data available from smart meters.</p> <p>We recommend that any changes to methodology are fully discussed with Ofwat and subject to external challenge through the assurance process.</p>
<p>Review in detail the processes for assessing:</p> <ul style="list-style-type: none"> <li>• Distribution Input, including the validation process,</li> <li>• Zonal (bottom up) leakage;</li> <li>• Measured HH consumption;</li> <li>• Other processes identified on the day of the audit on the basis of being higher risk.</li> </ul>	G	<p>The company does not undertake verification of the DI meters, so is technically not compliant with the guidance. However, the company considers the use of alternative upstream and/or downstream meters is a significantly more robust approach. We concur with this view which is also supported by the Environment Agency for the company's abstraction meters.</p> <p>We also reviewed the other components of the water balance and found no issues.</p>
Conduct a sample check of all components of the water balance back to source	G	We reviewed a sample of the sources during the audit and also reviewed the water balance calculation spreadsheet and supporting information post-audit.
<p>Refer to the PRC file in the 'Jacobs' folder in 'Jacobs Shared Folder' on AW's Sharepoint (link below) to confirm whether there is a Process Risk Control (PRC) document for that group.</p> <p><a href="#">Anglian Economic Regulation Team - Jacobs Shared Folder - All Documents</a></p>	W	


Test	RAG	Comments
If there is a PRC document, the auditor is asked to review the identified risks and provide their opinion on whether or not the list is exhaustive and accurate. If there is no Process Risk & Control (PRC) document, the auditor is asked to focus on the suitability of the process for producing consistent data.		
If there is one, provide an opinion on the way that risk is described within the PRC document.	W	
Alert the company to any material areas of concern or weakness observed.	G	Further details in the "Observations and Actions" section below.
Review progress against issues raised in the last audit.	G	At the AR23 audit we recommended that unbilled consumption, SPL and DSOU components should be reviewed as they were several years old. The team explained some components have been refreshed but others will be included in a wider water balance review to make use of smart metering data.
Review whether the APR procedures and any associated local procedures / work instructions are current, accurate and appropriate.	W	
Seek understanding of the upstream processes which generate data and the controls in place for ensuring the reliability of those data. Test where possible.	G	Robust processes to provide and challenge data.
<p><b><u>For PCs only:</u></b></p> <p>Ensure that commentary contains either a statement that all components of the RAG checklist are green for each PC or that a copy of the RAG compliance checklist for each PC along with assessments of the materiality of the impact of any non-compliant components on reported performance. This should comply with the guidance in the "Common performance measures" section of RAG 3.14, paragraph 4.40.</p>	G	<p>Values at audit (screenshots below):</p> <ul style="list-style-type: none"> <li>• Leakage 182.1 ML/day</li> <li>• PCC= 127.6 l/head/day</li> </ul> <p>We have reviewed the company's consistency RAG status, which is fully compliant with the exception of the 'Water Balance and MLE' which is coded red due to the reconciliation error being 3.18% of distribution input. The company continues to investigate options to improve the water balance reconciliation error and is proposing to undertake a major review of the methodology and assumptions over the next two years. As the error remains below the 5% limit specified for Maximum Likelihood Estimation we do not consider the gap materially impacts on leakage reporting for 2023-24.</p> <p>We have not seen the commentary – the focus of this audit was on the compliance of the methodology with the guidance.</p> <p>We found that the values in Table 6B are consistent with the water balance and Table 6D has been</p>


Test	RAG	Comments
		completed using an approach consistent with the guidance and is unchanged from previous years.
Observations & Actions		
RAG	Comments	
B	<p>The company uses a fixed allowance for trunk mains and service reservoir losses which has not been updated since 2005. The current estimate is a small (7.1 ML/d) of total leakage as the majority of the trunk mains are downstream of the meters used for leakage reporting. During the audit we were provided with evidence that (i) the number of trunk mains bursts have been relatively stable since 2005 and (ii) repair times have reduced. We therefore consider that it is likely that trunk mains leakage will have been relatively stable. If the BABE estimate is an over/under-estimate then this will be consistent in all years, including those used for the baseline.</p> <p>However, as the trunk mains network is being extended we recommend that losses are derived from flow balances for the new trunk mains as they are added to the network.</p>	
B	<p>The company has identified a number of dwellings of multiple occupancy, so has therefore revised the population estimate, adding ca.50,000 (1% of the total estimate). We consider the company has used a robust approach, but we have asked for additional details of the likely timeline of when these properties have been built.</p>	
G	<p>We note the company is planning to restate the AR22 values as an error was identified in calculation of non HH demand when moving from a manual to an automated system. The company has provided updated values, but we have requested a copy of the water balance spreadsheet for 2022-23.</p> <p>Update: this was provided and confirms the revised in-year leakage and PCC values stated during the audit.</p>	
G	<p>In our opinion, Anglian's arrangements for responsibility, accountability of leakage activities and performance are solid with a clear line of sight from the technical and operational activities up through the Company to the Executive Management and Board of Directors/Chairman level. We are satisfied that there is an open and transparent culture within the Company under robust management where leakage performance can be reported through the business. We found that leakage reporting and monitoring for the APR is shared on a weekly basis internally and is used to drive operational activity These are sufficiently agile to respond to changing circumstances and tightening regulatory targets.</p>	
Recommendations (Longer Term Improvements)		
<p>The team explained they are in discussions with Ofwat regarding how the vast amount of smart metering data could impact the water balance calculation, with the aim of being an 'industry leader'. As part this wholesale review the team will review the most appropriate way to all components of the water balance (including PHC) and hope to start shadow reporting for 2024-25. We support this approach.</p>		
Documentation reviewed (attach copies or screenshot)		


 2024.04.29 ANH Leakage\_Yrs3\_OfwatLetter .pdf


 Bursts\_Trunk\_Mains\_Amended.xlsx


 Daily DI Graphs including Hartlepool.xlsb


 DI Master Spreadsheet 23-24 with Hartlepool.xlsb


 Document summary.xlsx


 Domestic smart and dumb combined.xlsx


 MNCHCalc2324.xlsb

 NHH Examples.pptx


 Table 3F Draft File.xlsx


 Table 6B Draft File.xlsx


 Table 6D Draft File.xlsx


 Water balance 23-24.xlsx


#### Additional information provided 27<sup>th</sup> May 2024


 3a commentary 24th may.pdf


 3f commentary 24th may.pdf


 6b commentary 24th May.pdf


 6d commentary 24th may - exc finance line.pdf


 AR24 consistency RAG Audit - year end audit.xlsx


 Bulk supply list 20-05-24 - install date.xlsx


 Bursts\_Trunk\_Mains\_Amended.xlsx


 CommercialConsumptionSummary\_2223.xlsx


 DI Estimation %.xslm


 Document summary.xlsx

 Res Prop count with Bulk.xlsx







 Table 6B Draft File.xlsx

 Trunk mains.docx

 Water balance 22-23 restated.xlsx

 Water balance 23-24.xlsx

#### Additional Information provided 20<sup>th</sup> June 2024

-  6b commentary with financial line updated.pdf
-  Copy of BaseData P12 WK52 23-24 FINAL 9th apr extract.xlsx
-  IMR\_LEAKAGE workings 23-24.xlsx
-  Leakage costs v2.xlsx
-  Stoptaps 23-24.xlsm
-  Table 6D Draft File - finance line updated.xlsx

### Version Control Notes

V3 Final

### Audit Identification

Date of audit	15 <sup>th</sup> May 2024 16 <sup>th</sup> May 2024 (Dave Ward, Arun Pontin & Graham Hindley)
Auditees	15 <sup>th</sup> May 2024: Sean McCarthy, David Jacobs, Caroline Jefferies, Geoff Huntingdon, James Pounder, Arun Pontin, Philip Stephens (properties/population)
Follow-up audit	22 <sup>nd</sup> May 2024 – review of the use of occupancy in PHC
Auditees	Sean McCarthy, David Jacobs, Arun Pontin

**Table 3F.4-6 (as audited)**

Pro forma 3F													
Underlying calculations for common performance commitments - water and retail												Anglian Water	
Line description	Unit	Standardising data indicator	Standardising data numerical value	Performance level - Actual (current reporting year)	Performance level - Calculated (i.e. standardised)							RAG 4 reference	
Performance commitments set in standardised units - Water													
Mains repairs - Reactive	Mains repairs per 1000 km	Mains length in km	39,397.00	3,444	87.42						61.000	3F.1	
Mains repairs - Proactive	Mains repairs per 1000 km	Mains length in km	39,397.00	1,400	35.54						32.000	3F.2	
Mains repairs	Mains repairs per 1000 km	Mains length in km	39,397.00	4,844	122.95							3F.3	
Per capita consumption (PCC)	lpd	Total household population (000s) and household consumption (MI/d)	4,986	636	127.60							3F.4	
Line description	Unit	Performance level - actual (2017-18)	Performance level - actual (2018-19)	Performance level - actual (2019-20)	Baseline (average from 2017-18 to 2019-20)	Performance level - actual (2020-21)	Performance level - actual (2021-22)	Performance level - actual (2022-23)	Performance level - actual (2023-24)	Performance level - actual (2024-25)	Performance level 3 year average (current and previous 2 years)	Calculated performance level to compare against PCLs	
Performance commitments measured against a calculated baseline													
Leakage	MI/d	191.3	199.9	191.0	194.1	182.4	173.4	190.5	182.1		182.0	6.2	3F.5
Per capita consumption (PCC)	lpd	134.8	134.1	133.3	134.1	146.9	136.0	132.3	127.6		132.0	1.6	3F.6

**Table 6B.4-15 (as audited)**

Assets and operations				
Water delivered (non-potable)	MI/d	2	50.22	6B.4
Water delivered (potable)	MI/d	2	1000.41	6B.5
Water delivered (billed measured residential properties)	MI/d	2	531.36	6B.6
Water delivered (billed measured businesses)	MI/d	2	305.12	6B.7
Proportion of distribution input derived from impounding reservoirs	Propn 0 to 1	3	0.020	6B.8
Proportion of distribution input derived from pumped storage reservoirs	Propn 0 to 1	3	0.411	6B.9
Proportion of distribution input derived from river abstractions	Propn 0 to 1	3	0.072	6B.10
Proportion of distribution input derived from groundwater works, excluding managed aquifer recharge (MAR) water supply schemes	Propn 0 to 1	3	0.498	6B.11
Proportion of distribution input derived from artificial recharge (AR) water supply schemes	Propn 0 to 1	3	0.000	6B.12
Proportion of distribution input derived from aquifer storage and recovery (ASR) water supply schemes	Propn 0 to 1	3	0.000	6B.13
Proportion of distribution input derived from saline abstractions	Propn 0 to 1	3	0.000	6B.14
Proportion of distribution input derived from water reuse schemes	Propn 0 to 1	3	0.000	6B.15

**Table 6B.29-39 (as audited)**

Assets and operations				
Peak 7 day rolling average distribution input	MI/d	2	1376.85	6B.29
Peak 7 day rolling average distribution input / annual average distribution input	%	2	118.43%	6B.30
Water balance - company level				
Measured household consumption (excluding supply pipe leakage)	MI/d	2	508.18	6B.31
Unmeasured household consumption (excluding supply pipe leakage)	MI/d	2	127.79	6B.32
Measured non-household consumption (excluding supply pipe leakage)	MI/d	2	304.11	6B.33
Unmeasured non-household consumption (excluding supply pipe leakage)	MI/d	2	1.92	6B.34
Total annual leakage	MI/d	2	182.07	6B.35
Distribution system operational use	MI/d	2	8.34	6B.36
Water taken unbilled	MI/d	2	19.34	6B.37
Distribution input	MI/d	2	1151.76	6B.38
Distribution input (pre-MLE)	MI/d	2	1162.55	6B.39

**Table 6B.58-67 (as audited)**

Components of total leakage (post MLE) - company level				
Leakage upstream of DMA	MI/day	2	7.46	6B.58
87 Distribution main losses	MI/day	2	135.55	6B.59
Customer supply pipe losses – measured households excluding void properties	MI/day	2	23.18	6B.60
Customer supply pipe losses – unmeasured households excluding void properties	MI/day	2	11.98	6B.61
Customer supply pipe losses – measured non-households excluding void properties	MI/day	2	1.01	6B.62
Customer supply pipe losses – unmeasured non-households excluding void properties	MI/day	2	0.06	6B.63
Customer supply pipe losses – void measured households	MI/day	2	1.60	6B.64
Customer supply pipe losses – void unmeasured households	MI/day	2	0.28	6B.65
Customer supply pipe losses – void measured non-households	MI/day	2	0.92	6B.66
Customer supply pipe losses – void unmeasured non-households	MI/day	2	0.04	6B.67



Table 6D.22-25 (as audited)

Leakage activities	Units	DPs	Maintaining leakage	Reducing leakage	Total	
Total leakage activity	£m	3	80.029	26.059	106.088	6D.22
Leakage improvements delivering benefits in 2020-25	M/d	2			8.40	6D.23
<b>Per capita consumption (excluding supply pipe leakage)</b>						
Per capita consumption (measured)	l/h/d	2	120.63			6D.24
Per capita consumption (unmeasured)	l/h/d	2	165.39			6D.25

Water Balance spreadsheet (extracts align with the reporting tables)

Table 10 Line 28		
Distribution Losses		
136.824		
141.586		
Component	MI/d	
Company System	129.687	130.106
Trunk Mains	7.137	7.137
Unmeasured SP Leakage - D	11.377	11.961
Unmeasured SP Leakage - ND	0.057	0.056
Measured SP Leakage - D	14.843	14.248
Measured SP Leakage - ND	0.961	0.958
Measured SP Leakage - INT	7.544	9.063
Measured void SP Leakage	2.395	2.465
Unmeasured void SP Leakage	0.301	0.294
<b>Total Leakage</b>	<b>174.303</b>	176.29
<b>Total leakage after MLE</b>	<b>182.072</b>	190.464

4935.47446	population	4985.51
635.970374387	post mle v	635.970374387
128.86	pcc	127.56

	MDOM	UDOM	Total
Pre MLE vol	499.38	124.88	624.25
Post MLE vol	508.18	127.79	635.97
Occupancy	2.2788	2.7321	2.3389
Raw Properties	1,829,489	282,799	
Dwelling corrected properties	19265	0	
Corrected total properties	1,848,754	282,799	2,131,553
Population	4,212,884	772,628	4,985,511
Pre MLE PCC	118.54	161.62	125.21
<b>Post MLE PCC</b>	<b>120.63</b>	<b>165.39</b>	<b>127.56</b>
Post MLE PCC prior year	124.00	176.48	132.31
PHC pre MLE	270.12	441.57	
PHC post MLE	274.88	451.86	298.36

Assets and operations					
Water delivered (non-potable)	M/d	2	50.22		68.4
Water delivered (potable)	M/d	2	1000.41		68.5
Water delivered (billed measured residential properties)	M/d	2	531.36		68.6
Water delivered (billed measured businesses)	M/d	2	305.12		68.7
Proportion of distribution input derived from impounding reservoirs	Propn 0 to 1	3			68.8
Proportion of distribution input derived from pumped storage reservoirs	Propn 0 to 1	3			68.9
Proportion of distribution input derived from river abstractions	Propn 0 to 1	3			68.10
Proportion of distribution input derived from groundwater works, excluding managed aquifer recharge (MAR) water supply schemes	Propn 0 to 1	3			68.11
Proportion of distribution input derived from artificial recharge (AR) water supply schemes	Propn 0 to 1	3	0.000		68.12
Proportion of distribution input derived from aquifer storage and recovery (ASR) water supply schemes	Propn 0 to 1	3	0.000		68.13
Proportion of distribution input derived from saline abstractions	Propn 0 to 1	3	0.000		68.14
Proportion of distribution input derived from water reuse schemes	Propn 0 to 1	3	0.000		68.15
Peak 7 day rolling average distribution input	M/d	2	1376.85		68.29
Peak 7 day rolling average distribution input / annual average distribution input	%	2	118.43%		68.30
<b>Water balance - company level</b>					
Measured household consumption (excluding supply pipe leakage)	M/d	2	508.18		68.31
Unmeasured household consumption (excluding supply pipe leakage)	M/d	2	127.79		68.32
Measured non-household consumption (excluding supply pipe leakage)	M/d	2	304.11		68.33
Unmeasured non-household consumption (excluding supply pipe leakage)	M/d	2	1.92		68.34
Total annual leakage	M/d	2	182.07		68.35
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Distribution input	M/d	2	1151.76		68.38
Distribution input (pre-MLE)	M/d	2	1162.5497466		68.39

Components of total leakage (post MLE) - company level				
Leakage upstream of DMA	MI/day	2	7.46	68.58
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Customer supply pipe losses – measured households excluding void properties	MI/day	2	23.2	68.60
Customer supply pipe losses – unmeasured households excluding void properties	MI/day	2	11.98	68.61
Customer supply pipe losses – measured non-households excluding void properties	MI/day	2	1.01	68.62
Customer supply pipe losses – unmeasured non-households excluding void properties	MI/day	2	0.06	68.63
Customer supply pipe losses – void measured households	MI/day	2	1.60	68.64
Customer supply pipe losses – void unmeasured households	MI/day	2	0.28	68.65
Customer supply pipe losses – void measured non-households	MI/day	2	0.92	68.66
Customer supply pipe losses – void unmeasured non-households	MI/day	2	0.04	68.67

## Restatement of 2022-23

Measure	Units	2022-23	
		Previously reported	Restated
Leakage	MI/d	182.6	190.5
PCC	l/person/d	131.3	132.3
Non-Household demand	MI/d	324.2	305.8
Distribution Input	MI/d	1178.1	1173.4
Imbalance	MI/d	30.5	46.2
Imbalance %	%	2.6%	3.9%

3 yr. leakage PCL	MI/d	177.6	177.6
3 yr. leakage	MI/d	179.5	182.1
Penalty - leakage	£m	1.3	3.2

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