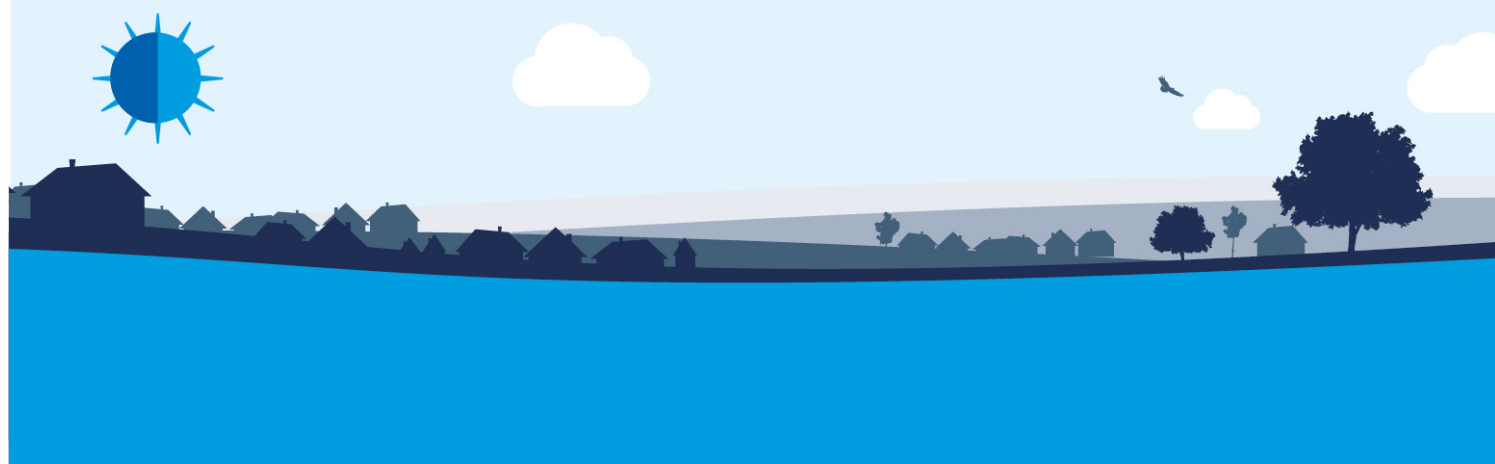


Appendix 5

Monte Carlo risk distribution



Principles of our Monte Carlo modelling

This document provides extensive additional detail on how we have modelled the ODI P10/P90 range following Ofwat’s interventions in our draft determination. It is necessary to provide this detail so that we can appropriately substantiate our concerns with the resultant P10/P90 range at the package level.

Where we have accepted an intervention on a performance commitment level, we have adjusted our risk range to allow for the assumption that the new target is the P50. Where we have not accepted an intervention, and for those measures where no intervention was applied, the risk range remains the same as in April. The exception to this is CRI, where an examination of the latest data and our experience leads us to update our risk range.

It is important to recognise that there is generally not enough data to be able to accurately model future risk distributions. This is a combination of limited historical data points, difficult to quantify externalities historically and in the future (for example weather impacts) and not least, future management actions which we are planning to implement to try and meet our performance commitment targets, and which we need to take account of over time.

Therefore, our risk distributions have been elicited from experts from within the business and the software used to fit a reasonable distribution to those elicitation parameters, primarily the estimation of the P10, P50 and P90. In the simulation tool we have added in the other parameters for each ODI from our draft determination, namely the performance commitment, deadbands, caps and collars, and incentive rates.

We have used three main shapes to represent our risk distributions in the simulation tool (Palisade @Risk). The examples below show the types of distribution we have used and why.

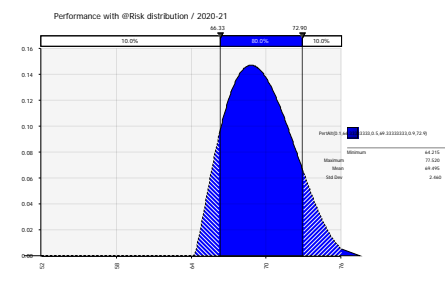
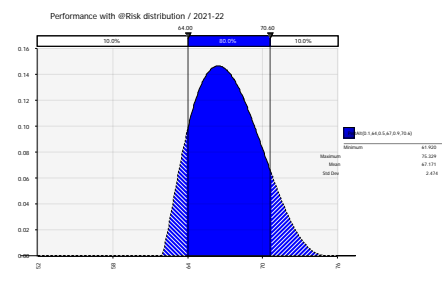
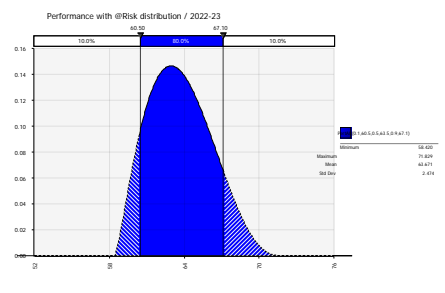
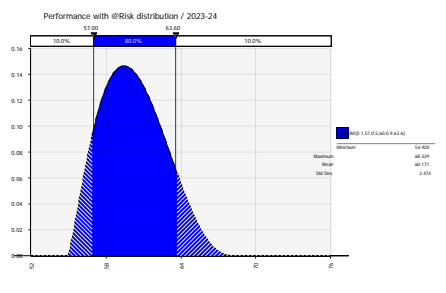
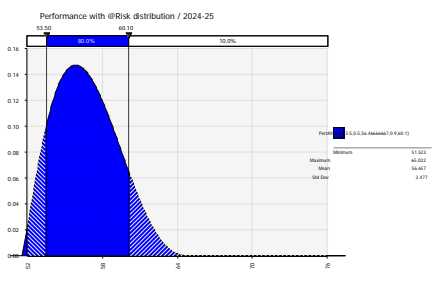
Gamma distribution	Pert distribution	Triangular distribution
<p>The gamma distribution is a good representation for measures that have a one sided tail.</p> <p>For example, a measure where zero is the best possible performance but which can experience a potentially unlimited downside with decreasing likelihood.</p> <p>The simpler triangular shape (red overlay) is not a good fit in this case because it significantly overestimates the likelihood in the extended tail region and therefore underestimates the central region.</p>	<p>The pert distribution is a good representation where the measure is reasonably symmetrical around the central estimate, and some tail is present but not expected to be extended such as in the gamma distribution. This is very similar to a normal distribution but the normal has longer tails of increasingly insignificant likelihood.</p> <p>The simpler triangular shape (red overlay) is a reasonable fit to the pert distribution and so could also be used in this case without significant impacts, although it may slightly overestimate the likelihood in the tails.</p>	<p>Some very straightforward measures did not need the complexity of a curved distribution. Also, occasionally the software we used (Palisade @Risk) was unable to fit a curved distribution to our parameter estimates because of a very narrow working range. In these cases we reverted to a triangular distribution provided it did not significantly overestimate the tails.</p> <p>As seen in this example, the triangular distribution can be skewed to the left (blue) or right (red overlay), which is useful where an asymmetric balance of risk for a measure needs to be represented. Other distributions (such as the pert) can also be adjusted in this manner if required.</p>
<p>The key factors in choice of distribution were:</p> <ul style="list-style-type: none">• The ability of the distribution to adequately represent the elicited P10, P50 and P90 judgements from the business experts, which take account of our future management actions to improve performance over time.• The behaviour of the distribution in the tails, and whether this is a logical representation of what happens in operational practice.• The ability of the distribution to adequately represent a risk skew, if it is considered that one exists.		

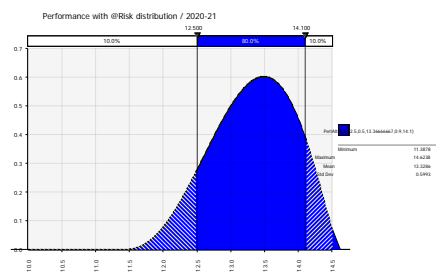
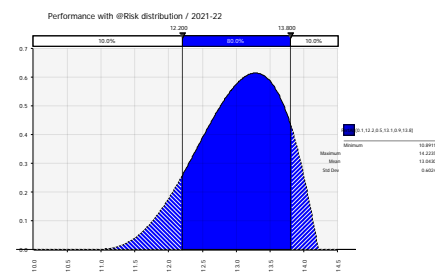
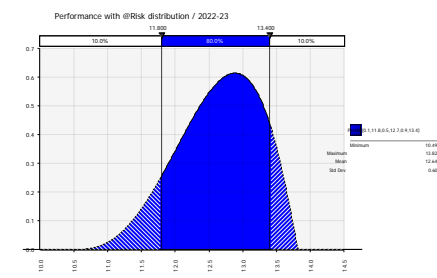
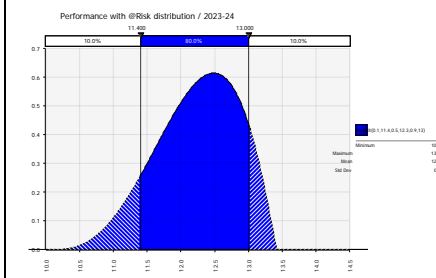
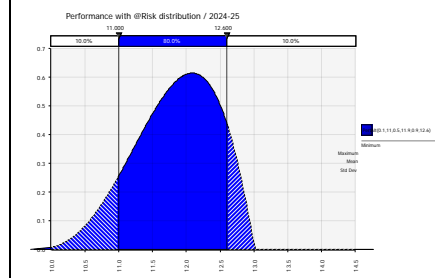
The templates below (one for each of our financially incentivised measures) show the considerations we have made for each measure in determining the appropriate representation of risk going forward. These risk distributions are modelled simultaneously to derive the P10/P90 range of the entire ODI package, which is discussed in the main draft determination response.

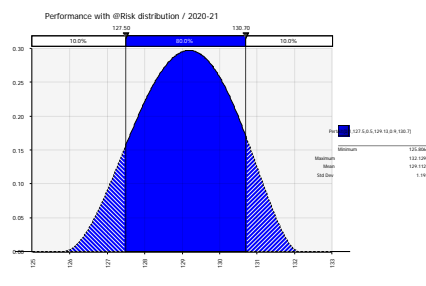
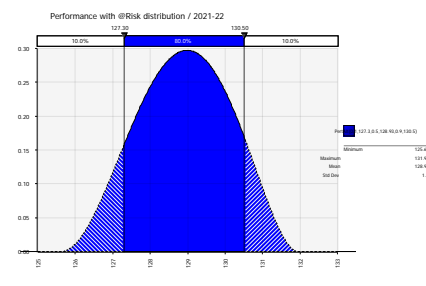
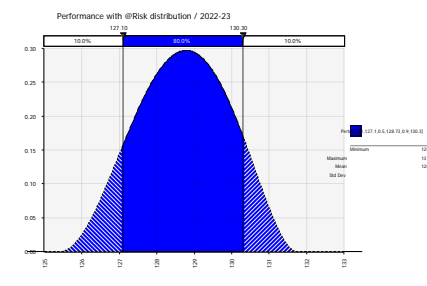
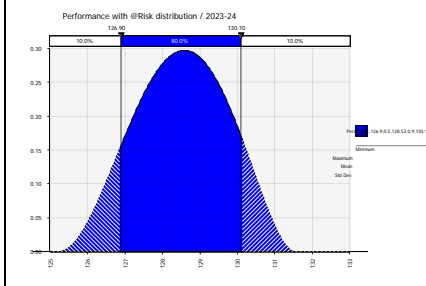
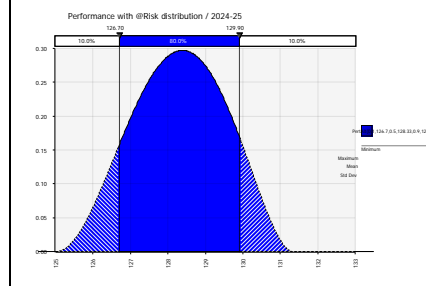
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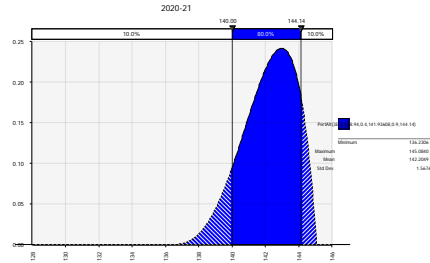
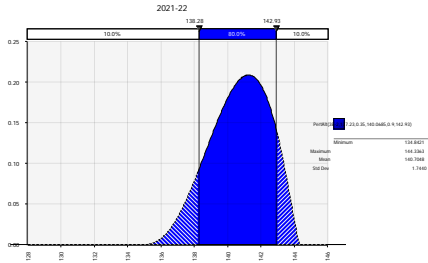
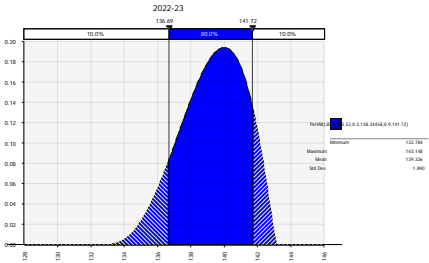
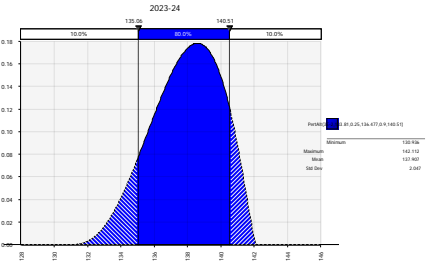
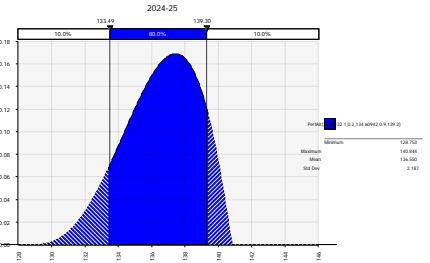
Our model was originally developed with the help of Jacob’s Asset Management Advisory. For this submission we have also had our inputs and outputs assured by Jacobs Regulation, Assurance and Advisory. The assurance team were not part of the original development of our model so we consider them sufficiently independent. The assurance team have reviewed this data alongside our financial model and stress testing.

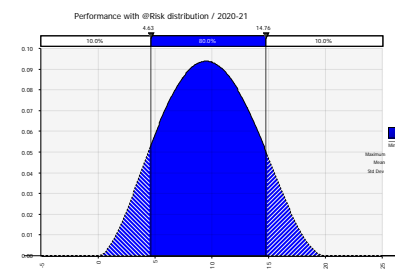
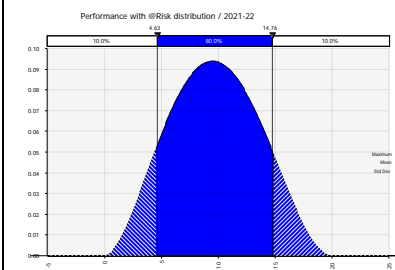
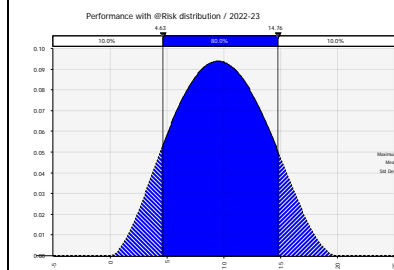
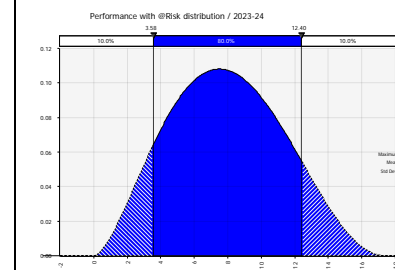
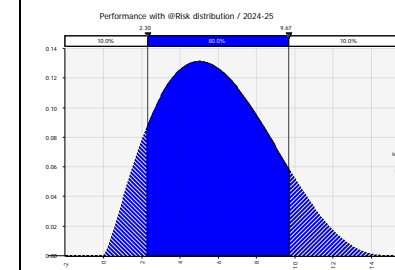
Common performance commitments

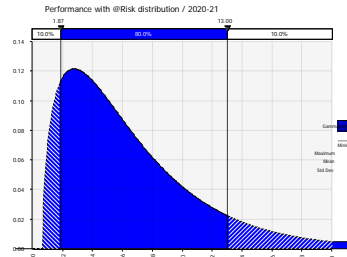
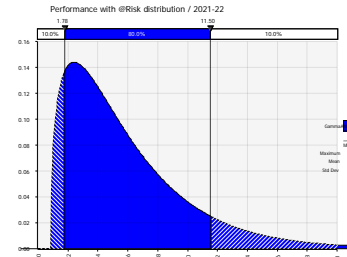
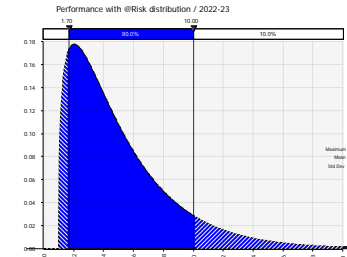
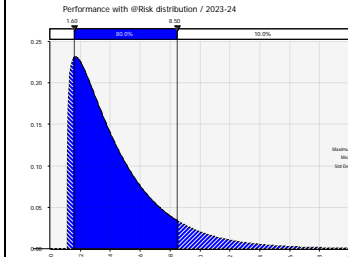
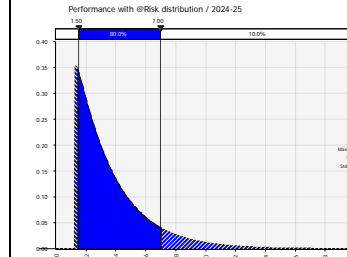
C1: Leakage South Staffs region (Ml/d, three-year average)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	69.33	67.00	63.50	60.00	56.47
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	74.03	74.03	74.03	74.03	74.03
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	65.71	63.45	60.00	56.54	53.02
Comments on our risk range	Leakage performance commitments are expressed as a percentage reduction in our draft determination, which we have converted to Ml/d for this analysis. Leakage is exposed to uncertainty due to weather volatility, which is partly mitigated (although not completely) by the use of a three-year rolling average in this measure. The circa 25% reduction (annual leakage 2019/20 to 2024/25) in the South Staffs region is an extremely stretching step change and will require a range of new innovations to be explored.				
Management actions over AMP7	We are exploring a range of innovations to reduce leakage over the five year period including the HydroSEAL leak repair system, live network monitoring and network and pressure management. It will be an unprecedented challenge to implement these innovations over a large distribution network to obtain targeted and consistent results and there remains uncertainty over how successful these techniques will be.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	72.90	70.60	67.10	63.60	60.10
P50	69.33	67.00	63.50	60.00	56.47
P90 (best 10%ile)	66.33	64.00	60.50	57.00	53.50
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-0.84	-0.85	-0.85	-0.85	-0.85
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.59	0.59	0.59	0.59	0.58
Comments on simulation	The three-year average has the effect of narrowing the risk range because the year result is averaged with the proceeding two years. The risk distributions we have chosen reflect the fact that there is room for this measure to improve, but that there remains uncertainty about the effect of the new innovations we are exploring to achieve this target, and the weather can also still have a significant effect. We have allowed the risk distribution to remain symmetrical with the target and track down with it over time, reflecting these issues. We think the 50% chance of achieving the target is a fair reflection of these uncertainties however depends on the delivery of the investment we propose, as without the investment the chance of delivering this degree of reduction would be significantly reduced. A higher underperformance incentive rate than the outperformance incentive rate results in a larger incentive at P10 than at P90 despite the symmetrical risk range.				

C2: Leakage Cambridge region (MI/d, three-year average)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	13.37	13.10	12.70	12.30	11.90
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	n/a	n/a	n/a	n/a	n/a
Comments on our risk range	Leakage performance commitments are expressed as a percentage reduction in our draft determination, which we have converted to MI/d for this analysis. Leakage is exposed to uncertainty due to weather volatility, which is partly mitigated (although not completely) by the use of a three-year rolling average in this measure. The circa 15% reduction (annual leakage 2019/20 to 2024/25) in the Cambridge region is an extremely stretching step change and will require a range of new innovations to be explored.				
Management actions over AMP7	We are exploring a range of innovations to reduce leakage over the five year period including the HydroSEAL leak repair system, live network monitoring and network and pressure management. It will be an unprecedented challenge to implement these innovations over a large distribution network to obtain targeted and consistent results and there remains uncertainty over how successful these techniques will be.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	14.10	13.80	13.40	13.00	12.60
P50	13.37	13.10	12.70	12.30	11.90
P90 (best 10%ile)	12.50	12.20	11.80	11.40	11.00
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-0.19	-0.18	-0.18	-0.18	-0.18
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.18	0.19	0.19	0.19	0.19
Comments on simulation	The three-year average has the effect of narrowing the risk range because the year result is averaged with the proceeding two years. The risk distributions we have chosen reflect the fact that Cambridge region is at the upper quartile level (normalised for mains length) and it is therefore more difficult to improve. We have allowed the risk distribution to track down with the target over time. We think the 50% chance of achieving the target is a fair reflection of these uncertainties however depends on the delivery of the investment we propose, as without the investment the chance of delivering this degree of reduction would be significantly reduced.				

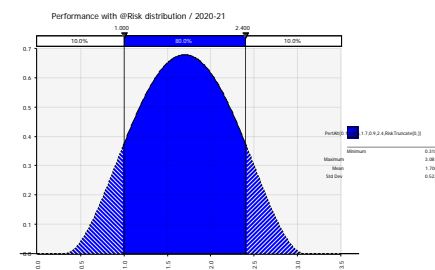
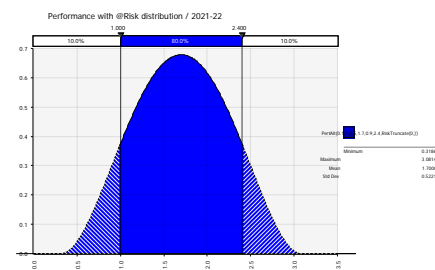
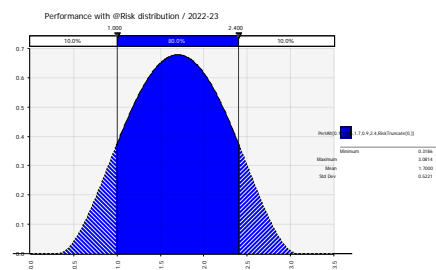
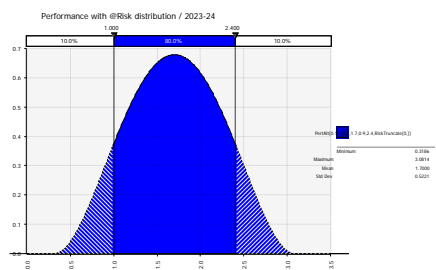
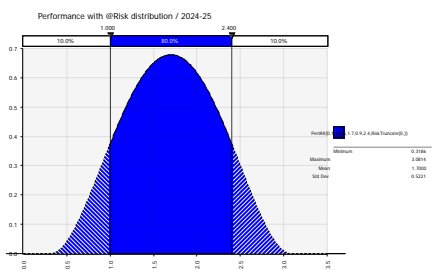
C3: Residential water consumption South Staffs region (l/p/d, three-year average)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	129.13	128.93	128.73	128.53	128.33
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	n/a	n/a	n/a	n/a	n/a
Comments on our risk range	We and the majority of other companies have seen an increasing level of PCC over the past two years driven by warm weather. The impact of the weather, even with a three-year average to smooth volatility, remains the most significant short term impactor on this measure. The actions we undertake to reduce PCC are also softer actions – requiring customers to alter their behaviour in response to our messaging and activity, and there is a natural degree of uncertainty on how customers will respond. Customers’ behaviour and trends are also influenced by other sources such as the weather (as already mentioned), environmental messaging in the wider media, white goods manufacturers and government policies.				
Management actions over AMP7	We will continue our existing water efficiency activity and expand our activity to ask customers to use water wisely.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	130.70	130.50	130.30	130.10	129.90
P50	129.13	128.93	128.73	128.53	128.33
P90 (best 10%ile)	127.50	127.30	127.10	126.90	126.70
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-0.28	-0.28	-0.28	-0.28	-0.28
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.20	0.20	0.20	0.20	0.20
Comments on simulation	This measure historically operates within a fairly narrow range, which is impacted by the weather and other external sources as discussed above but still typically sees only single digit percentage variation, either up or down. We have reflected this in the risk range used for modelling. We also consider the weather has a significant influence in short term performance even with the three-year average in place, to such an extent as to overshadow most of the short term effects of our activity. On this basis we consider that there is a 50% chance of achieving the performance commitment on average, which is reflected in these distributions which track down with the reducing performance commitments.				

C4: Residential water consumption Cambridge region (l/p/d, three-year average)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	141.94	140.07	138.34	136.48	134.61
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	n/a	n/a	n/a	n/a	n/a
Comments on our risk range	We and the majority of other companies have seen an increasing level of PCC over the past two years driven by warm weather. The impact of the weather, even with a three-year average to smooth volatility, remains the most significant short term impactor on this measure. The actions we undertake to reduce PCC are also softer actions – requiring customers to alter their behaviour in response to our messaging and activity, and there is a natural degree of uncertainty on how customers will respond. Customers’ behaviour and trends are also influenced by other sources such as the weather (as already mentioned), environmental messaging in the wider media, white goods manufacturers and government policies.				
Management actions over AMP7	We will continue our existing water efficiency activity and expand our activity to ask customers to use water wisely.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	144.14	142.93	141.72	140.51	139.30
P50	142.39	140.84	139.49	138.07	136.76
P90 (best 10%ile)	140.00	138.28	136.69	135.06	133.49
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	40%	35%	30%	25%	20%
Incentive simulation P10 (£m)	-0.06	-0.07	-0.08	-0.10	-0.12
Incentive simulation P50 (£m)	-0.01	-0.02	-0.03	-0.04	-0.05
Incentive simulation P90 (£m)	0.04	0.04	0.03	0.03	0.02
Comments on simulation	This measure historically operates within a fairly narrow range, which is impacted by the weather and other external sources as discussed above but still typically sees only single digit percentage variation, either up or down. We have reflected this in the risk range used for modelling. We also consider the weather has a significant influence in short term performance even with the three-year average in place, to such an extent as to overshadow most of the short term effects of our activity. Ofwat has intervened in our Cambridge PCC target such that the new performance commitment is below our original P10. We have made some considerations of how to account for this in the modelling – we consider Ofwat’s revised target to be lower than 50% likely to be achieved given the recent data history and trends in the region although we will be increasing our water efficiency activity which may or may not compensate in the short term, depending on how extreme the weather is each year.				

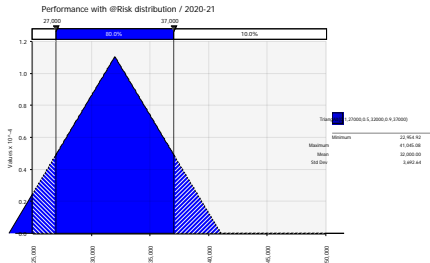
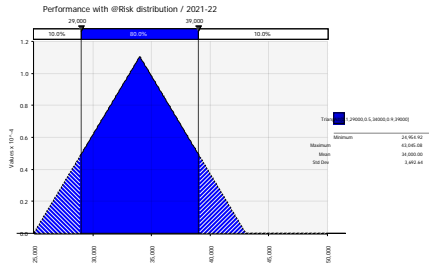
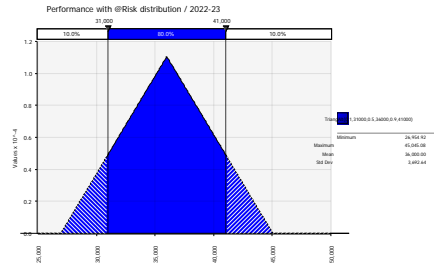
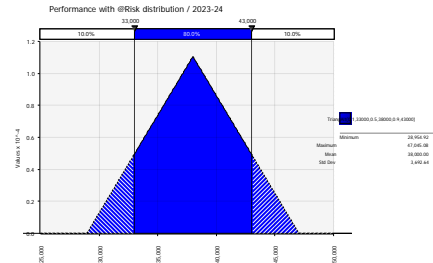
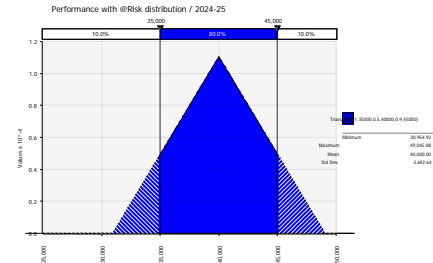
D1: Compliance risk index (points)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	0	0	0	0	0
Underperformance deadband	2	2	1.5	1.5	1.5
Underperformance collar	9.5	9.5	9.5	9.5	9.5
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	n/a	n/a	n/a	n/a	n/a
Comments on our risk range	Our likely performance range is high because of the sensitivity of HL and SM failures to the CRI score, evidenced in our AMP6 performance in the last two years of approximately 6.1 (2017) and 13.6 (2018), averaging at 9.85. On the basis of this recent data we have reconsidered our P10, P50 and P90 levels since our April submission. This is caused by these works’ high proportional contribution to our supply and the upgrade works to be completed. We consider that as we complete the upgrade works our performance is likely to improve in years 4 and 5, but the high proportional contribution to our supply will not change so the CRI score will always be sensitive to failures at these works.				
Management actions over AMP7	Our treatment works upgrade programmes will add a second stage filtration to both surface water works. In conjunction with the UV disinfection already installed this will reduce compliance failure risk and satisfy the DWI notice. Timescales for completion are Hampton Loade by March 2023 and Seedy Mill by March 2024. We are also planning to carry out a strategic mains cleaning programme to remove accumulated sediment in our trunk mains, which enables us to realise the appearance contacts benefits of our upgrade works.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	14.8	14.8	14.8	12.4	9.7
P50	9.6	9.6	9.6	7.8	5.6
P90 (best 10%ile)	4.6	4.6	4.6	3.6	2.3
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	Almost zero	Almost zero	Almost zero	Almost zero	Almost zero
Incentive simulation P10 (£m)	-2.00	-2.00	-2.14	-2.14	-2.14
Incentive simulation P50 (£m)	-2.00	-2.00	-2.14	-1.69	-1.10
Incentive simulation P90 (£m)	-0.70	-0.70	-0.84	-0.56	-0.21
Comments on simulation	In years 1 to 3 the simulation predicts maximum underperformance penalty at both P10 and P50. The penalty incentive value is the same in both because the penalty cap at 9.5 points is limiting the incentive. In years 4 and 5 the P10 is still above the level of the cap, but the P50 starts to reduce in line as a result of our management actions. In all years the P90 is also in penalty, because the likelihood of performing within the deadband range (2 points reducing to 1.5 points in year 3) is extremely small.				

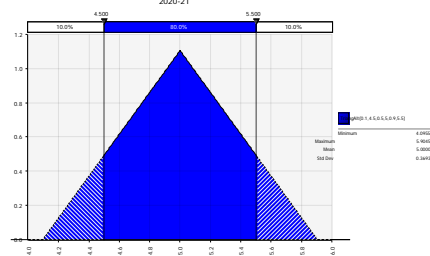
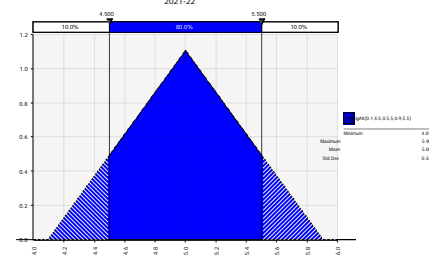
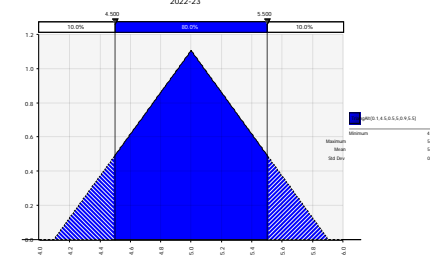
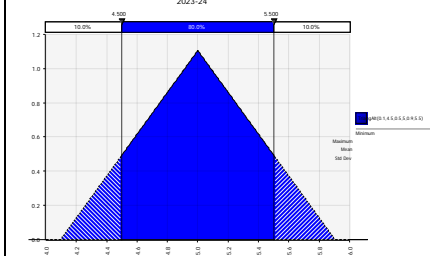
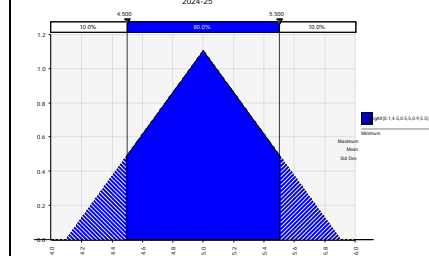
D2: Supply interruptions (minutes:seconds)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	05:24	04:48	04:12	03:36	03:00
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	21:36	21:36	21:36	21:36	21:36
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	01:52	01:47	01:42	01:36	01:30
Comments on our risk range	This measure is exposed to large unplanned events which are largely outside management control. We consider incremental improvement over time is possible on average, but any single year stands a good chance of being skewed by unplanned events. The glidepath across the period is steep and therefore the target is more difficult to achieve in later years, we do not expect our incremental improvements to keep up with the rate at which the target reduces.				
Management actions over AMP7	We are exploring interventions to reduce the planned interruptions time during our network maintenance activity. There are very limited short term interventions to reduce the likelihood of an unplanned event but we are examining how to better mitigate the consequences of these, although this will be dependent on the nature and severity of the event that occurs.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	13:00	11:30	10:00	08:30	07:00
P50	05:24	04:48	04:12	03:36	03:00
P90 (best 10%ile)	01:52	01:47	01:42	01:36	01:30
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-1.80	-1.59	-1.37	-1.16	-0.95
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.70	0.59	0.49	0.39	0.30
Comments on simulation	The simulation takes into account that there is a residual risk of a large unplanned event, represented by the elongated tail in the chosen distribution. The toughening target over the five years manifests in a decreasing outperformance opportunity at P90, as we move through the period.				

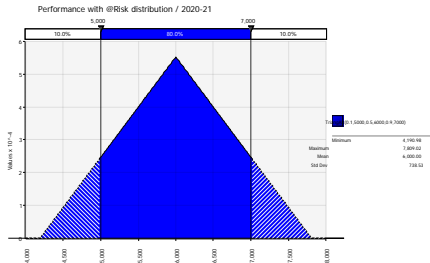
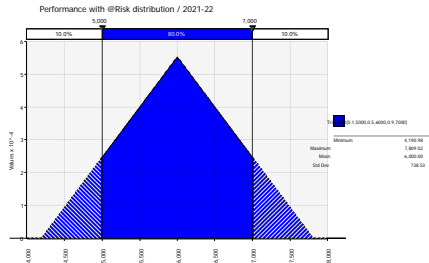
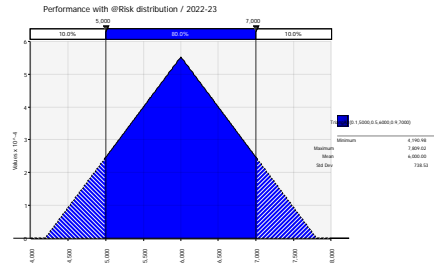
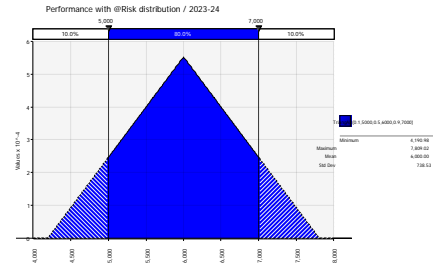
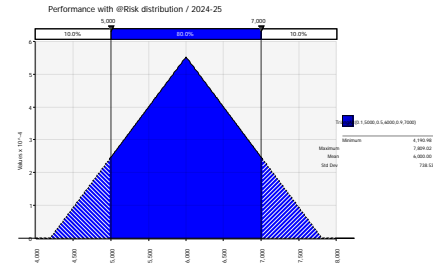
D4: Mains bursts (nr/1000 km)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	120	120	120	120	120
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	180	180	180	180	180
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	102	102	102	102	102
Comments on our risk range	This measure is exposed to volatility from the weather which is outside management control. Our network maintenance programme seeks to maintain stable asset health however there is a risk of additional leak detection activity causing an increase in detected bursts. Our last three year’s performance has been between 133 and 144 bursts per 1000km of main.				
Management actions over AMP7	We are continuing investing in our network maintenance, targeting the mains most likely to burst using the extensive data we have collected over the last 20 years. We are planning to invest in network monitoring technologies which will provide further data to effectively target our maintenance programme. We will also be increasing our leak detection activity which may cause an increase in detected bursts.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	150	150	150	150	150
P50	120	120	120	120	120
P90 (best 10%ile)	102	102	102	102	102
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-1.68	-1.68	-1.68	-1.68	-1.68
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.34	0.34	0.34	0.34	0.34
Comments on simulation	Our chosen distribution reflects the upwards pressure from leakage detection increase and the downwards pressure from our targeted network renewal programme, which targets a stable level of mains bursts over time, whilst allowing for a working range to account for externally driven volatility. Our most recent data puts our bursts in the 133-144 range so the expected industry UQ target will be challenging to achieve. Given the management actions however we are setting this target as our P50 level. Ofwat’s underperformance incentive rate is three times higher than the outperformance rate so this generates a higher P10 level of incentive than P90.				

D5: Unplanned outage (%)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	1.7	1.7	1.7	1.7	1.7
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	n/a	n/a	n/a	n/a	n/a
Comments on our risk range	Unplanned outage is a relatively new measure and has been subject to shadow reporting since 2017/18. In this time, we have significantly progressed our reporting processes and are on track for full compliance by 2020. As an asset health measure focussed on water resources and treatment works, this measure is dependent on the condition of these assets and their resultant failure rate, along with our ability to respond to get the asset back into service quickly.				
Management actions over AMP7	Our asset maintenance programme is a long term cycle which will invest in deteriorated assets at the optimal time. This measure is a new constraint that will also inform this programme of works. We’ll also look at how our day to day operational maintenance influences asset health and how our response time to unplanned events can be improved if required.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	2.4	2.4	2.4	2.4	2.4
P50	1.7	1.7	1.7	1.7	1.7
P90 (best 10%ile)	1.0	1.0	1.0	1.0	1.0
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-0.38	-0.38	-0.38	-0.38	-0.38
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.25	0.25	0.25	0.25	0.25
Comments on simulation	Although this measure is naturally capped at zero, and has an unlimited downside, we do not have any data or case to suggest that this measure will have a significant tail to its distribution. This is because the performance of the underlying assets is relatively stable over time – required to be so to meet supply needs and this is the fundamental purpose of our asset maintenance programme. Taking this into consideration, we have modelled the performance of this measure to be symmetrical within a reasonably small range. The underperformance rate is larger than the outperformance rate, hence why the symmetrical risk distribution results in an asymmetric incentive estimate.				

Bespoke performance commitments

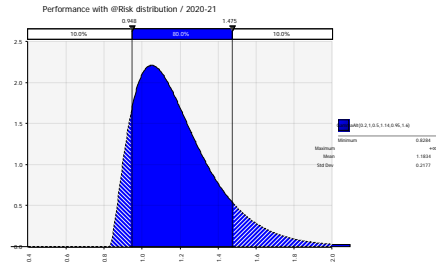
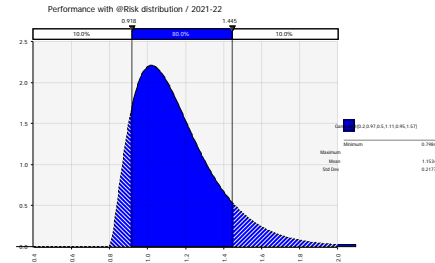
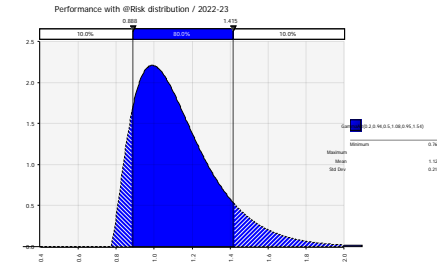
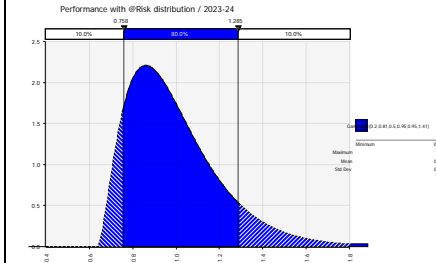
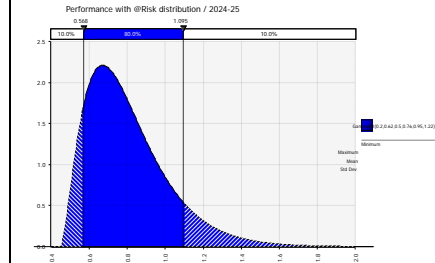
B1: Financial support (number of customers receiving)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	32000	34000	36000	38000	40000
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	n/a	n/a	n/a	n/a	n/a
Comments on our risk range	This is a penalty only measure focussed on the number of customers who receive financial support, from our social tariff or other types of help. Based on our successful implementation to date we expect to achieve our target however there are external influences that could mean we under or over-perform.				
Management actions over AMP7	We are continuing to promote our support packages extensively using a several marketing methods including our Community Hub and outreach support to help reach those in highly deprived areas.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	27000	29000	31000	33000	35000
P50	32000	34000	36000	38000	40000
P90 (best 10%ile)	37000	39000	41000	43000	45000
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-0.03	-0.03	-0.03	-0.03	-0.03
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.00	0.00	0.00	0.00	0.00
Comments on simulation	We used a triangular distribution because this is a simple measure with a high degree of management control. We expect to reach our target on this measure given the historical success of the programme and our continuing marketing. However there is a residual likelihood of over or underperformance given external influences which we have built into the risk range for modelling. On balance we have modelled this measure with our performance commitment at the P50 and using a narrow range of ± 5000 customers which is reflective of business expectations that this forecast is reasonably accurate.				

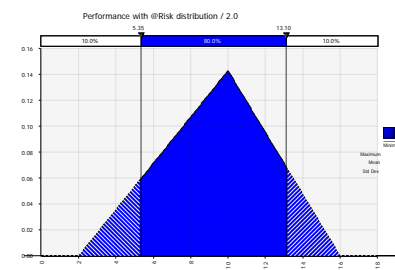
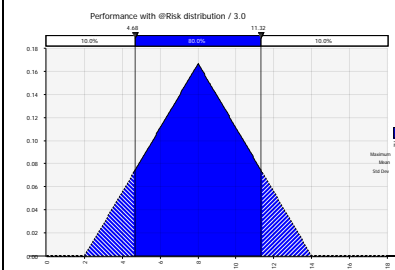
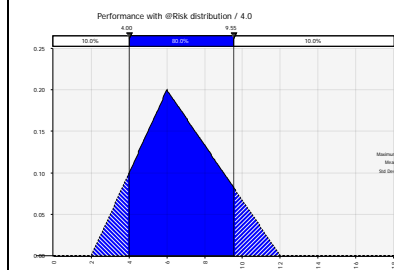
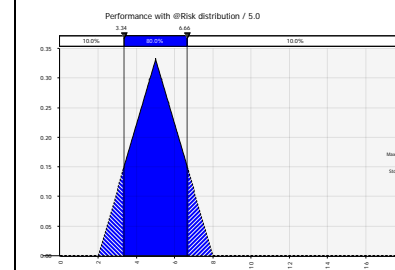
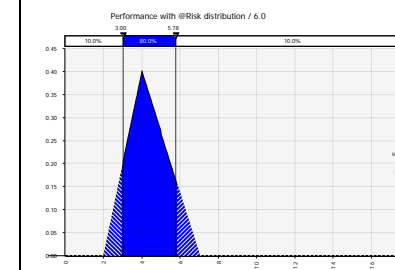
B2: Extra Care assistance (percentage of PSR registered customers receiving)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	5.0	5.0	5.0	5.0	5.0
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	n/a	n/a	n/a	n/a	n/a
Comments on our risk range	This is a penalty only measure focussed on the number of customers who receive Extra Care support, which is a new package of assistance measures targeted at customers on our priority services register. This is a new measure however our analysis suggests a 5% take up rate to be realistic.				
Management actions over AMP7	We are continuing to promote our support packages extensively using a several marketing methods and dedicated resources including our Community Hub and outreach support to help reach those in highly deprived areas. As the priority services register itself grows over time, our 5% target reflects an increasing number of customers receiving this additional support.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	4.5	4.5	4.5	4.5	4.5
P50	5.0	5.0	5.0	5.0	5.0
P90 (best 10%ile)	5.5	5.5	5.5	5.5	5.5
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-0.02	-0.02	-0.02	-0.02	-0.02
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.00	0.00	0.00	0.00	0.00
Comments on simulation	We used a triangular distribution because this is a simple measure with a high degree of management control. This is a new measure reflecting a new offering of additional support to vulnerable customers. We have modelled this measure with our performance commitment at the P50 and using a narrow range of ± 0.5% which is reflective of business expectations about delivery and the number of customers on the priority services register, which is itself increasing over time.				

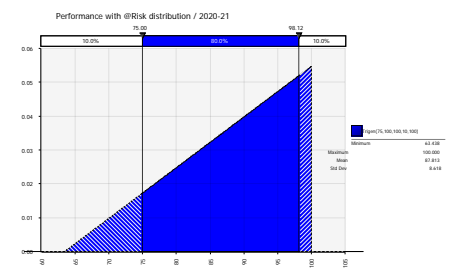
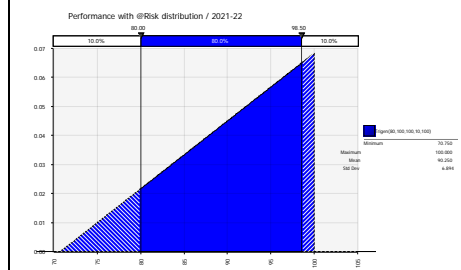
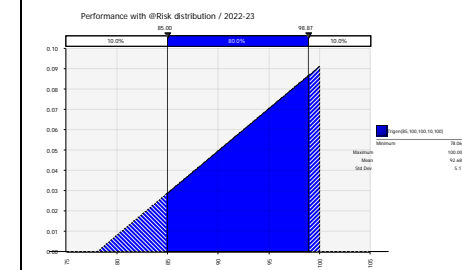
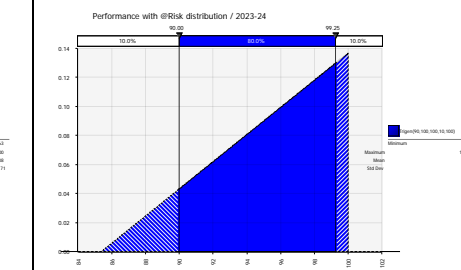
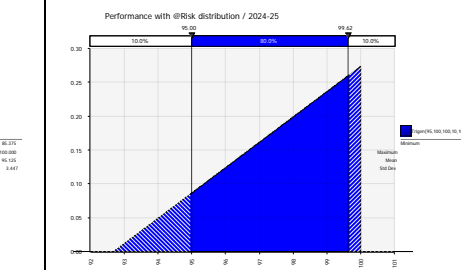
B3: Education activity (number of people receiving)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat's DD parameters					
Performance commitment	6000	6000	6000	6000	6000
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	7000	7000	7000	7000	7000
Comments on our risk range	Ofwat has increased our performance commitment for this measure to 6000 people. This measure is largely dependent on resourcing providing the target does not approach closely to the maximum number of opportunities we have available to us in our supply regions, namely schools’ willingness to participate and the number of pupils available. We have considered Ofwat’s intervention and believe that with additional resourcing that it is achievable. Ofwat have capped the outperformance at 7000 reflecting the degree of management control in this measure.				
Management actions over AMP7	We are extending our resourcing of our education programme which is still in development as we have recently moved to an outreach focussed offering.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	5000	5000	5000	5000	5000
P50	6000	6000	6000	6000	6000
P90 (best 10%ile)	7000	7000	7000	7000	7000
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-0.02	-0.02	-0.02	-0.02	-0.02
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.01	0.01	0.01	0.01	0.01
Comments on simulation	We used a triangular distribution because this is a simple measure with a high degree of management control. This is a new measure reflecting our growing education programme. We have modelled this measure with Ofwat’s performance commitment at the P50 and using a narrow range of ± 1000 people which is reflective of business expectations about delivery and resourcing.				

C5: Environmentally sensitive water abstraction (AIM score)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	0.0	0.0	0.0	0.0	0.0
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	n/a	n/a	n/a	n/a	n/a
Comments on our risk range	AIM is a measure of over or under-abstraction, using a scoring system where zero means no net over or under abstraction has occurred. We have two AIM sites, only one of which is operational and so we consider the risk range to be relatively narrow with a large degree of management control.				
Management actions over AMP7	We will set up internal monitoring of our AIM sites and relevant thresholds that define when the local environment is becoming sensitive to our abstraction, these have been set in liaison with the Environment Agency.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	-0.5	-0.5	-0.5	-0.5	-0.5
P50	0.0	0.0	0.0	0.0	0.0
P90 (best 10%ile)	0.5	0.5	0.5	0.5	0.5
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-0.05	-0.05	-0.05	-0.05	-0.05
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.02	0.02	0.02	0.02	0.02
Comments on simulation	We have used a triangular distribution as the working range of AIM is very narrow and did not suit curved distributions. We expect the working range of AIM to be relatively narrow, and centred around our performance commitment as the P50.				

C7: Protecting wildlife, plants, habitats and catchments (Hectares)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	194	320	451	592	690
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	229	355	486	627	725
Comments on our risk range	This measure of biodiversity has a large degree of management control over our marketing of the schemes but is ultimately reliant on take up of our support from local groups and farmers. We consider that the target is achievable and expect a relatively narrow working range reflective of the level of management action available to us.				
Management actions over AMP7	We are extending our programme of biodiversity related catchment management in AMP7 as well as continuing with our existing PEBBLE and SPRING funds, as well as undertaking biodiversity work on our own land.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	169	295	426	567	665
P50	194	320	451	592	690
P90 (best 10%ile)	229	355	486	627	725
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-0.06	-0.06	-0.06	-0.06	-0.06
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.04	0.04	0.04	0.04	0.04
Comments on simulation	We have used a triangular distribution as this is a relatively simple measure with a narrow working range. We have placed the performance commitment at the P50 reflecting the level of management control and experience we have in delivery, following on the success of our initiatives in AMP6, and the distributions selected track this increasing performance commitment over time.				

D6: Customer contact about water quality (nr/1000 population)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat's DD parameters					
Performance commitment	1.14	1.11	1.08	0.95	0.76
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	n/a	n/a	n/a	n/a	n/a
Comments on our risk range	This performance commitment is a continuation of our AMP6 measure, which whilst extremely challenging, we have made significant progress in improving over the last four years. Over this time we have yet to meet our performance commitment although projections for the 2019/20 year are currently on target to achieve it. The performance commitment continues to reduce over AMP7.				
Management actions over AMP7	We have undertaken extensive reviews of the root causes of customer contact and now have a strong focus on our calm network and mains flushing programmes to ensure we minimise the risk of transient quality problems. Continuous improvement in this measure is dependant on some significant projects in AMP7 which seek to address long term deposition of sediments in our network and take actions to prevent future deposition by improving the treatment processes at our two surface water treatment works.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	1.48	1.45	1.42	1.29	1.10
P50	1.14	1.11	1.08	0.95	0.76
P90 (best 10%ile)	0.95	0.92	0.89	0.76	0.57
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	50%	50%	50%	50%	50%
Incentive simulation P10 (£m)	-0.37	-0.37	-0.37	-0.37	-0.37
Incentive simulation P50 (£m)	0.00	0.00	0.00	0.00	0.00
Incentive simulation P90 (£m)	0.17	0.17	0.17	0.17	0.17
Comments on simulation	There is a skew to this distribution, as it increasingly difficult to achieve a lower level of contacts because this requires reduction of the background level – which is not concentrated in a hot spot and exhibits a random pattern of occurrence. We have however, reflected the extensive upgrade works at Hampton Loade and Seedy Mill which along with a large mains cleaning programme is designed to deliver our performance commitment, by ensuring that the target is centred in the modelled distribution at the 50 th percentile. The distribution also tracks our reducing target over the period.				

D7: Visible leak repair time (90% repaired within N days)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	90% in 6 days	90% in 5 days	90% in 4 days	90% in 4 days	90% in 4 days
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	n/a	n/a	n/a	n/a	n/a
Comments on our risk range	This is a new measure which complements our leakage and customer service objectives. The performance commitment is extremely challenging to achieve, our current performance level being estimated at around 14 days although we need to undertake further work on our reporting process.				
Management actions over AMP7	We are currently setting up the reporting process for this measure as it has not been reported in this format before. We are examining our works management and leakage detection processes to ensure that information flows efficiently and we are examining our response times to determine how to meet this extremely challenging but important target.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	90% in 13.1 days	90% in 11.3 days	90% in 9.6 days	90% in 6.7 days	90% in 5.8 days
P50	90% in 9.5 days	90% in 8.0 days	90% in 6.5 days	90% in 5.0 days	90% in 4.3 days
P90 (best 10%ile)	90% in 5.4 days	90% in 4.7 days	90% in 4.0 days	90% in 3.3 days	90% in 3.0 days
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	14%	13%	10%	22%	40%
Incentive simulation P10 (£m)	-0.92	-0.81	-0.72	-0.34	-0.23
Incentive simulation P50 (£m)	-0.45	-0.39	-0.33	-0.13	-0.03
Incentive simulation P90 (£m)	0.04	0.02	0.00	0.04	0.07
Comments on simulation	There is limited existing data on this measure as it is new however, so we have selected a simple triangular distribution. We consider the target to be extremely stretching and hence the expectation that there is a low chance of achievement initially, improving over time with our management actions. This means that the P50 estimate of incentives is slightly into an underperformance position which we consider realistic.				

E2: Residential void properties and gap sites (% validation)					
	2020/21	2021/22	2022/23	2023/24	2024/25
Ofwat’s DD parameters					
Performance commitment	100	100	100	100	100
Underperformance deadband	n/a	n/a	n/a	n/a	n/a
Underperformance collar	n/a	n/a	n/a	n/a	n/a
Outperformance deadband	n/a	n/a	n/a	n/a	n/a
Outperformance cap	n/a	n/a	n/a	n/a	n/a
Comments on our risk range	We have committed to 100% validation of the properties registered as voids each year, which is a challenging target and a large uplift from current level of validation.				
Management actions over AMP7	We will be implementing new processes to achieve this level of validation from a combination of business as usual activities and cross checks through to consultancy support, for example by linking to credit reference agencies and third party providers.				
Monte Carlo input parameters and risk distributions					
Monte Carlo risk distribution					
P10 (worst 10%ile)	75	80	85	90	95
P50	89	91	94	96	98
P90 (best 10%ile)	100	100	100	100	100
Monte Carlo outputs (10k iterations was stable)					
Likelihood of achieving PC	30%	35%	40%	45%	50%
Incentive simulation P10 (£m)	-0.04	-0.04	-0.04	-0.04	-0.04
Incentive simulation P50 (£m)	-0.02	-0.02	-0.01	-0.01	0.00
Incentive simulation P90 (£m)	0.00	0.00	0.00	0.00	0.00
Comments on simulation	The format of this measure is unique as it is a percentage naturally capped at 100. We have represented this with a triangular distribution which fits with a reasonable range of performance rising over time as our management actions strengthen over the period. The P90 is less relevant in this measure (and the performance commitment is penalty only) because greater than 100% cannot be achieved. We have manually set the P90 at 100%, reflecting that we consider around a 50% chance of achieving the full 100% validation by the end of the period, given that this is a large number of properties.				