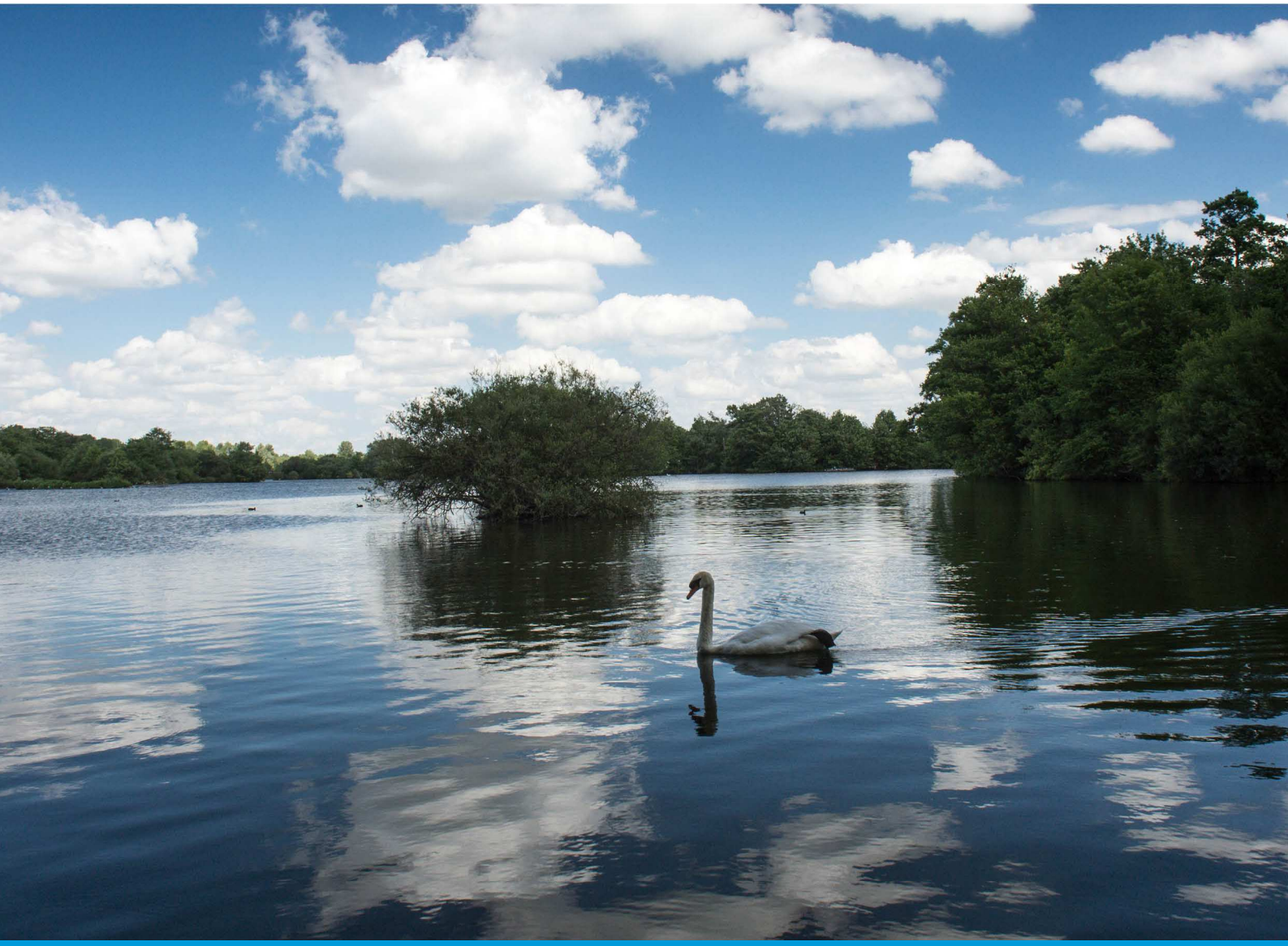
Affinity Water

Your local supply, on tap



AFW Company response: reference AFW-OD

Delivering outcomes for customers

30 August 2019

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1 Introduction

1.1 Purpose and structure of this document

The purpose of this document is to set out our response to Ofwat's draft determination (DD) interventions in relation to '**delivering outcomes for customers'.** The reference for this document is '"AFW-OD".

We list the individual interventions and the actions, grouping them in three categories:

- 'Acknowledged or noted' where we do not seek a change to the interventions made at this stage of the determination process.
- 'Representation' where change to the DD is required to achieve a balance of performance and incentives that protects our customers.
- 'Technical points' where we address technical issues through providing clarification or provide additional information as required, including where we introduce a revised PC.

We present, in individual sections, the rationale for our response, the detailed analyses we have carried out and the information we have used to support our position.

- Section 2: Summary table of responses to interventions and actions
- Section 3: Representation on mains repairs
- Section 4: Representation on supply interruptions over 12 hours
- Section 5: Representation on low pressure (DG2 register)
- Section 6: Technical point on our revised PC for customer contacts (discoloured water, appearance, taste, and odour)
- Section 7: Technical points on outperformance payments for river restoration
- Section 8: Technical points on value for money (VFM)
- Section 9: Technical points on the unit for per capita consumption (PCC) PC
- Section 10: Technical points on revised name for our cyber security and resilience PC
- Section 11: Technical points on risk of severe restrictions in a drought.

1.2 Company response overview

In our response to the initial assessment of plans (IAP) we made changes to our PCs and outcome incentives to unlock more for customers and we are pleased with Ofwat's recognition of progress in our response to IAP.

The DD sets 31 interventions relating to 'delivering outcomes for customers'. We have considered each of Ofwat's actions and interventions in detail, undertaking comprehensive additional analyses to inform our response.

We acknowledge the majority of the DD interventions. These introduce more challenging collars for leakage and PCC, remove collars for low pressure and remove outperformance payments for low pressure and abstraction reduction.

In agreement with the DD action, we extend our PC for discoloured water customer contacts to a more comprehensive measure, including contacts for discoloured water, taste and odour, and appearance. For this revised measure we use the underperformance incentive rate set in the DD. We introduce a revised

PC for VFM for which we propose to use a new survey question developed with our customer challenge group (CCG).

Noting that the additional information we provided on customer research (AFW Willingness to Pay Appendices, June 2019) was not provided in time to be taken into consideration at DD, we restate our outperformance incentive for river restoration with the support of our customers.

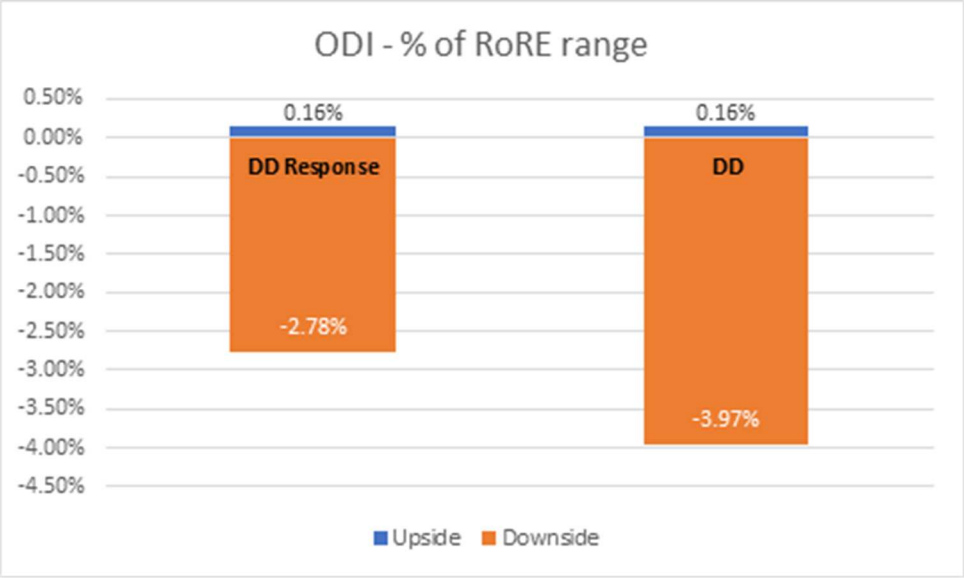
We represent on our plans in a limited number of key areas by requiring a change to the DD interventions in:

- Mains repairs.
- Low pressure (DG2 register).
- Supply interruptions over 12 hours.

These changes are required to address disproportionate penalty risks introduced by the DD interventions and to secure an achievable balance of benefits and risks in delivering our outcomes.

With our response to the DD we progress further by increasing stretch in performance targets and incentives to perform. Our response also defines the more proportionate balance of performance and risk required to secure sustainability in our operations. In the graph below we use Ofwat's P10 and P90 derived values in the DD guidance to illustrate the outcome delivery incentives (ODI) risk to RoRE range of the DD and the RoRE range from our response (RP).

Figure 1: RoRE ranges at DD and DD response



Source: Affinity Water analysis

We provide the details of representations and technical points in sections 3 to 11, noting that this response to the DD continues to challenge us over and above our response to IAP.

1.3 Supporting documentation

In addition to our company response to 'delivering outcomes for customers' in this document, we provide additional supporting appendices, either within this document or as standalone documents. These should be read in conjunction with the relevant representation and technical point.

A list of supporting documentation and the relevant representation/technical point is included in the table below.

Table 1: Supporting documentation for our response to 'delivering outcomes for customers'

Document reference	Description	Standalone document	Representation/technical point
AFW-OD. Appendix A	Further analysis into the collar, rate and level of stretch relating to supply interruptions over 12 hours.	No	**Section** 4. Representation: AFW.OC.C8 – Supply interruptions over 12 hours
AFW-OD-Appendix B	Drought resilience – Risk of severe restrictions in a drought calculations.	Yes	**Section 11.** Technical point – AFW.OC.A19 (risk of severe restrictions in a drought)
AFW-OD-Appendix C	Drought resilience metric – certainty grade calculations.	Yes	**Section 11.** Technical point – AFW.OC.A19 (risk of severe restrictions in a drought)

Source: Affinity Water DD response

2 Table of responses to interventions and actions

The table below presents all actions and interventions relating to 'delivering outcomes for customers' and one action (AFR.LR.A1) relating to 'securing long-term resilience'. The table sets out the following:

- Column A sets out the action reference for the individual action.
- Column B sets out the intervention area relating to the individual Ofwat intervention.
- Column C sets out where we acknowledge the intervention or seek a change through a representation or technical point. This is denoted as follows:
  - 'A': Acknowledged or noted with no further commentary in this document.
  - 'R': A change is required to the DD and therefore we have provided a representation in this document.
  - 'T': Technical issues addressed by providing clarification or additional information as required.
- Column D provides the section reference in this document where we seek change through a representation or a technical point.

Table 2: Ofwat actions and interventions relating to 'delivering outcomes for customers'

A. Action reference	B. Intervention Area	C. Response	D. Section reference
AFW.OC.A2	Asset health measures: New PC for customer contacts on appearance, taste, and odour	T	**Section 6.** Technical point: AFW.OC.A2 – Revised PC for customer contacts (discoloured water, taste and odour, and appearance)
AFW.OC.A3	Value for Money: New PC	T	**Section 8**. Technical point: AFW.OC.A3 – Revised PC for Value for Money
AFW.OC.A8	Supply interruptions ≥3 hours: Glide path and PC targets	A	
AFW.OC.A10	Supply interruptions ≥3 hours: Caps, collars, and deadbands	A	
AFW.OC.A11	Leakage: PC targets	A	
AFW.OC.A13	Leakage: ODI rates	A	
AFW.OC.A14	Leakage: Caps and collars	A	
AFW.OC.A18	Gaps and voids: ODI rates	A	

A. Action reference	B. Intervention Area	C. Response	D. Section reference
AFW.OC.A19	Risk of severe restrictions in a drought: intermediate calculations	T	**Section 11**. Technical point – AFW.OC.A19 (risk of severe restrictions in a drought)
AFW.OC.A21	CRI: Deadbands	A	
AFW.OC.A24	Burst Mains: PC targets	R	**Section 3.** Representation: AFW.OC.A24, AFW.OC.A25, AFW.OC.A26 – Mains repairs
AFW.OC.A25	Burst Mains: ODI Rate	R	**Section 3.** Representation: AFW.OC.A24, AFW.OC.A25, AFW.OC.A26 – Mains repairs
AFW.OC.A26	Burst Mains: Caps and Collars	R	**Section 3.** Representation: AFW.OC.A24, AFW.OC.A25, AFW.OC.A26 – Mains repairs
AFW.OC.A29	Low Pressure: Outperformance payments	A	
AFW.OC.A30	Low Pressure: ODI Rate	R	**Section 5.** Representation: AFW.OC.A30 – Low pressure (DG2 register)
AFW.OC.A31	Low pressure: Caps and collars	A	
AFW.OC.A40	River restoration: Outperformance payments	T	**Section 7.** Technical point: AFW.OC.A40 – Outperformance payments for river restoration
AFW.OC.A42	Abstraction reduction: Outperformance payments	A	
AFW.OC.C1	Environmental innovation (community projects): PC target	A	
AFW.OC.C2	Abstraction reduction: PC target	A	
AFW.OC.C3	Abstraction reduction: Definition	A	
AFW.OC.C4	WINEP: New PC (non-financial)	A	
AFW.OC.C5	Customer contacts on water discolouration: PC target	(A) Superseded by AFW.OC.A2	
AFW.OC.C6	Customer contacts on water discolouration: ODI rates	A	

A. Action reference	B. Intervention Area	C. Response	D. Section reference
AFW.OC.C7	Strategic resource development: Removal of PC	A	
AFW.OC.C8	Unplanned interruptions to supply over 12 hours: Definition, Incentive type	R	**Section 4.** Representation: AFW.OC.C8 – Supply interruptions over 12 hours
AFW.OC.C9	Low pressure: Definition	A	
AFW.OC.C10	Low pressure: New PC	A	
AFW.OC.C11	Per capita consumption: Caps and collars	A	
AFW.OC.C12	Abstraction incentive mechanisms: Caps and collars	A	
AFW.OC.C13	Community projects: Caps	A	
N/A	Per capita consumption: PC target measurement units	T	**Section 9.** Technical point: Clarification of PC unit for per capita consumption
N/A	Cyber security and resilience: PC title	T	**Section 10.** Technical point: Revised name for
AFW.LR.A1	Outstanding actions on operational resilience PCs	See response to interventions for 'mains repairs' (AFW.OC.A24, AFW.OC.A25, AFW.OC.A26), 'unplanned interruptions to supply over 12 hours' (AFW.OC.C8).	

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customer actions and interventions, and Affinity Water DD response

3 Representation: AFW.OC.A24, AFW.OC.A25, AFW.OC.A26 – Mains repairs

3.1 Purpose of this section

Table 3: Ofwat actions addressed in this section

Action reference	Intervention area
AFW.OC.A24	Mains repairs: PC targets
AFW.OC.A25	Mains repairs: ODI rate
AFW.OC.A26	Mains repairs: Collar

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customer actions and interventions

In April, we proposed a PC level of 185.8 mains repairs per 1,000 km of mains with an underperformance rate of -£0.096 and an underperformance collar at 200 repairs per 1,000 km of mains.

In the DD, Ofwat intervened to increase the level of stretch in our mains repairs commitments by:

- Tightening the PC level to 133.5 repairs per 1,000km of mains.
- Setting an underperformance-only ODI with a significantly increased underperformance rate of -£0.160m for each additional burst repaired per 1,000km of mains.
- Removing the underperformance collar.

This section provides the rationale and details of our response on mains repairs. It includes statistical analyses and evidence supporting the need for a revised PC, underperformance rate and collar.

3.2 Summary of response

We have analysed mains repairs data and trends using statistical methods. We have used regression analysis to establish the strength of performance with factors out of our control. Even when taking optimistic scenarios, which do not account for weather extremes because they exclude the extreme weather we experienced in AMP4, our analysis demonstrates that the DD target (the average of the best three years over the last ten) is not a consistently deliverable performance level.

We conclude that a stretching target for mains repairs of 159.1 per 1,000km of mains and that the incentive payment and collar levels need to be changed from DD levels to -£0.096m and 200 mains repairs per 1,000km of mains respectively.

Draft determination

Table 4: Draft determination on mains repairs

	Unit	2020/21	2021/22	2022/23	2023/24	2024/25
PC	Repairs per 1,000km of mains	133.5	133.5	133.5	133.5	133.5
ODI Penalty rate	£m/unit	-0.160	-0.160	-0.160	-0.160	-0.160
ODI Penalty collar	Repairs per 1,000km of mains	None	None	None	None	None

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customer actions and interventions

DD response

Table 5: Our DD response on mains repairs

	Unit	2020/21	2021/22	2022/23	2023/24	2024/25
PC	Repairs per 1,000km of mains	159.1	159.1	159.1	159.1	159.1
ODI Penalty rate	£m/unit	-0.096	-0.096	-0.096	-0.096	-0.096
ODI Penalty collar	Repairs per 1,000km of mains	200	200	200	200	200

Source: Affinity Water

3.3 Summary of analysis

The number of mains repairs per 1,000km of mains is an asset health measure. We collect and update performance and static data on an on-going basis in our corporate systems. We also make use of relevant data on correlated factors such as, for example, weather conditions, soil moisture content and temperatures.

To set a PC which is a representative measure of our asset health:

- We first assessed and determined a robust methodology. We compared the results of statistical regression analyses carried out on burst data with the results of Ofwat's methodology of taking the average of the three best years in the last 10 years. We found that Ofwat's methodology does not take reasonable account of factors out of our control.
- Having evidenced the linkages between external factors and bursts, we carried out Monte Carlo simulations to calculate the range and variability of the measure. We then adjusted this distribution based on different scenarios for frequency of extreme weather events to generate a range of P50 values.
- The analysis showed that the range of P50 is between 159 repairs per 1,000km of mains and 177 repairs per 1,000km of mains.
- To reflect our ambition and support Ofwat's objective to stretch ourselves, we have set the mains repairs PC to 159.1 bursts per 1,000km of mains.
- Having established the variability of P50 with external factors out of our control, we calculated the financial impact of the underperformance rate using the DD ODI rate and the P10/P90 figures provided by Ofwat. We repeated this exercise for the P10/P90 values produced from our own statistical analysis.
- Our analyses found that the DD incentive rate and removal of the collar create disproportionate risk. To set the incentive rate and collar we followed guidance from Ofwat, 'Technical Appendix 1: Delivering Outcomes for Customers' and set the underperformance rate to the median in line with standard statistical practice.

In summary, our overall package for this PC incentivises us to deliver stretching improvement targets on our burst mains performance and protect the interests of customers.

3.4 Structure of this section

The section is structured as follows:

- **3.4. Understanding performance.** This section sets out the regression analysis we have undertaken to understand the key drivers of our burst mains performance, and the impact of factors outside of our control.
- **3.6. Setting an evidence-based and ambitious PC target.** This section presents the regression and Monte Carlo analyses used to determine P50 ranges.
- **3.7. Industry evidence of external factors**. This section sets out supporting evidence from the wider industry on the impact of factors such as weather events and geology on the rate of burst mains, identifying where Affinity Water is impacted by the same relationships.
- **3.8**. **Striking the right balance between ambition and risk.** This section sets out the analysis we have undertaken to set the underperformance rate for this PC, along with our rationale for restating our collar at the level in our response to IAP. This includes the financial risk assessment we have undertaken in addition to supporting evidence from our customer engagement programme.
- **3.9**. **The impact of active leakage control.** In our IAP response we set out the relationship between active leakage control (ALC) and mains repairs. Whilst we no longer take this relationship into account when setting our new PC target, we set out our response to Ofwat's queries in this area.
- **3.10. Conclusion.** Summary of the key conclusions of our burst mains analysis and our new PC target, underperformance rate, and collar.

3.5 Understanding performance

3.5.1 Regression analysis of our historic burst mains

A series of iterative regression models were tested to identify the key independent variables that affected bursts. This process starts with considering a large number of weather factors. The specification was refined by removing insignificant factors through an iterative process to reach the specification of best fit. The final specification and outputs from this analysis are shown in the table below and demonstrate that our burst mains repairs performance is heavily influenced by factors that are outside of our management control.

Table 6: Bursts regression outputs

Variable	Coefficient	Standard Error	p-value
Intercept	334.8	19.2	0.000000
SMD (mm)	0.8	0.2	0.000661
Min Temp (ºC)	-11.4	2.7	0.000040
Sunshine (hrs)	-22.9	3.7	0.000000
Min Air Temp below -3ºC	1205.6	128.2	0.000000
Max Air Temp Above 22ºC	152.1	37.9	0.000096
Multiple R squared	0.84		
R squared	0.70		

Source: RPS analysis

A brief description of each factor is set out below[1]:

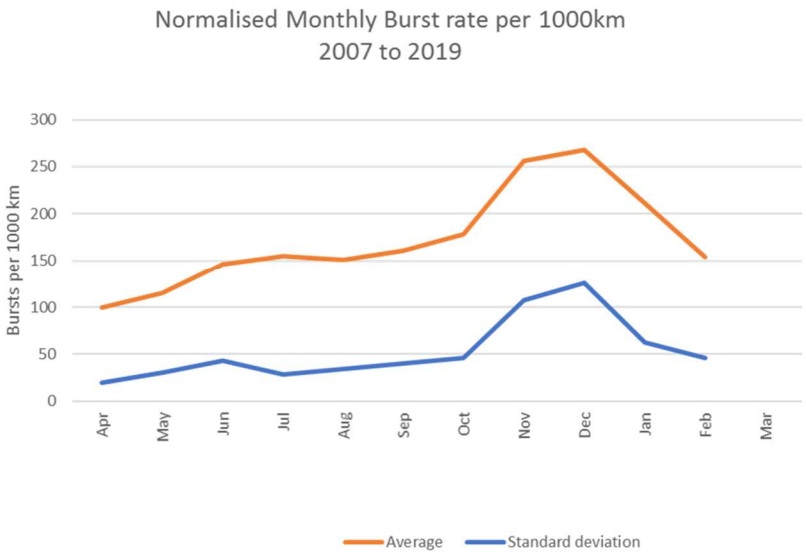
[1] We note that some of these independent variables are likely to be related to one another e.g. sunshine and maximum air temperature above 22ºC and therefore there may be multicollinearity in the specification. However, as we use the regression analysis as whole to understand the relationship between burst mains and factors outside of our control rather than individual coefficients thus this does not reduce the validity of the overall analysis.

- SMD (mm) – The average soil moisture deficit for the month.
- Min Temp (ºC) – The average minimum temperature for the month.
- Sunshine (hrs) – The average number of hours of sunshine in a day for the month.
- Min Air Temp below -3ºC[2] – The probability that a given day has a minimum temperature of below -3 for the month.
- Max Air Temp above 22ºC – The probability that a given day has a maximum temperature of above 22 for the month.

As shown in the table above, each of the variables has a very low p-value ($p < 0.05$) and therefore are deemed to be statistically significant at the 99% level. The results provide strong evidence that the directional relationships between each factor and the overall burst rate hold, e.g. the positive co-efficient on 'Min Air Temp below -3 ºC' means that if this increases, so does the burst mains rate. The R-square value was high and as such a large proportion of the variation in burst rates is explainable by the weather variations.

This relationship is evidenced further in the seasonality of our performance. Figure 2 shows average performance and standard deviation of normalised monthly burst performance since 2007 (in bursts per 1,000 km). It shows that performance deteriorates during winter months and standard deviation increases. This implies a strong impact of variable winter weather conditions on performance outcomes in a given year.

Figure 2: Actual burst main rates and standard deviations by month since 2007



Source: Affinity Water analysis

Ofwat's approach in the DD takes the average of our best three years of performance from the previous ten. It assumes that it is within management control to repeatedly deliver this level of performance. The findings from the regression analysis show that there is a high degree of variability in burst mains performance due to weather conditions outside of our control. In effect, the DD PC target assumes the

[2] Min Air Temperature below -3ºC calculated as the number of days below -3ºC divided by the total number of days in the month. The same approach is taken for Max Air Temp above 22ºC.

most favourable (mild) weather as the sustained operating environment. Recent records in weather events and temperatures show that this is not a realistic assumption. Furthermore, the conditions are out of our control. The methodology used in the DD is not a statistically robust or representative means to set a target and needs to be changed.

3.5.2 Influence of our catchment's unique geology

We also recognise that our soil and ground geology puts us in a unique position when compared to other companies, which do not have to deal with the impact of shrink swell and soil corrosivity caused by the diverse geology of our operation area. A large part of our central area is covered by large clay groups to the north and west of London, which border the chalk escarpments of the Chiltern Hills and the Thames basin to the south and east. The impact that soil fractures can have on our network is well understood and puts us at a higher risk of bursts, particularly during drier periods, when soil fractures can cause greater damage on the network.

We have approximately 40% of our network located in high shrink swell soils and approximately 25% in London Clays. London Clay is unique in the UK due to its combination of high corrosivity and extreme ground movement potential. About 65% of mains are ferrous and corrosion compromises their structural integrity. When combined with longitudinal and vertical stresses induced by ground movement (i.e. in high shrink swell environments), then failure of the main ensues. London Clays are highly corrosive and leaves the mains vulnerable to ground movement.

Long, hot, dry summers and increasing soil moisture deficit causes soil volumes to shrink, the London Clays being more prone to this behaviour than other clays. The reduction in soil volume induces stresses in the pipe wall causing failure. In summer of 2018 with soil moisture deficits exceeding 110 mm and recorded 200 more bursts than our long term average over the months of July and August. Most of which were in the London Clay areas. We would have expected significantly more bursts later that Autumn if the long dry period was followed by a very wet period as experienced in 2003.

Our network is also exposed to a significant level of risk during winter periods. Bursts data from across the UK indicate an increase in burst numbers during the winter period for cast iron pipes. The winter increase in burst rate has been found to be mainly due to small diameter grey iron mains with transverse fractures This indicates that longitudinal forces are the source of the failure, which could be caused by contraction of cast iron, or external loading. Ground movement (swelling) will generate bending stresses - which are added to those produced by thermal contraction/expansion forces - resulting in a high axial stresses leading mainly to circumferential cracking. Rigid/brittle UPVC pipes are also susceptible to this failure. In January 2017 we recorded 704 bursts which is double the usual long term average for any January months (370 bursts on average). We had a similar episode in December 2010 where we recorded 706 bursts during an exceptionally cold winter. 87% of bursts occurred on cast iron pipes which make up c.55% of our network.

3.6 Setting an evidence-based and ambitious PC target

To set a PC target that is evidence-based and ambitious, we carried out Monte Carlo simulation analysis based on historic data. This was then adjusted to reflect our historic performance over different durations. We present 3 scenarios along with an analysis of our historic performance over the past 10 years (AMP5 and AMP6).

Each scenario makes use of historic data from a different period to offset the Monte Carlo output distribution. This approach allows the degree of extreme weather to be accounted for across individual scenarios and generate a range of P50 estimates for bursts.

The results from each of these scenarios, the analysis of our historic performance over the last 10 years, and with how they have been used to inform our final PC target are detailed below.

Table 7: Summary of analysis

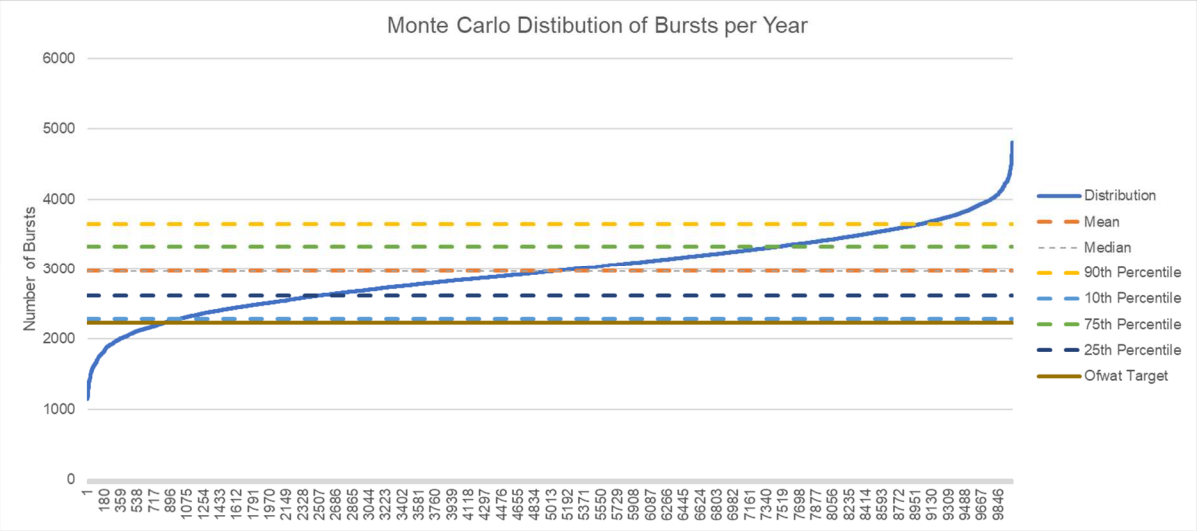
Scenario	Description
Scenario 1	Simulation adjusted to reflect historic data from 2007. This accounts for the extreme weather conditions experienced in AMP4.
Scenario 2	Simulation adjusted to reflect average performance of the previous three years (16/17, 17/18, and 18/19).
Scenario 3	Simulation adjusted to reflect average performance in the AMP6 period.
Distribution of our AMP5 and AMP6 performance	Distribution of annual performance over the last 10 years.

Source: Affinity Water analysis

3.6.1 Scenario 1

This scenario makes use of historic data from 2007 onwards to account for extreme weather conditions by using a larger data set that captures extreme weather conditions experienced. Our analysis finds a mean value of 177.4 bursts per 1,000km of mains. Furthermore, the P90 performance (90th percentile) is above Ofwat's DD PC target highlighting issues with deliverability. The P10 performance (10th percentile) is also above our previously proposed collar rate.

Figure 3: Monte Carlo based on historic performance since 2007

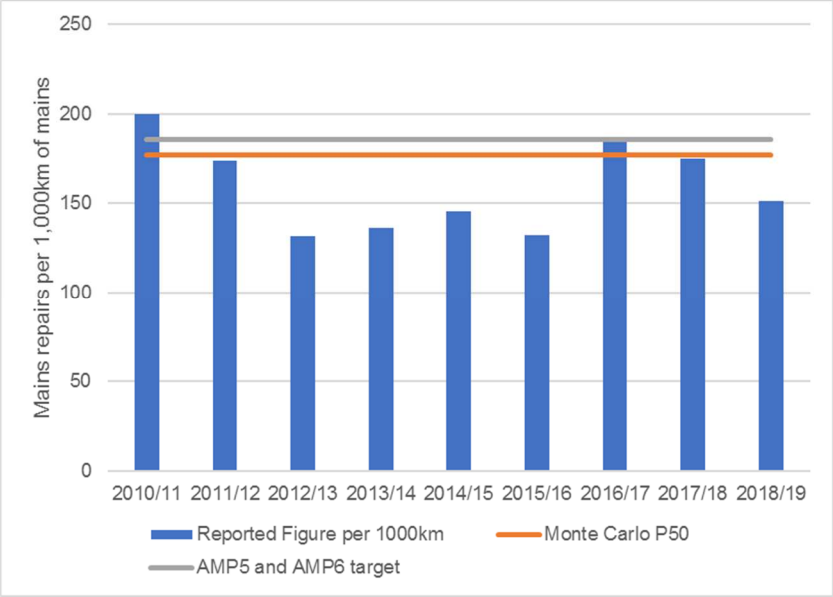


Statistic	Bursts per 1,000km of mains
Mean	177.4
Median	177.1
10th Percentile	217.9
90th Percentile	136.8
Std Dev	31.7
Ofwat DD P50	133.5

Source: RPS and Affinity Water analysis

This P50 figure is below the PC target performance levels for AMP5 and AMP6 which shows the impact weather conditions have on our bursts performance as shown in Figure 4. This also would represent a deterioration from the actual performance levels seen over AMP6.

Figure 4: Burst mains historic performance comparison



Source: Affinity Water and RPS analysis

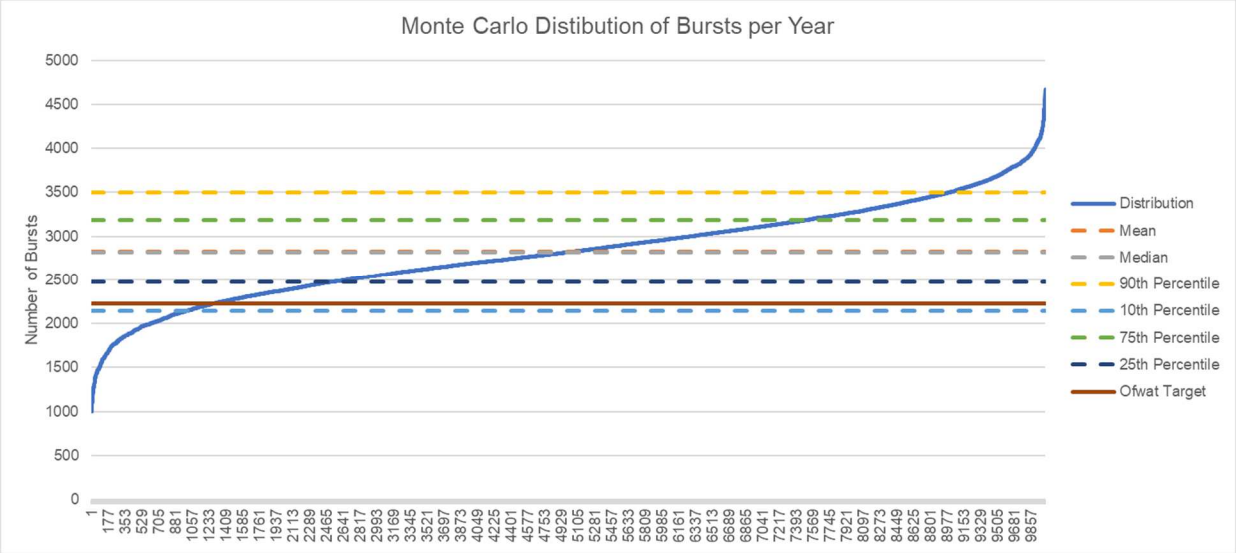
Whilst taking historic data from 2007 gives a better account of weather extremes, we consider that our targeted mains replacement programme has been an improving factor on performance over this period. This is taken into consideration in scenarios 2 and 3, which adjust Monte Carlo outputs in line with averages of our more recent performance and asset base.

3.6.2 Scenario 2

In order to reflect our more recent performance, we have adjusted outputs from the Monte Carlo analysis in Scenario 1, offsetting the mean to the average of our previous three years (16/17, 17/18 and 18/19). Adjusting to our more recent performance allows the analysis to take into account the influence of our targeted mains replacement programme. The results from this are shown in the diagram below.

Offsetting performance to the three-year average of 169 burst mains per 1,000km result in a P90 that is below that of the DD target, with the P10 notably still above our previously proposed collar.

Figure 5: Monte Carlo based on three-year historic performance



Statistic	Bursts per 1,000km
Mean	168.8
Median	168.5
10th Percentile	209.3
90th Percentile	128.2
Std Dev	31.7
Ofwat DD P50	133.5

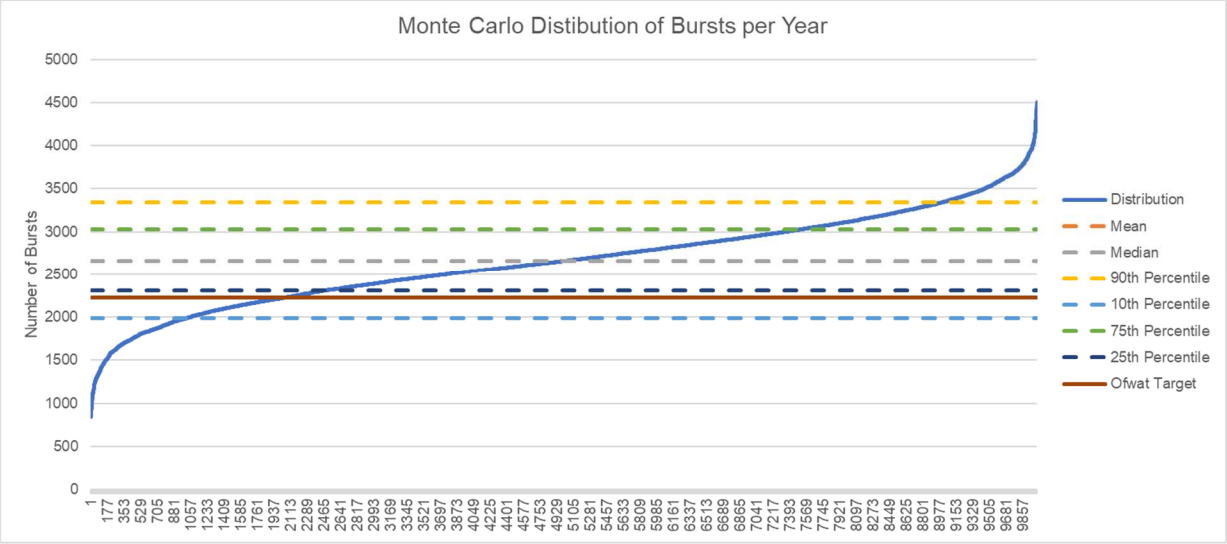
Source: Affinity Water and RPS analysis

3.6.3 Scenario 3

A similar exercise was taken, adjusting the mean of the Monte Carlo outputs to the average performance in AMP6. The results from this are shown in the diagram below.

By offsetting mean performance to the AMP6 average, the P90 is significantly below the DD performance level of 133.5 bursts per 1,000km. However, DD target is still below the 75th percentile, meaning that even without accounting for the extreme weather years seen prior to AMP6, the DD performance level would not be achievable in more than once in four years. The P10 is aligned with our previously proposed collar.

Figure 6: Monte Carlo based on AMP6 historic performance



Statistic	Bursts per 1,000km
Mean	159.2
Median	159.0
10th Percentile	199.8
90th Percentile	118.7
Std Dev	31.7
Ofwat DD P50	133.5

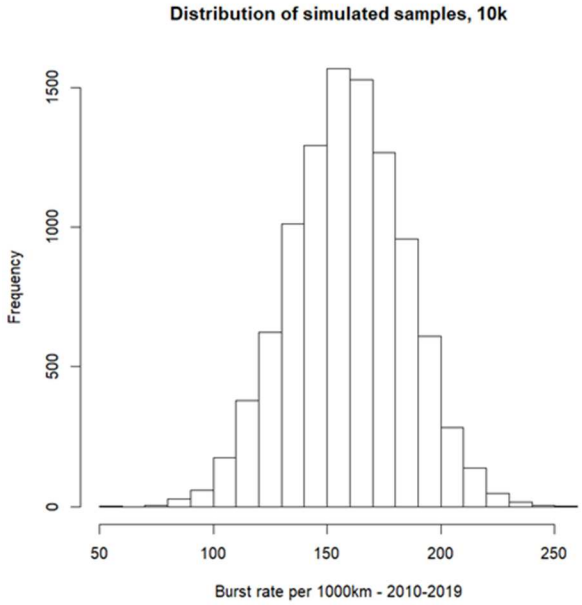
Source: Affinity Water and RPS analysis

3.6.4 Distribution of annual performance over the last 9 years

To ensure no deterioration from performance over the last 9 years, we also analysed the distribution of actual annual performance over the AMP5 and AMP6 period (9 years of data from April 2010 up to July 2019). This results in P50 performance at 159.1 with P10 and P90 values tighter than Scenario 3.

It is worth noting that due to the mean and standard deviation of our burst performance over the last 9 years, the distribution of simulated data is more clustered around the mean than previous simulations – this is strengthened by the fact that we have experienced our best years on record in the last 9 years, thereby reducing the overall variance in annual burst performance

Figure 7: Distribution of AMP5 & AMP6 annual performance



Statistic	Bursts per 1,000km
Median	159.1
90th Percentile	126.2
10th Percentile	191.5

Source: Affinity Water and RPS analysis

3.6.5 Setting a challenging PC target

Table 8: Summary of P50 from analyses

Scenario	P50
Scenario 1	177.1
Scenario 2	168.5
Scenario 3	159.0
Distribution of our AMP5 and AMP6 performance	159.1
Ofwat DD P50 target	133.5

Source: Affinity Water analysis

To reflect our ambition to set a stretching PC target, we set our target for burst mains at the lower end of the P50 range generated from the analyses i.e. 159.1 mains repairs per 1,000km of mains. This target balances our ambition to deliver improvements to our recent historic performance with the understanding of correlation with weather conditions.

Even when taking optimistic scenarios, which do not account for weather extremes because they exclude the extreme weather, we experienced in AMP4, our analysis demonstrates that the DD target (the average of the best three years over the last ten) is not a consistently deliverable performance level.

3.7 Industry evidence of external factors

There is additional information from the industry demonstrating the need to take into account the role of external factors on burst mains performance.

In their report for Wessex Water on the relationship between ALC and bursts, RPS Asset Management noted the effect that weather has on bursts. They state that 'some of the variability between the best and

worst scenarios accounts for the impact of weather (dry summers and/or extreme winters) which can have a significant impact on any one year's data, which is illustrated by the variability of the historical data[3]'.

In their IAP response, Yorkshire Water states that the external challenges in managing bursts come from the high proportion of cast iron pipes in their system, which are susceptible to failure as a result of extreme weather events; the continuing effects of climatic change have also made such extreme events more likely. Cast iron pipes have almost no resistance to stretching (impact and shock) which is caused by ground movement. When cast iron pipes are laid in soil with a high proportion of clay (which is the case for Yorkshire Water), temperature changes will result in '*extreme ground shrinkage and heave when subjected to high and low soil moisture content*'. They note that this relationship between extreme weather and burst rates '*has been demonstrated recently during the 'Beast from the East', which was followed by an exceptionally hot and dry summer.*' They argue that this is why any modelled comparison of companies in relation to asset health performance should accommodate for the difference in the asset stock in the underpinning assessment.[4]

We agree with Yorkshire Water's statement that comparison of performance across companies should take account of the geography and underlying asset stock. We set out evidence demonstrating the impact of geology on our performance in section 3.5.2 above. Our internal analysis has shown that 42% of our mains are in areas of high shrink-swell and we therefore face similar challenges. Just over half of the mains within these areas are cast iron. Hence 21.6% of our network at high risk of bursts in response to weather changes due to the relationship between weather, shrink-swell, and cast iron pipes. This is in addition to the wider impact of weather conditions that affect our network even outside of high shrink-swell areas.

Anglian Water noted in their original business plan submission that 'Weather conditions, particularly freezing temperatures which lead to ground movements, mean that there can be volatility in performance' for bursts[5]'.

A 2013 cross-company study by UKWIR also found strong evidence of the effect of weather on burst rates. Through their analysis, UKWIR found '*The key model weather parameters affecting the bursts and leakage are extremes of temperature range (warm or cold) … the related mechanism for both warm and cold conditions appears to be the stresses induced by pipe expansion and contraction.*'[6]

This demonstrates the existence of industry consensus on the relationship between bursts and factors out of management control, and that this should be taken into account when setting the PC targets.

[3] RPS Environmental Management for Wessex Water, '*Impact of Leakage Reduction on Burst Rate*', 28 February 2019, page 31.

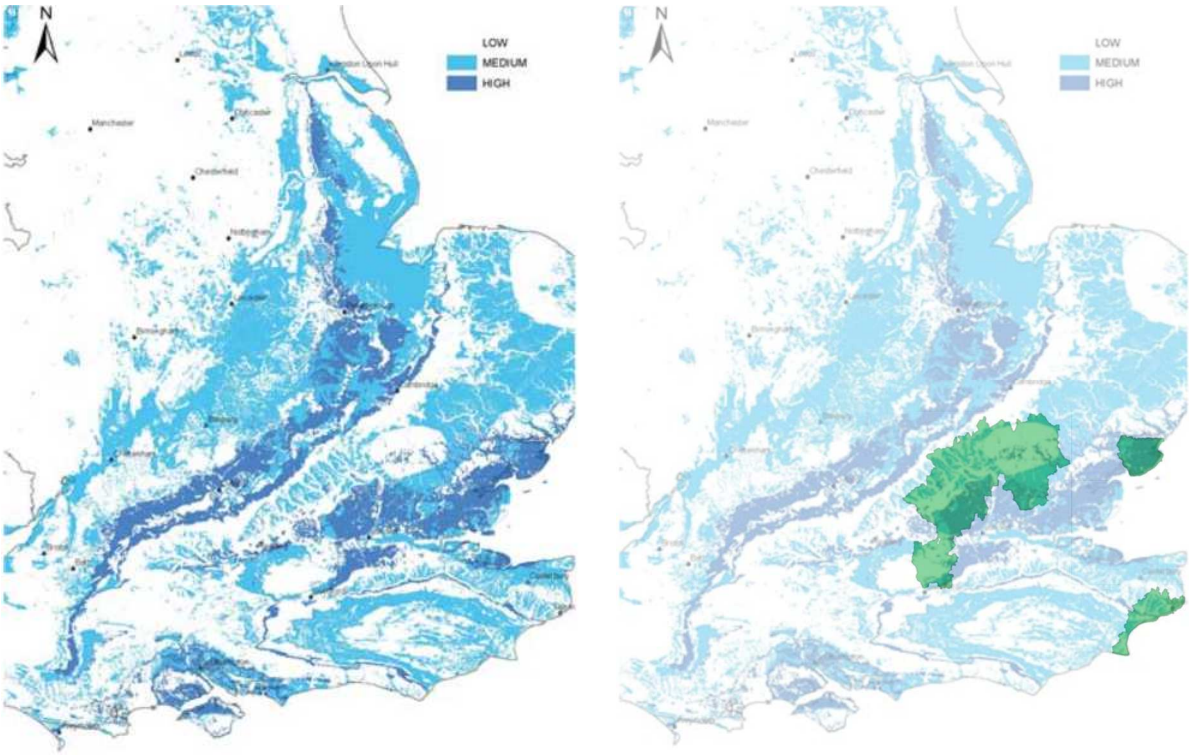
[4] Yorkshire Water, 'IAP response YKY.OC.A1-A52: Delivering outcomes for customers', pages 24-25.

[5] Anglian Water, '*Our Plan 2020-25*', page 223.

[6] UKWIR, 'Effect of Weather on Leakage and Bursts – UKWIR 13/WM/08/50', 2013.

The maps below set out the level of shrink-swell risk within our region.

Figure 8: Map of shrink-swell risk [7]



Source: Affinity Water analysis

3.8 Striking the right balance between ambition and risk

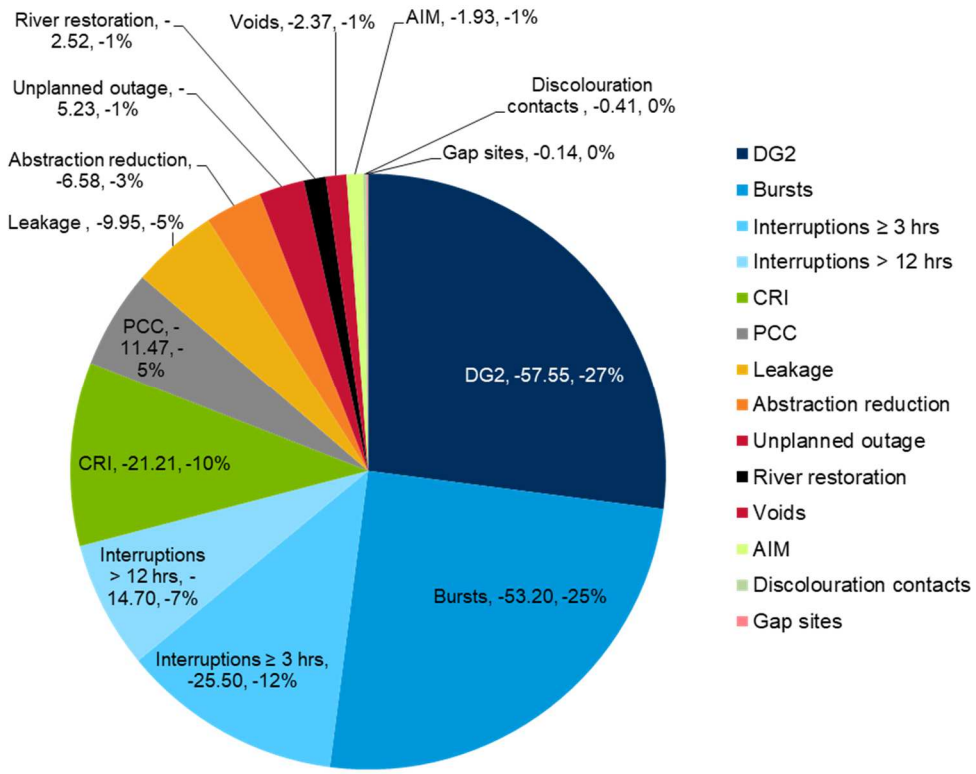
3.8.1 Analysis of the draft determination rates on financial risk

The introduction of a financial underperformance against this PC is highly material. It places a disproportionate level of RoRE risk on a single issue on our network (bursts).

The pie chart below shows our assessment of the P10 exposure for each of our PCs. 25% of our RoRE downside relates to bursts. This is a disproportionately large risk to be associated with a single aspect of our service where we face real service risks, some of which are beyond our management control.

[7] British geological survey, Shrink-swell hazard potential mapping

Figure 9: 5-year P10 exposure by PC (DD rates and assessment of P10)



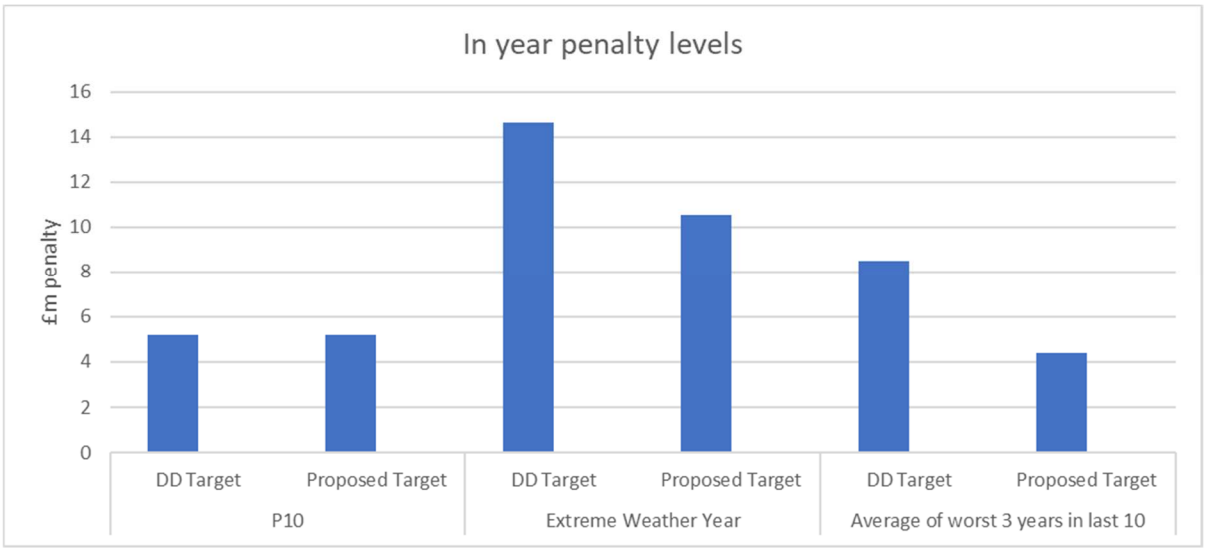
Source: Affinity Water analysis and Ofwat DD

This is particularly important when we consider our PC in the round. We have set a PC target at the lowest bound of the P50 range generated by our analyses. Specifically, this target does not take account of the full range of extreme events that we have experienced historically and of the impact these events have on bursts performance.

With the noted correlation between the PC and external factors, we will face uncertainty over the AMP7 period that lies outside of our management control. Even with strong underlying asset health, these factors will impact performance.

In this context, an increased underperformance rate with no collar will result in disproportionate annual penalties, over £10m, due to factors beyond the company's control as shown in Figure 10 below. This will be compounded by the cost of response and recovery and additional repairs needed in a given year.

Figure 10: Burst Mains draft determination underperformance rate implications

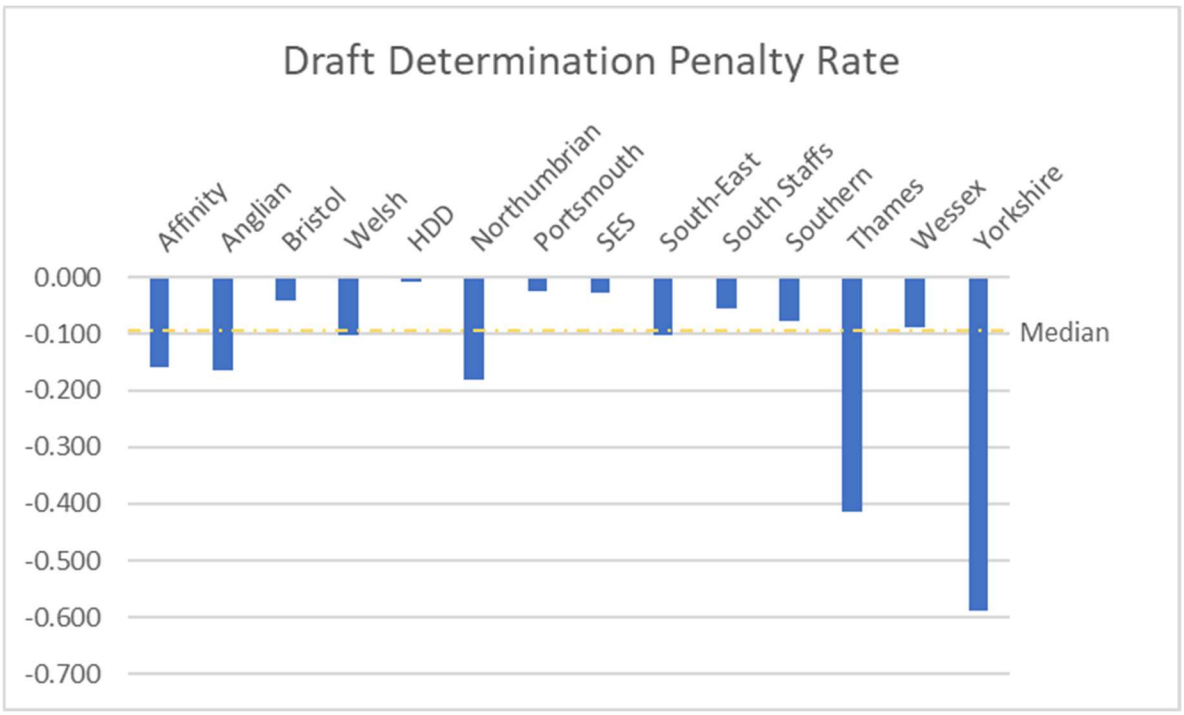


The extreme weather scenario is referenced to the worst performance since 2007.

Source: Affinity Water analysis

3.8.2 Setting a more proportionate ODI rate and collar

Figure 11: Burst mains underperformance rate industry comparison



Source: Affinity Water analysis

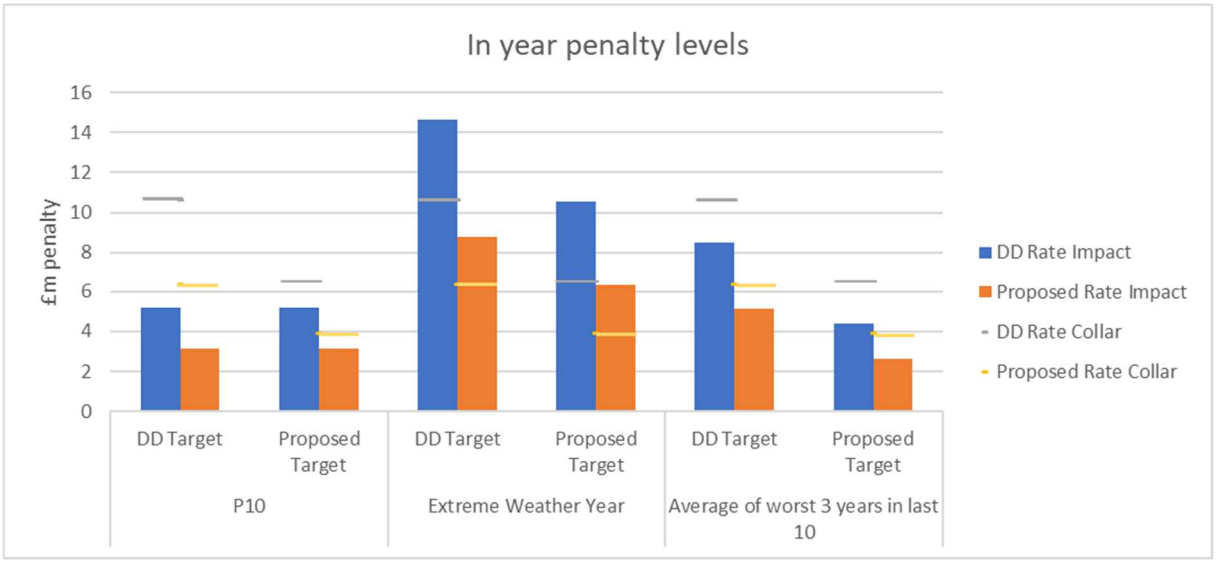
For the common asset health PCs, we previously used the average industry outperformance and underperformance rates from Ofwat, 'Technical Appendix 1: Delivering Outcomes for Customers', as detailed in our response to AFW.OC.A4.

We have repeated the analysis with DD rates. Given the outliers within this data set (Yorkshire Water and Thames Water) we have used the median to calculate a proposed value for our underperformance rate in

line with standard statistical practice and have found that the median value of these rates is -£0.095m. We restate the underperformance incentive rate of -£0.096 which is in line with this median value and therefore the industry precedent, and a collar of 200 repairs per 1,000km of mains.

We have purposely set this collar below our P10 value and the average worst performance of the last three years, and therefore the collar would only limit our underperformance payments in extreme weather scenarios. In the event of a P10 underperformance, we would still be subject to the full £3.1m penalty which provides us with an incentive to meet our PC targets.

Figure 12: Mains repairs DD and DD response underperformance rate implications



Source: Affinity Water analysis

3.9 The impact of active leakage control

In our IAP response, we present evidence that increased ALC impacts the number of mains repairs. In its DD, Ofwat challenged the impact of this relationship on forecast repair rates. In setting a new PC target, we have chosen not to make an upward adjustment to account for this relationship in the regression and Monte Carlo analysis.

In addition to mains replacement, we will use a toolbox of approaches including:

- Using technology such as sound logging to enable more rapid identification of leaks.
- Increasing our pro-active customer supply pipe leakage detect and repair – utilising our increasing metering penetration including automatic meter reading (AMR) meters.
- Carrying out more pressure management to complete our already extensive pressure management programme.
- Continuing DMA optimisation and a step test programme of work that divides existing DMAs into smaller areas.
- Increasing DMA coverage by 50,000 properties, attaining the coverage requirement for the new leakage convergence reporting needs. These additional measured leakage areas will continue to increase certainty around the water balance.

We intend to maximise the opportunity that these additional solutions present during AMP7 to ensure the most cost-effective overall approach. We note supporting evidence on ALC presented by Severn Trent

Water[8], United Utilities[9], South East Water[10], Wessex Water[11], Yorkshire Water[12] and Anglian Water[13]. We believe that a cost-effective approach to delivering leakage reduction will have an impact upon bursts.

In summary, our mains repairs performance level represents a very ambitious asset health performance target considering the wider programme of work on leakage reduction. However, we do not make an adjustment to our performance target on these grounds to respond to the ambition set by Ofwat.

3.10 Conclusion

Our analyses shows that the DD target of 133.5 mains repairs per 1,000km of mains is not achievable on a consistent basis given the significant impact of factors outside of our management control. We already operate a calm network and have extensive pressure management across our operating area, minimising pressure related bursts. In our DD response we set a revised performance target at the most challenging level deliverable of 159.1 mains repairs per 1,000km of mains.

The DD underperformance rate and absence of a collar will result in a disproportionate penalty in the event of extreme weather events which are outside the company's control. We restate our underperformance incentive rate and a collar which in combination with our more challenging PC target, deliver the appropriate balance between incentivising more ambitious performance and disproportionate risk. We note that our incentive rate is aligned with the industry median and therefore is representative of customer valuation across the wider industry.

In setting our collar rate below both the P10 value and average of our three worst years in the last 10 years, the collar will only come into force in extreme weather events, mitigating disproportionate financial exposure without eroding the incentive to meet our new PC target.

Accordingly, we set out:

- A PC level of 159.1 burst main repairs per 1,000km of mains.
- An underperformance rate of -£0.096m per mains repair per 1,000km.
- A collar at 200 mains repairs per 1,000km.

[8] Severn Trent, '*Appendix 2: Delivering outcomes for customers*', May 2019, page18.

[9] United Utilities, '*Representations: Outcomes*', May 2019, pages 4 and 19-20.

[10] South East Water, 'South East Water IAP Response –Delivering outcomes for customers', 1st April 2019, pages 49-51.

[11] Wessex Water, '*Our response to Ofwat's initial assessment of plans*', April 2019, pages 48-49.

[12] Yorkshire Water, 'IAP response YKY.OC.A1-A52: Delivering outcomes for customers', page 29.

[13] Anglian Water, '*Our Plan 2020-25*', page 223.

4 Representation: AFW.OC.C8 – Supply interruptions over 12 hours

4.1 Purpose of this section

Table 9: Ofwat actions addressed in this section

Action reference	Intervention area(s)
AFW.OC.C8	Supply interruptions over 12 hours PC definition Supper interruptions over 12 hours PC type Supply interruptions over 12 hours ODI rate Supply interruptions over 12 hours Collar

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customer actions and interventions

This section contains our DD response on supply interruptions over 12 hours.

We introduced supply interruptions >12 hours as a resilience measure in our response to the IAP. We proposed that this measure should have a non-financial ODI.

In the DD Ofwat intervened as follows[14]:

- The adoption of a PC as defined by Northumbrian Water.
- Change to the ODI from reputational to financial – outperformance and underperformance.
- Reward and underperformance rates set to the same levels as we used for the 2015-20 period.
- Collar of 775 per year.
- Timing changed to in period and revenue based.

4.2 Summary of response

We note Ofwat's revised PC definition and make the following response:

- The definition is onerous because of operational conditions in north London and South East England, where there is more major infrastructure and greater road congestion. These factors make it more difficult to reach a burst quickly and mean that we are frequently denied access to our assets. We cannot fully mitigate these risks.
- The impact of introducing a financial ODI is disproportionate. It means that 20% of our P10 ODI exposure relates to supply interruptions, and 45% relates to bursts (because supply interruptions are caused by bursts). This is a disproportionately large risk to be associated with a single aspect of our service where we face risks which are beyond our management control.
- Ofwat's interventions to avoid a disproportionate impact on our leakage RoRE exposure are not consistent with their approach to this ODI.
- There is direct overlap with guaranteed standards scheme (GSS) payments and risk of underperformance penalties in mains repairs.

In conclusion, the ODI type should revert to non-financial.

[14] Source: Ofwat Draft determination. Affinity Water – Delivering outcomes for customers actions and interventions. AFW.OC.C8, pp27-28

Ofwat's draft determination along with our represented new PC on 'supply interruptions over 12 hours' are set out in the tables below.

Draft determination

Table 10: Draft determination on supply interruptions over 12 hours

	Unit	2020/21	2021/22	2022/23	2023/24	2024/25
PC		320	320	320	320	320
ODI underperformance rate	£m/unit	-0.00646	-0.00646	-0.00646	-0.00646	-0.00646
ODI Penalty collar		755	755	755	755	755
ODI outperformance rate	£m/unit	0.00116	0.00116	0.00116	0.00116	0.00116

Source: Ofwat draft determination

DD response

Table 11: Our DD response on supply interruptions over 12 hours

	Unit	2020/21	2021/22	2022/23	2023/24	2024/25
PC		320	320	320	320	320
ODI underperformance rate	£m/unit	N/A	N/A	N/A`	N/A	N/A
ODI collar		N/A	N/A	N/A	N/A	N/A
ODI outperformance rate	£m/unit	N/A	N/A	N/A	N/A	N/A

Source: Affinity Water analysis

4.3 Structure of this section

- Section 4.4: Our response to the definition, setting out what we believe is different between us and Northumbrian Water.
- Section 4.6: Materiality of issue in support of the fact that a financial ODI is disproportionate.
- We summarise our position in Section 4.7.

Appendix A of this document contains further analysis into the collar, rate and level of stretch relating to this PC that is supplemental to our main representation.

4.4 Performance commitment definition

We note the revised definition and set out our response below.

We accept and support that resilience should involve resilience to all events, whether they are in our control or not. We are committed to maintaining and improving resilience on our network through better management of the larger supply interruptions. It is, nonetheless, a more onerous definition.

4.5 Understanding future performance

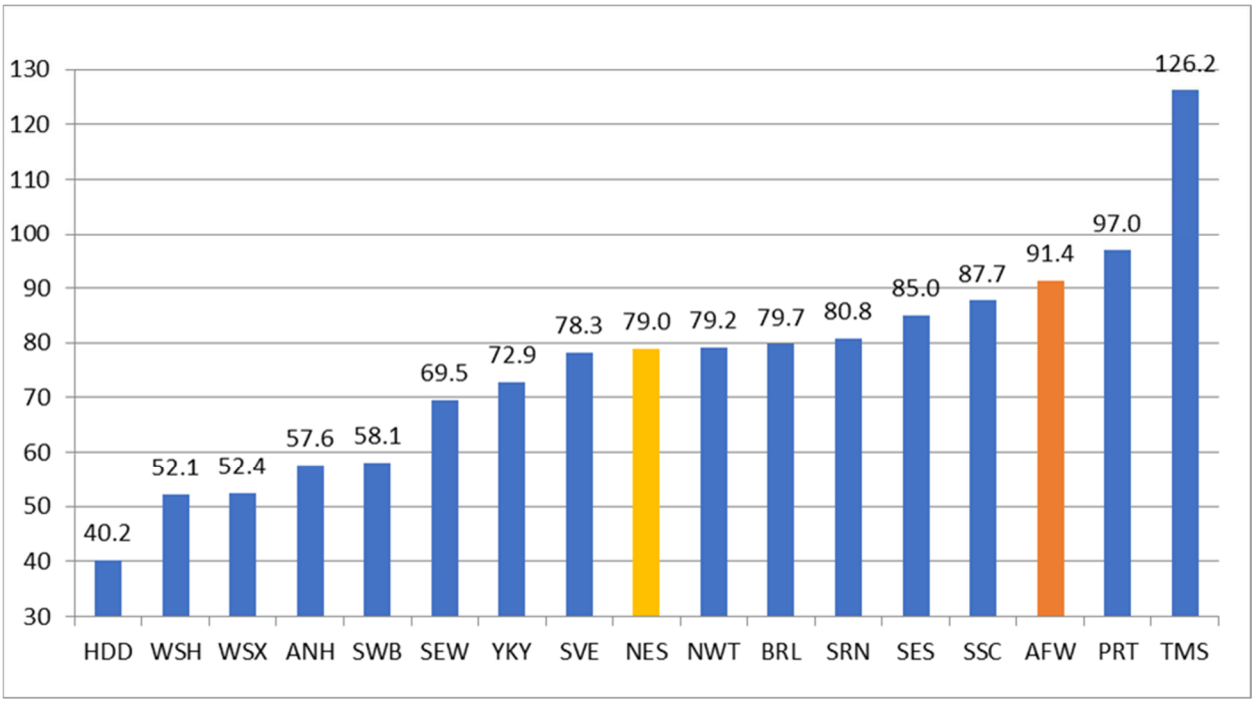
Only Affinity Water and Northumbrian Water have a PC for interruptions over 12 hours, and therefore the comparisons we make in this section (section 4.4) are between Affinity Water and Northumbrian Water.

We note that the risks to Affinity Water from a single event will be significantly higher than for Northumbrian Water. This is because we have a greater property density and a higher proportion of infrastructure (e.g. including very busy roads) in our operating area.

The impact of higher property density

Property density in our area is another factor that has an impact on our number of properties exposed to interruptions over 12 hours. Our operating area is predominantly urban, which means that our mains serve denser clusters of customers. Therefore the average number of customers impacted per event is larger than a company with a more rural customer base. The chart below shows that our property density is the third highest in the industry, whereas Northumbrian Water is ninth.

Figure 13: Industry number of properties per km of mains



Source: Affinity Water analysis, water company APR data

The impact of a higher proportion of busy roads

As well as a higher property density, we have a higher proportion of very busy roads in our area, which can mean we have difficulty accessing our assets. This includes both time for our field staff to get to the site of a burst and difficulty accessing bursts when they are located on congested roads.

Our operating area spans the South East of England, which has the highest vehicle miles of any region in England at 20% of the total for England[15]. The North East (i.e. Northumbrian Water's operating region) by contrast has 4% of the total for England, and the East of England 14% (representing Essex and Suffolk's operating region).

There are regular supply interruptions in our area where congestion on a busy road stops us from restoring supplies. For example, one event on the side of the A3 (near the M25 junction) during 2018/19 impacted 105 properties for 16.8 hours (adding 5.21s to our customer minutes lost). We estimate that the

[15] Source: Affinity Water analysis of DfT Table, TRA0103_(2018)

burst started at 03:30am, and our first 'no water' call came through at 07:42am. The police and Highways England denied us access for c.14.5 hours due to not being permitted to commence traffic management until the traffic volume was below 60 vehicles per 3 minutes. We were able to reconnect 53 customers in under 12 hours by rezoning (mitigating the impact of the burst).

Our analysis of the DfT average delay on locally managed 'A' roads data for 2018[16] shows that we have a significant number of traffic hotspots on local authority 'A' roads in our operating area, especially in north London. Local authority areas where congestion is more than double the number reported for England include four of the London Boroughs we serve (Barnet, Brent, Ealing and Enfield). Luton, Slough and the remaining two London Boroughs are above the average delay time for England as a whole. The DfT data on average speed on local 'A' roads[17] shows a similar picture.

The South East of England contains more major infrastructure than Northumbrian Water's operating area (which is based in northeast England and the east of England) and our mains are often laid along or over infrastructure such as roads, railways and gas mains. This can lead to longer supply interruptions due to access issues. For example, one particularly complex AMP6 burst on a trunk main next to a major road and a gas main increased our customer minutes lost by 01:42. In this case the gas main needed to be assessed before we could access the burst.

The maps in Figure 14 and Figure 15 show visually that the rail network, strategic road network and the road network more widely are significantly denser in our operating area than in the north east of England. This means in practice that we are often unable to access a burst quickly due to restrictions placed on us by other infrastructure owners.

The table below shows the road lengths per square kilometre compared between Affinity Water and Northumbrian Water. Affinity Water has 4.08 kilometres of road per square kilometre of company area, whereas Northumbrian Water has 2.74 kilometres of road per square kilometre.

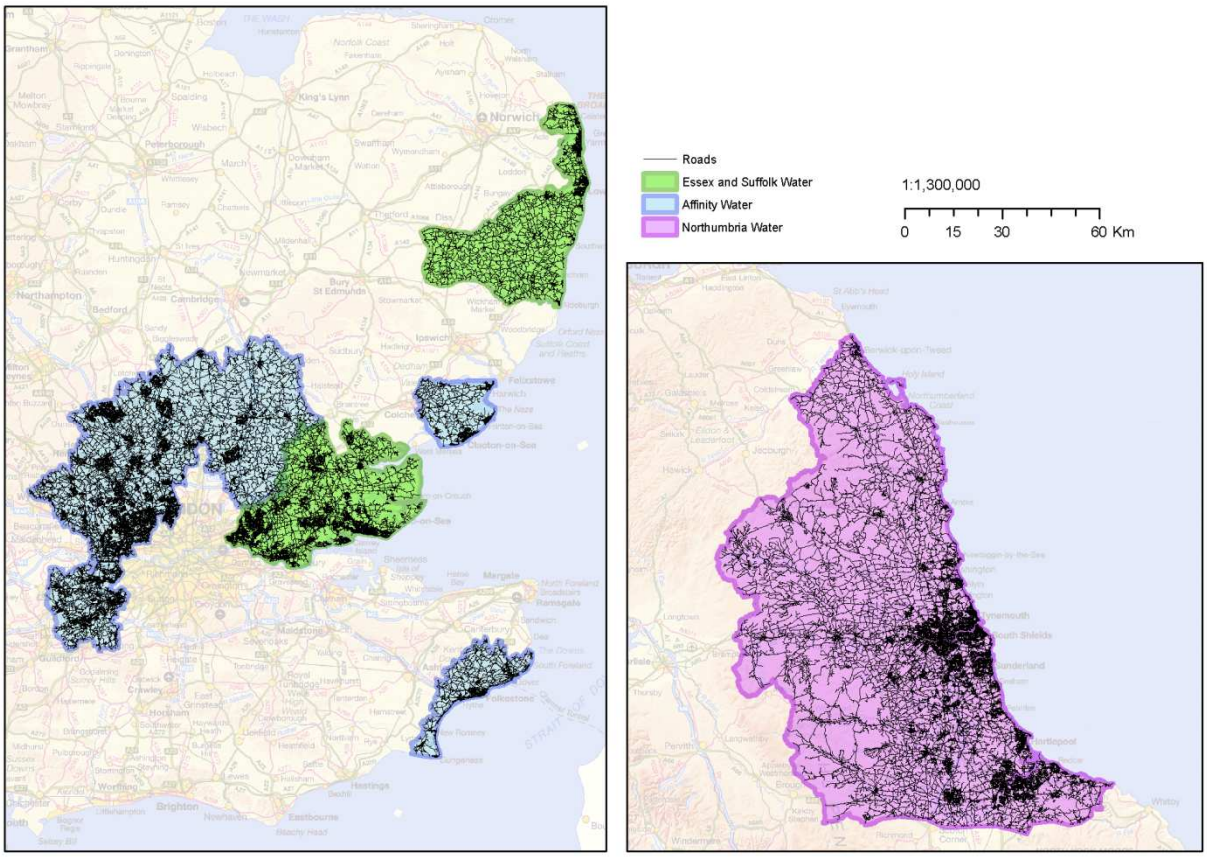
Table 12: Our DD response on supply interruptions over 12 hours

	Northumbrian Water – Northumbrian area	Northumbrian Water – Essex & Suffolk area	Northumbrian Water – total	Affinity Water
Approximate road length (km, to nearest 10 km)	22,290	9,770	32,060	18,350
Approximate company area (km^2)	8,900	2,800	11,700	4,500
Kilometres of road per km^2 company area	**2.50**	**3.49**	**2.74**	**4.08**

Source: Affinity Water analysis of Ordnance Survey roads open data and CACI Acorn data.

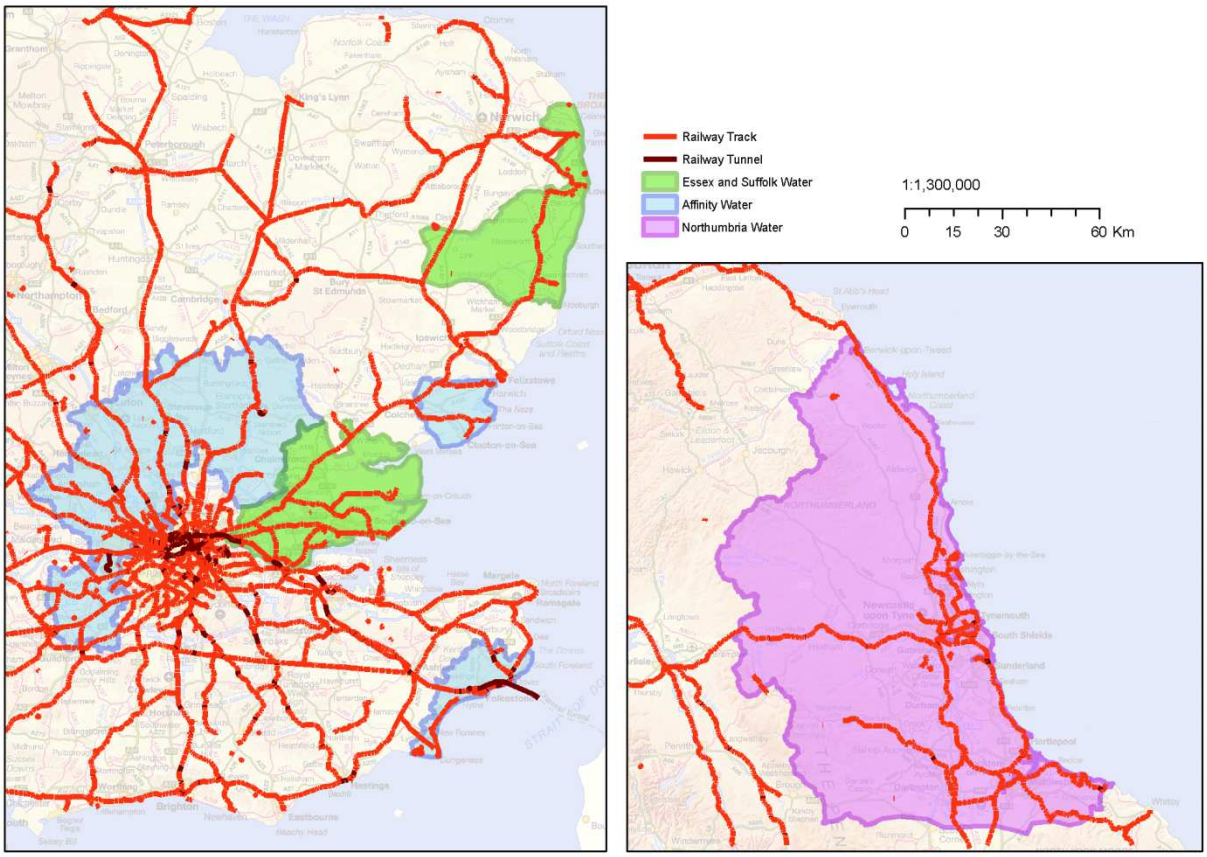
[16] Source: DfT Table CGN0502b
[17] Source: DfT Table CGN0501b

Figure 14: The UK road network is denser in the South East of England when compared with Northumbrian, Essex and Suffolk Water's operating areas (general road map on the left, strategic road network on the right)



Source: Affinity Water analysis

Figure 15: The UK rail network is denser in the South East of England when compared with Northumbrian, Essex and Suffolk Water's operating areas



Source: Affinity Water analysis

These risks lie outside of our management control

We cannot fully mitigate these additional risks. We are innovating, and continue to innovate, to mitigate interruption to the extent possible and have already started to implement changes to meet the AMP7 supply interruptions ≥3 hours targets. However, adverse weather conditions and the characteristics of our operating area set out in the previous section place limits on what we can achieve.

In our response to AFW.PD.B1 we state that 'we are further changing our stand-by model, introducing software in to the control room to detect loss of supplies before customers notify us and widening the capability of our restoration teams through the use of our own water tanker. We will continue to practise and train in live situations to improve our skills and therefore performance when called upon.'

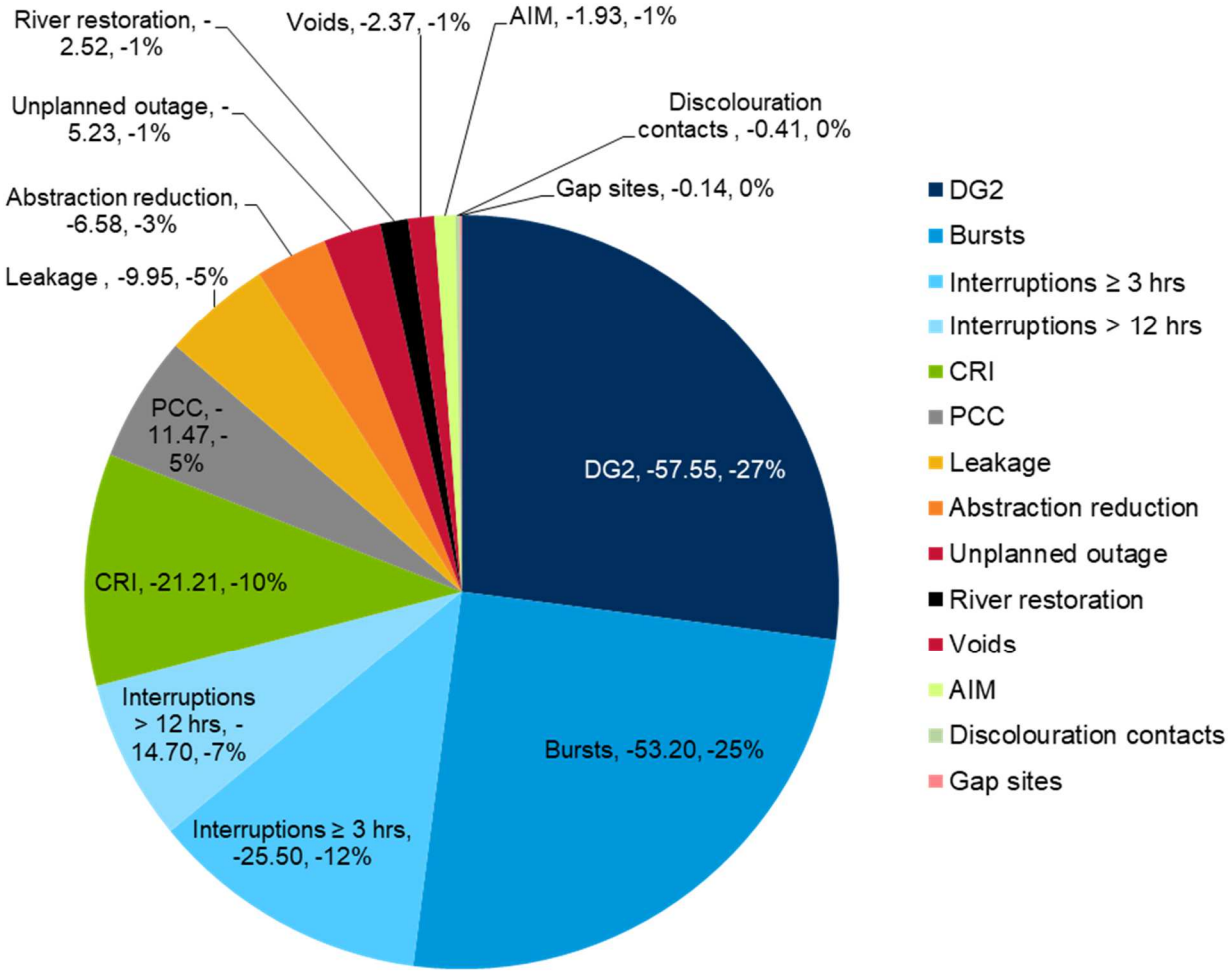
In the example set out in above, where Highways England denied us access to a burst main, these innovations may have helped us given that the burst occurred early in the morning when the road is likely to have been less busy. If we could have got to the site before the morning rush hour, we would have had more chance of fixing it in under 12 hours. However, for bursts that start during busy periods we would still not be granted access and would therefore not be able to mitigate.

In the example discussed above, which involved a gas main that needed to be assessed, we would not have been able to access the burst under any circumstances until the gas main was assessed, and would not have been able to mitigate this, or a similar event.

4.6 Financial materiality of the DD intervention

The introduction of a financial underperformance ODI against this PC is highly material. It places a disproportionate level of RoRE risk on a single issue on our network (interruptions and bursts). The pie chart below shows our assessment of the P10 exposure for each of our PCs. Supply interruptions ≥3 hours makes up 12% of our total P10 exposure and placing a financial incentive on interruptions over 12 hours is a further 7% of our total RoRE downside. Hence, overall, around a fifth of our RoRE downside relates to interruptions to supply. Supply interruptions are caused by bursts. A further 25% of our RoRE downside relates to bursts (based on the DD, as shown in Figure 17[18]). This means 45% of our ODI exposure is linked to the same issue. This is a disproportionately large risk to be associated with a single aspect of our service where we face significant service risks, some of which are beyond our management control.

Figure 16: 5-year P10 exposure by PC - Draft determination rates and assessment of P10 (£m)



Source: Affinity Water analysis

For the reasons presented in the previous section, we run a higher risk in relation to interruptions over 12 hours than larger companies, which we can only partially mitigate. Our risk is greater than companies that are more rural due to our high urban population density. In events where we are denied access due to traffic we would not be able to mitigate. For example, we could not lay an overland main to restore supply

[18] DG2 also receives a disproportionately high proportion of our overall exposure. We are also representing on DG2 (see Section 5).

because it would need to come from the same pipe that we were not allowed to access. Weather is a further generic factor that increases the number of supply interruptions and potentially their duration given it can take longer to access our assets during adverse weather. Again, we cannot fully mitigate for this.

Our historic performance demonstrates that we run a high risk of failure against this PC. Although we have significantly improved our management of supply interruptions[19], and outperformed our target in 2018/19, the weather was relatively benign in that year. In a cold winter (e.g. 2017/18), we would run a significant risk of failing the target notwithstanding the management focus and innovation we are bringing to managing supply interruptions.

Comparing an Ofwat intervention on another PC with the situation for interruptions over 12 hours: Ofwat's interventions on leakage reduce our P10 underperformance level by £0.61m (on a 1 year basis). In its assessment and rationale for AFW.OC.A13, Ofwat stated that the represented plan financial exposure resulting from the leakage PC would be 'disproportionate'. We estimate that the additional financial exposure for supply interruptions over 12 hours is £2.94m at the P10 level (on a 1 year basis). This is substantially more than the £0.61m for leakage. Given that Ofwat considered the lower adjustment (to reduce the penalty) for leakage to be material, we question the consistency of applying a much larger intervention (significantly increasing penalty exposure) on supply interruptions; and would further question why Ofwat considers that the intervention on supply interruptions to be proportionate.

Overlap with GSS

We are already paying a penalty through GSS if we fail to restore supply within 12 hours. Supply interruptions greater than 12 hours is one of the items included in the Water Supply and Sewerage Services (Customer Service Standards) Regulations 2008. We are committed to paying the following automatic compensation to each customer affected in the following circumstances:

- £20 per customer where the supply is interrupted or cut off in an emergency due to a leak or burst on a strategic main and is not restored within 48 hours of the company first becoming aware of the interruption or that the supply was cut off. From March 2020, the payment will increase to £30 per customer.
- £20 per customer where the supply is interrupted or cut off in an emergency for any other reason and is not restored within 12 hours of the company first becoming aware of the interruption or that the supply was cut off. From March 2020, the payment will increase to £30 per customer.
- A further £10 automatic GSS payment must be made for each full 24-hour period that the supply is interrupted or cut off. From March 2020, the payment will increase to £30 per customer, and will apply at >24 hours unplanned interruption, rather than the current >36 hours.

Hence, we will be paying at least £30 compensation per affected customer during AMP7. This is an almost complete overlap with Ofwat's proposed ODI (from March 2020 the exemption for bursts on strategic mains that run for 12-24 hours will be removed).

Overlap with burst mains

Supply interruptions are caused by burst mains. The mains repair PC has a financial ODI which also subjects us to significant financial exposure and is not subject to a collar. Our DD response on the mains repair PC is provided in section 3. Our represented repair PC target is 159.1 repairs per 1,000 km of mains. Bursts that cause >12 hour interruptions up to the 159.1 target would not be subject to double jeopardy, but bursts above this level would. Given that, in a cold winter our bursts, interruptions ≥3 hours

[19] Evidence for this is given in our September plan. Source: Affinity Water, September 2018 'Our Business Plan 2020 to 2025' pp19-21. We also provide evidence for this in our response to AFW.PD.B1, submitted on 24th May 2019

and interruptions over 12 hours would all be adversely impacted, and we would also pay GSS for all the >12 hour interruptions, we would be penalised four times for an extreme event.

Given that there is overlap with GSS payments and bursts underperformance payments, we would argue that the introduction of a penalty for this PC is disproportionate.

4.7 Conclusion

Over the long term, we need and intend to maintain and improve resilient supplies and the asset health of our network. We view the common PC exposure on supply interruptions as stretching incentive protecting our customers' interests. Performance in interruptions over 12 hours is impacted by factors outside of our control. There is also overlap with GSS and mains repairs. Hence, 45% of our ODI exposure is related to the same issue. This is disproportionate.

We are not complacent about supply interruptions. It is a key driver of customer contact, and an important issue to customers. We want to see supply interruptions incentivised in a proportionate way through the price control.

Overall, we maintain that the ODI should not be financial because it is double counting with the common PC for supply interruptions ≥3 hours, bursts and GSS; and because the proportion of our RoRE downside for supply interruptions and bursts is disproportionate.

4.8 Supporting documentation

Table 13: Evidence to support our response

Reference	Section
AFW-OD. Appendix A	Appendix A. Supply Interruptions over 12 hours

Source: Affinity Water DD response

5 Representation: AFW.OC.A30 – Low pressure (DG2 register)

5.1 Purpose of this section

Table 14: Ofwat actions addressed in this section

Action reference	Intervention area
AFW.OC.A30	Low pressure ODI rate

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customer actions and interventions

This section is our response on low pressure, specifically our PC relating to properties on the DG2 register.

In response to our IAP feedback, we introduced a financial PC relating to the number of properties on the DG2 register per 10,000 household connections, setting a target of 1.118 properties per 10,000 connections by 2024/25 and an underperformance rate of -£0.1046m based on industry WTP metadata.

We are pleased that Ofwat have recognised the higher levels of stretch in the DD feedback[20] and we acknowledge the removal of outperformance payments. We are taking steps to resolve low pressure issues for our properties. This higher stretch target combined with a downside only financial ODI will generate the right incentives for improving performance.

Ofwat have also challenged us on our underperformance rate, increasing this to its calculated industry mean of -£0.4592m. We set out our response to Ofwat's intervention on the underperformance ODI rate and the supporting analysis used to reach our position.

5.2 Summary of response

We have examined Ofwat's calculations of the industry mean, along with the underlying data, and have found several outlier companies in the data. We propose to use the median (excluding Yorkshire Water which is an extreme outlier) as a more robust methodology to calculate the industry average and for the purpose of setting an ODI rate.

Unlike the mean, the median is not affected by outliers and therefore gives a more representative value of the industry average. This is in line with Ofwat's approach to other ODIs such as unplanned outages, where concerns around data quality have resulted in targets being set to the median value to eliminate the impact of outliers. We also set out evidence that the higher number of our properties on the DG2 register are driven by a more informed understanding of performance based on the use of data from loggers.

The tables below set out DD and represented values of the penalty rate set at industry median. We have not been able to replicate exactly Ofwat's calculations of the industry mean nor do we have access to individual company data. As such, Ofwat's calculation of the median may differ marginally from the values in Table 16 below. However, we expect that any difference should not be material.

The DD, alongside our represented values for the ODI penalty rate for low pressure (DG2 register) PC are set out in the tables below.

[20] Ofwat, PR19 draft determinations. Affinity Water – Delivering outcomes for customer actions and interventions. July 2019, page 17.

Draft determination

Table 15: Draft determination for low pressure (DG2 register) incentive rate

Area	Unit	2020/21	2021/22	2022/23	2023/24	2024/25
ODI Penalty rate	£m/unit	-0.4592	-0.4592	-0.4592	-0.4592	-0.4592

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customer actions and interventions

DD response

Table 16: DD response on low pressure (DG2 register) incentive rate

Area	Unit	2020/21	2021/22	2022/23	2023/24	2024/25
ODI Penalty rate	£m/unit	-0.105	-0.105	-0.105	-0.105	-0.105

Source: Affinity Water DD response

5.3 Summary of analysis

In re-examining the appropriate underperformance incentive rate, we have reviewed previous customer engagement findings, as well as examining activities over the AMP6 period. We have also assessed Ofwat's calculations of the industry average for statistical robustness and conclude that a number of adjustments to account for statistical outliers are required to reach a representative measure.

In AMP6 we have increased the number of critical point data loggers over the region we serve. This has led to a corresponding increase in reporting which allows us to have a more detailed reporting of performance. The performance assessment across companies is dependent on their coverage of data loggers and it is not clear whether Ofwat's assessment takes this factor into account when setting the PC and ODI rate.

In the DD, our incentive rate is aligned with a 'reasonable range' by setting it to the industry average. We have analysed Ofwat's calculation of the industry average and conclude that the arithmetic mean is not an appropriate measure of average industry ODI rates given the data quality and distribution issues.

Ofwat acknowledges that there is significant variation across individual companies' ODI rates, and statistical testing identifies several unexplained outliers, Anglian Water, Bristol Water and Yorkshire Water. In line with standard statistical practice, any calculation of the average should account for the presence of outliers, either by removing them from the calculation of the mean, or by taking the median.

The remainder of this section is structured as follows:

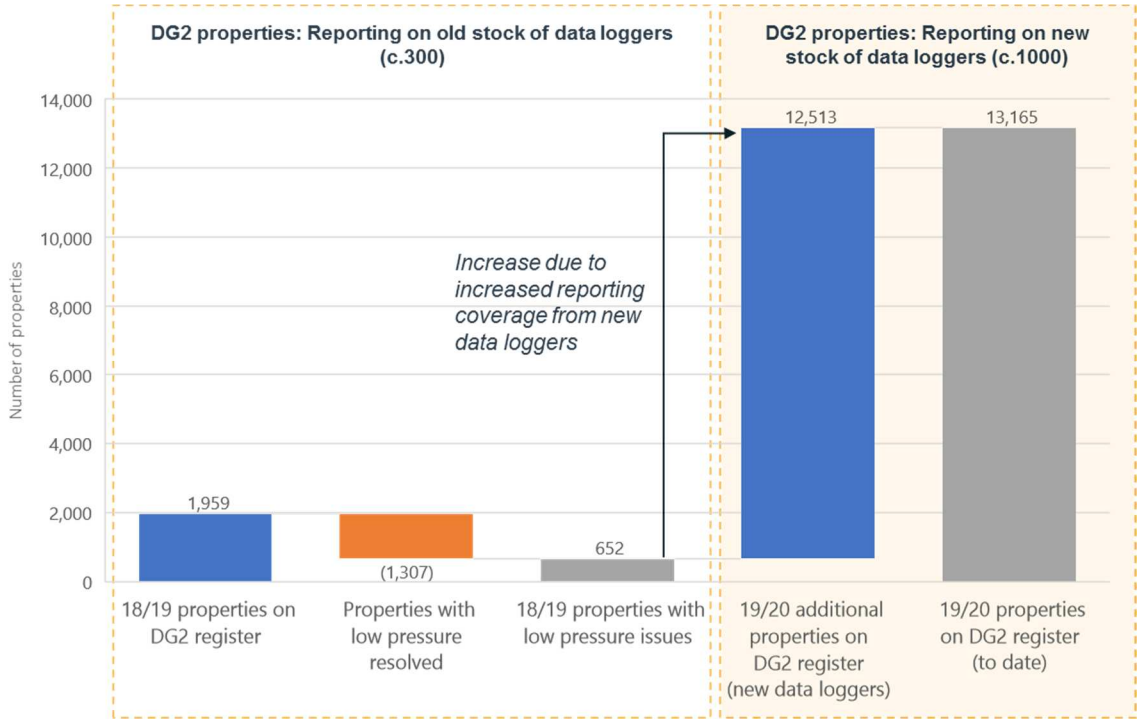
- **Section 5.4. Reflecting our critical point loggers coverage rate.** Evidence of our investment in critical point data loggers over the AMP6 period, the impact this has had on our DG2 register properties, and the degree of comparability for benchmarking across the industry for assessing relative performance.
- **Section 5.5. Alignment of the ODI rate with our customer feedback.** Evidence from our customer engagement exercise which demonstrates the low value our customers place on low pressure avoidance, and importance of aligning this to our ODI rate to incentivise the right behaviour.
- Section 5.6. **Evaluating Ofwat's calculation of the industry average ODI rate**. Statistical analysis of Ofwat's calculation of the industry average ODI rate and the appropriate adjustments required to calculate a robust industry average reflecting the industry data quality and outliers.
- **Section 5.7**. **Conclusion.** Summary of key conclusions for our low pressure (DG2 register) PC.

5.4 Reflecting our data loggers coverage rate

Over the AMP6 period we have invested the coverage of properties with data loggers, increasing this from 300 to 1,000 data loggers covering all of our district meter areas, and this has led to a corresponding increase in our performance data reporting.

Our analysis shows that whilst the number of our DG2 register properties has increased, these new properties relate primarily to properties for which we were previously unable to record pressure. This can be seen in the graph below which shows a sharp increase in DG2 properties once reporting on all new data loggers has been incorporated. Consequently, our increase in DG2 register properties over the AMP6 period is a symptom of improved visibility rather than deteriorating performance.

Figure 17: DG2 properties based on old and new data logger coverage



Source: Affinity Water analysis of DG2 report data

This distinction is important in light of Ofwat's DD feedback on our PC. Ofwat's intervention in our DG2 register underperformance rate are based on the assumption that we are not a good performer in relation to the wider industry. However, given our significant increase in data loggers, we are of the view that our pressure visibility may be higher than other companies, and this is driving our higher DG2 register rate. Furthermore, as soon as this data was retrieved, we put in an ambitious programme of pressure improving projects that allowed for us to propose a PC of 250 by the end of year 1 in our business plan. Given Ofwat's focus on improving dataflows and improving customer experience at the tap, it is not appropriate to uplift our underperformance rate due to actions we have taken on Ofwat's recommendation.

5.5 Alignment of the ODI rate with our customer feedback

When setting the underperformance rates for the financial ODI, we decided to maintain the approach used for the rates for the (previously financial) revised PC. This underperformance rate was constructed using the Ofwat formula, with the marginal cost based on the expenditure allocated to resolving low pressure in

our TOTEX portfolio, and the marginal benefit computed using metadata from other companies' Willingness-To-Pay (WTP) studies for properties experiencing low pressure.[21] We adjusted these rates in order to fit with the 'properties per 10,000 household connections' unit and submitted them for the new PC.

Our customers place a low value on avoidance of low pressure, and this should be reflected in the ODI underperformance rate. Following the submission of our response to the IAP, we commissioned ICS Research to conduct WTP research to understand our customers' valuation of the disbenefit of receiving low pressure[22]. These findings show that the value that our customers place on the avoidance of low pressure is below the industry average. It should be noted that in our IAP response we were unable to use our WTP values due to restrictions in the Ofwat formula which requires marginal benefits to be greater than marginal costs. As such, we have maintained the higher benefit valuation we had obtained from the industry metadata, recognising Ofwat's challenges on the use of metadata and the fact that this value is likely to overstate the value to our own customers who have a lower WTP.

We are therefore concerned that this intervention to further increase the ODI rate risks incentivising behaviour that is not in the best long-term interests of our customers, when considered in the context of our wider ODI package. Specifically, the level of prioritisation suggested by the DG2 register ODI rate does not reflect the relative value that our customers place on avoidance of occasional low pressure and may divert focus away from areas that offer better value for money.

5.6 Evaluating Ofwat's calculation of the industry average ODI rate

In order to adjust our underperformance rate in line with their calculated reasonable range, Ofwat have proposed to set our ODI rate based on their calculation of the industry average.

The selection of the most appropriate measure of central tendency will depend on the characteristics of the individual dataset being characterised. Of the potential options, the two most commonly used measures are the median and the arithmetic mean. Whilst the mean is the most commonly used measure of the 'average', it performs poorly where there are outliers in the data being assessed due to its sensitivity to extreme values. In this case, the median can offer a more appropriate alternative. Ofwat itself uses this approach, choosing to use the median for calculation of the 'good' level for unplanned outages *'as using median eliminates the impact of outliers on the average.[23]'*

Accordingly, it is standard procedure to first examine the raw data and undertake outlier detection tests before choosing the appropriate measure of central tendency.

5.6.1 Outlier detection of company ODI rates

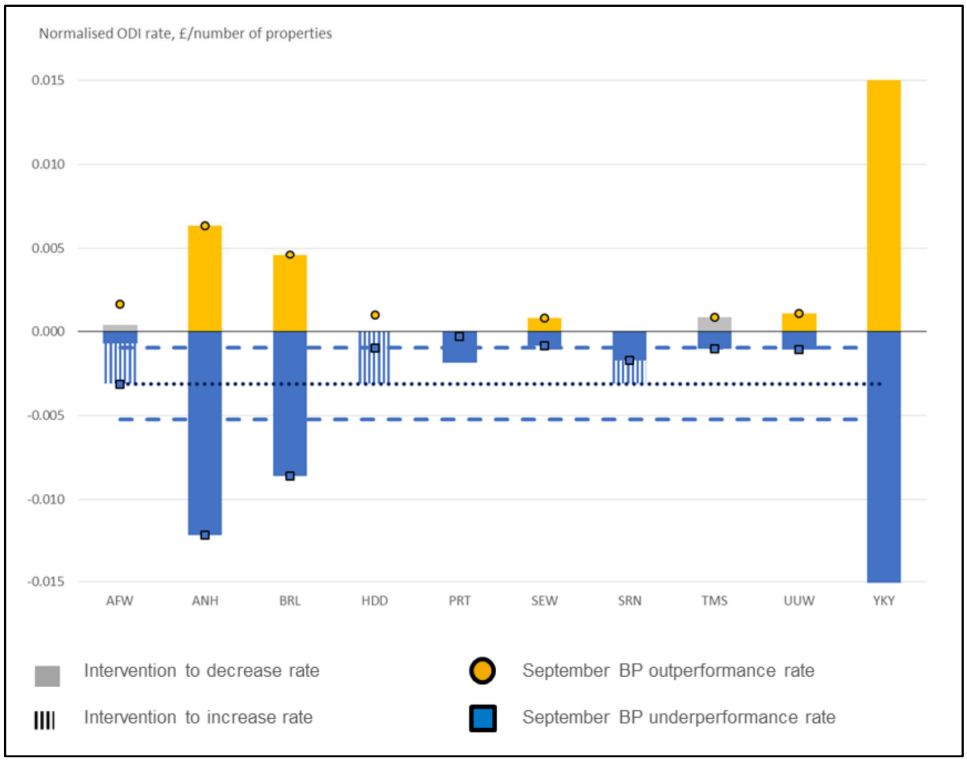
Ofwat sets out individual company ODI rates in its 'Delivering outcomes for customers policy appendix' which we show in the graph below.

[21] 'Our Business plan for 2020 – 2025 Appendix 4: Our Outcomes and Performance Commitments', September 2018, pages 97, 104, 109 and 113-114

[22] ICS Research, 'Affinity Water PR19 WTP and ODI Research Programme', June 2019, page 57.

[23] Ofwat, PR19 draft determinations. Delivering outcomes for customers policy appendix. Page 41.

Figure 18: Low Pressure ODI Rates



Source: Ofwat, 'PR19 draft determinations: Delivering outcomes for customers policy appendix', July 2019, page 160.

From a visual inspection, it is clear that there are three companies that represent outliers: Anglian Water, Bristol Water and Yorkshire Water. Ofwat have acknowledged that '*substantial variation remains across companies which neither we nor the companies are able to satisfactorily explain*'[24]. The existence of extreme values and lack of explanation around why these may have occurred indicates a low level of comparability across company ODI rates that would suggest use of the arithmetic mean is inappropriate due to its sensitivity to extreme values.

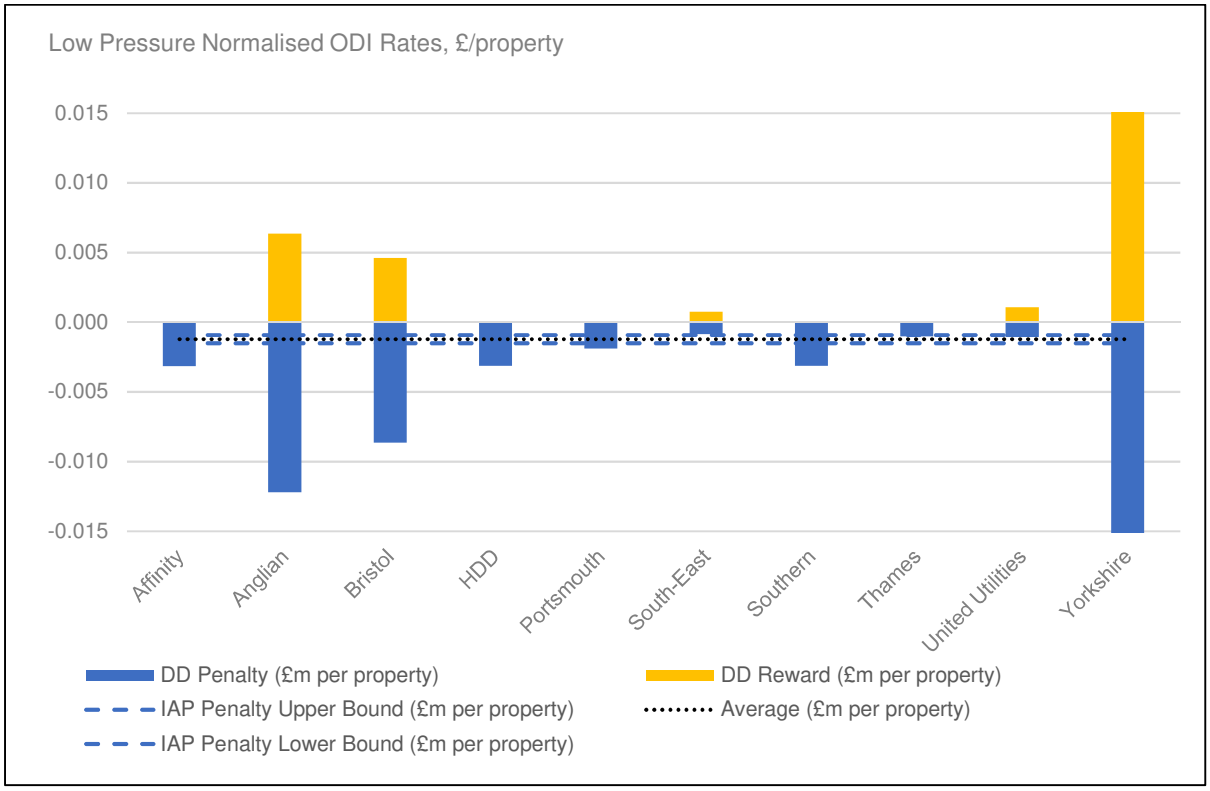
In order to further investigate the scale of impact this has on the average ODI rate, we attempt to reproduce Ofwat's analysis[25]. By excluding Yorkshire Water's IAP rate, we are able to closely replicate Ofwat's graph as shown in Figure 19[26]. We conclude that in calculating the mean ODI, Ofwat have recognised that Yorkshire Water represents an extreme outlier and has chosen to exclude it from its calculations. However, we remain concerned that even excluding Yorkshire Water, the rates proposed by Anglian Water and Bristol Water are significantly outside the range of other company's ODI rates.

[24] Ofwat, PR19 draft determinations. Delivering outcomes for customers policy appendix. Page 66.

[25] We have replicated Ofwat's 'normalisation' of the data in order to reproduce the analysis. We note that three of the companies in the graph have expressed the PC as 'properties experiencing low pressure per 10,000 connections'; these companies are Affinity, South East Water and United Utilities. In order to express the rates for these companies as '£m/property', we divide their ODI rates by the average number of connections for the AMP7 period divided by 10,000. For the other companies in the graph, their ODI rates are already expressed as £m per property, so we do not adjust them

[26] There are some minor differences in the rates calculated by Ofwat and those we have calculated ourselves which we expect are due to minor differences in the scale factors applied.

Figure 19: Affinity analysis of ODI rates



Source: Affinity Water analysis of IAP response rates

We verify this using the modified z-score approach[27] to detect outliers in the ODI rates data. The modified z-score approach is widely used for outlier detection, particularly when sample sizes are small. Unlike standard z-scores it is a resistant estimator and is commonly recommended as a robust method for outlier detection.[28] We keep with *Iglewicz and Hoaglin's* recommendation to identify observations with an absolute value of greater than 3.5 as potential outliers[29].

Applying this approach to the full dataset of companies, our analysis finds that all three companies are potential outliers. Furthermore even when we repeat this exercise excluding Yorkshire Water, the modified z-scores of Anglian Water and Bristol Water exceed the cut-off point. This provides strong evidence that the rates proposed by these two companies are also outliers, and we are concerned that Ofwat have chosen not to control for the effects of these datapoints either by excluding them from the calculation of the mean or by using the median. We note that where data quality and the existence of outliers has been an issue for other PCs such as unplanned outages, Ofwat have chosen to set targets based on the median value to eliminate the impact of outliers[30].

5.6.2 Methodological drivers of outliers

We agree with Ofwat's concerns that the substantial variation in ODI rates may be driven by methodological issues rather than true variation in customer preferences, and this reduces the degree of

[27] We note that the modified z-score approach includes an assumption on normality of the data.

[28] Modern Robust Data Analysis Methods: Measures of Central Tendency. Wilcox, Keselman, 2003

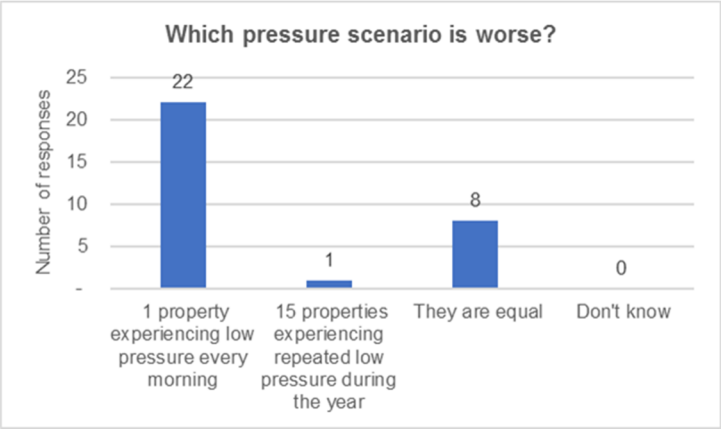
[29] ibid.

[30] Ofwat, '*PR19 draft determinations: Delivering outcomes for customers policy appendix*', July 2019, page 41. https://www.ofwat.gov.uk/wp-content/uploads/2019/07/PR19-draft-determinations-Delivering-outcomes-for-customers-policy-appendix.pdf

comparability across individual ODI rates. For example, what is considered 'low pressure' by customers may be different from the reality experienced by customers on the DG2 register; with the latter only experiencing low pressure 1.37% of the year rather than daily. When setting an ODI rate that uses WTP, it is important to recognise the kind of service that is being valued. The Ofwat underperformance rate formula requires both a marginal benefit and marginal cost value, with the former having to be larger than the latter. This means that high benefit valuations will increase the size of the underperformance rate.

Our consumer research found that the majority of customers viewed persistent low pressure (every morning) to be worse than occasional low pressure. This suggests that simply linearly scaling WTP for persistent low pressure to reach an equivalent value for occasional low pressure i.e. assuming a constant 'pound per minute' value, would result in an overestimate.

Figure 20: Comparing occasional and persistent low-pressure scenarios



Source: Affinity Water consumer research

This may explain, at least in part, the extreme ODI rates for Anglian Water. Anglian Water's PC is for 'Properties at risk of persistent low pressure', and this is reflected in its customer research which estimates the value of 365 days of low pressure a year. Affinity Water's analysis shows that this is not what customers on the DG2 register actually experience, and we are concerned therefore that this rate does not accurately reflect the WTP for DG2 register customers due to the non-linear relationship between persistent and occasional WTP.

Our review of individual companies also shows that companies used different approaches to set the marginal benefits when not conducting their own research. Some have relied on industry WTP metadata from PR14 and PR19, others have used marginal costs, and some have rolled over their PR14 WTP findings. This creates issues when attempting to set an average, as the underperformance rate then becomes a function of marginal costs to resolve DG2 (which vary by operational solution), as well as the metadata observations selected by companies to set their rates.

5.6.3 Alternative calculation of the average industry ODI rate using the median

It is clear that there is significant variation in ODI rates for this measure, and several outliers in the data. We agree with Ofwat's concerns around their 'inability to explain the variation in companies' rates and the potential that it is driven by factors which do not reflect differences in customer preferences'[31]. This is compelling evidence to use the median rather than the arithmetic mean to estimate the industry ODI rate for DG2 after adjusting for extreme outliers.

[31] Ofwat, PR19 draft determinations: Delivering outcomes for customers policy appendix, July 2019, page 67.

In our calculation, the median for the range (excluding Yorkshire Water which is clearly an extreme outlier) would be -£0.001057m.[32] This is significantly lower than our computation of the mean average, which is -£0.003516m and represents a difference of -£0.002459m per property. Given this difference, we recommend that Ofwat reconsiders its analytical approach, and considers using the more appropriate median for computing the industry average rate for this measure.

[32] Even including Yorkshire Water the median still comes out significantly below the mean, with a value of -£0.001396m.

5.7 Conclusion

Whilst we understand Ofwat's motivation to uplift our ODI rate into their 'reasonable range', we are concerned that its calculation of the average industry ODI rate is not appropriate given the data quality and distribution. Furthermore, Ofwat's intervention does not accurately reflect the value that our customers place on avoidance of low pressure or our recent investment in increasing data logger coverage.

Ofwat believes that we are a poor performer in this area, and this has led it to intervene on our ODI rate. However, our higher DG2 property numbers are driven by our investment in increasing data loggers and reflect our desire to improve our understanding of the customer experience that other companies may not be able to demonstrate. Given Ofwat's focus on promoting this area, it is not appropriate that we are penalised due to this investment.

Our research also shows that our customers place a relatively low value on avoidance of low-pressure events, and this has been echoed by other companies such as Hafren Dyfrdwy which found a close to zero WTP for resolving low pressure problems. In setting an ODI rate that is materially higher, we are concerned that this will lead us to concentrate on areas that are not a priority for our customers and do not deliver the best value for money.

Finally, given the significant variation in methodology used to calculate the ODI rate across companies under this PC, we reiterate our position that taking a simple mean average for the 'industry underperformance rate' does not stand up to statistical rigour. We are of the view that there is a material risk that ODI rates across the industry are not comparable and are distorting the mean ODI rate. We propose that if Ofwat pursues the approach of taking an industry average against which to benchmark and set company underperformance rates, taking the median value across the industry, excluding extreme outliers such as Yorkshire Water, is a more appropriate analytical method for setting an average.

This approach strikes a balance between mitigating against the presence of such large and unexplained outliers whilst still recognising that these datapoints may still provide useful information on regional consumer preferences. Furthermore, this is in line with Ofwat's approach to other ODIs such as unplanned outages, where concerns around data quality have resulted in targets being set to the median value to eliminate the impact of outliers.

6 Technical point: AFW.OC.A2 – Revised PC for customer contacts (discoloured water, taste and odour, and appearance)

6.1 Purpose of this section

Table 17: Ofwat actions addressed in this section

Action reference	Intervention area
AFW.OC.A2	We consider the company should consider adding an asset health measure on 'taste and odour'.

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customer actions and interventions

This section addresses our response on customer contacts on appearance, taste and odour.

Ofwat's feedback at DD stage included a suggestion that we should consider including a 'taste and odour' customer contact PC in addition to our existing PC on water discolouration customer contacts.

We agree with Ofwat's suggestion and are proposing to replace our previous discolouration customer contacts PC with a combined PC covering customer contacts on appearance, taste, and odour. We set out the associated PC target, ODI rates, and caps and collars, and supporting analysis in the remainder of this section.

6.2 Key conclusions

We agree with Ofwat's suggestion to introduce a 'taste and odour' measure, and set out a revised PC for this asset health measure:

- PC definition: Customer contacts rate on appearance, taste, and odour.
- PC target of 0.80 each year (customer contacts per 1,000 population), with a P10 and P90 of 0.9 and 0.7 respectively.
- Outperformance and underperformance payments at a rate of -£2.044 and £2.044 respectively.
- Cap and Collar: Set at our P10 and P90 values.

Ofwat's DD and our represented plan for our revised PC are set out in the tables below.

Draft Determination

Table 18: Draft determination for customer contacts on water discolouration

	Unit	2020/21	2021/22	2022/23	2023/24	2024/25
PC	Number of contacts for appearance multiplied by 1,000 divided by the resident water supplied population as reported to the Drinking Water Inspectorate (DWI).	0.23	0.23	0.23	0.23	0.23
ODI underperformance rate	£m/unit	-2.044	-2.044	-2.044	-2.044	-2.044

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customer actions and interventions

DD response

Table 19: Our DD response on customer contacts on water discolouration, taste and odour, and appearance

	Unit	2020/21	2021/22	2022/23	2023/24	2024/25
PC	Number of contacts for appearance **and taste/odour** multiplied by 1,000 divided by the resident water supplied population as reported to the Drinking Water Inspectorate (DWI).	0.8	0.8	0.8	0.8	0.8
P10	As above	0.9	0.9	0.9	0.9	0.9
P90	As above	0.7	0.7	0.7	0.7	0.7
Caps and collars	As above	Caps and collars set to P90 and P10 respectively				
ODI outperformance rate	£m/unit	2.044	2.044	2.044	2.044	2.044
ODI underperformance rate	£m/unit	-2.044	-2.044	-2.044	-2.044	-2.044

Source: Affinity Water DD response

6.3 Summary of response

Following Ofwat's feedback at DD we introduce a new customer contacts measure, revising our previous customer contacts on water discolouration PC with a combined measure covering customer contacts on taste and odour, discoloured water, and appearance.

In setting the PC target, we take account of current performance, our plan of work for AMP7, and Ofwat's PR19 methodology. We set a target of 0.80 customer contacts per 1,000 of population based on the

average of our historic best 3 years. Despite the risk of increased customer contacts as a result of planned changes in source of water (increased water from Grafham Water), which we set out in further detail in section 6.6, we do not make an upward adjustment to our PC target to reflect ambition in our levels of performance.

6.4 Structure of this section

The remainder of this section is structured as follows:

- Section 6.5. Definition of our new performance commitment. This section sets out the definition of our new performance commitment on customer contacts on water appearance, taste, and odour.
- Section 6.6. Performance commitment target for our new measure. This section sets out the PC targets for our new measure of customer contacts, including our approach to calculating stretching targets in line with Ofwat's published PR19 methodology for this specific asset health measure.
- Section 6.7. Our rationale for underperformance and outperformance payments. This section sets out our analysis of industry precedent on the inclusion of outperformance payments for customer contact PCs.
- Section 6.8. ODI rate for our new PC. This section sets out the ODI rate for our new PC, taking into account our acknowledgement of Ofwat's intervention on our previous water discolouration customer contacts PC.
- Section 6.9. Conclusion. This section summarises our new PC measure on customer contacts on water appearance, taste, and odour.

6.5 Definition of our new performance commitment

Ofwat's feedback at DD included a suggestion to include a 'taste and odour' measure in our PCs. We agree with this suggestion, although we note that this is addressed in part through our CRI commitment and are proposing to amend our water discolouration customer contacts PC to a combined PC, which Ofwat have said is an acceptable alternative to separate PCs on appearance and taste and odour[33].

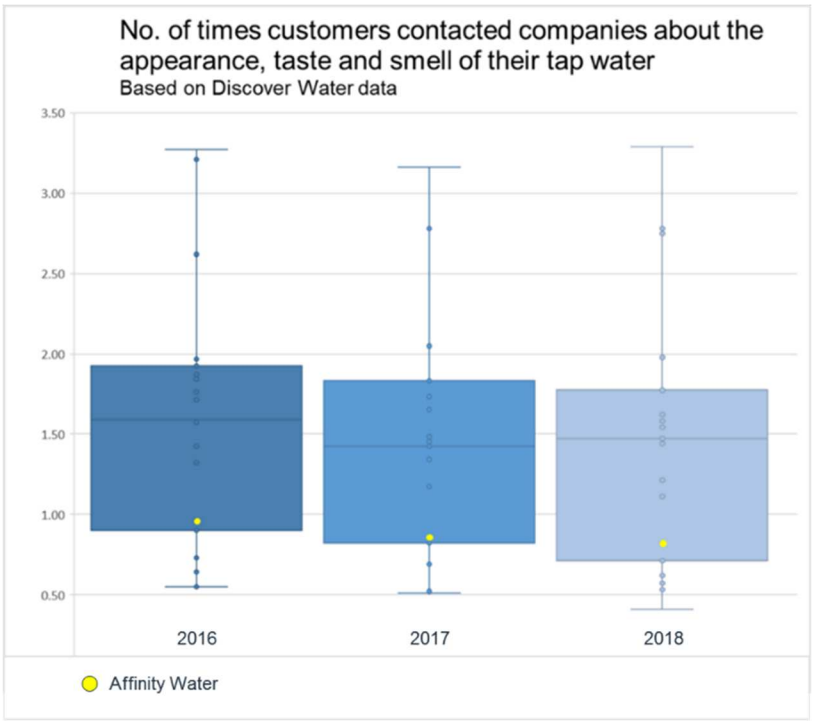
Furthermore, we are proposing to extend our water clarity measure to include all contacts on water appearance as defined by DWI, rather than water discolouration only. This will bring our combined PC in line with the rest of the industry and incentivise us to continue our strong performance across all aspects of water clarity.

6.6 Performance commitment target for our new measure

In setting the PC level and ODI type for our new PC, we have analysed our historic data to ensure that our target is sufficiently stretching, taking into account our planned activities for AMP7, along with reviewing alignment with Ofwat's PR19 methodology.

[33] Ofwat, PR19 draft determinations, Delivering outcomes for customers policy appendix, page 37.

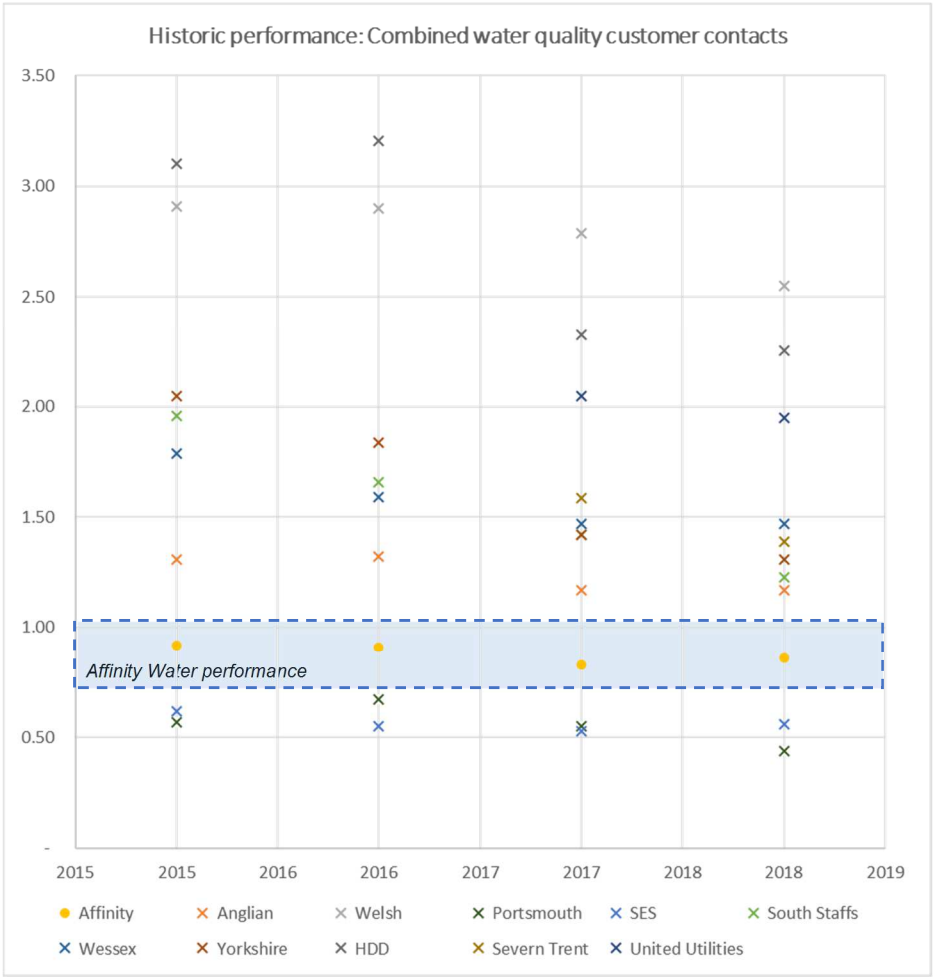
Figure 21: AFW water customer contacts performance



Source: Discover Water data

We are currently a good performer in this area, having consistently ranked close to the upper quartile in combined customer contacts as shown in Figure 21 above. This is supported by the historic performance data submitted for PR19 by those companies proposing a combined PC which shows that of those companies we are the third highest performer for each year of AMP6 (Figure 22).

Figure 22: AFW performance compared to other companies with combined PCs



Source: Affinity Water analysis based on individual company historic performance data, company IAP response submissions

Accordingly, we are setting a PC target of 0.80 (with a P10 and P90 of 0.9 and 0.7 respectively based on historic best and worst years). We have set our PC target equal to the average of our three best years from 2012[34] and reflecting our strong performance to date in this area. This is in line with Ofwat's approach to setting customer contact targets for good performers which balances a challenging target with recognition that '*some years may yield performance that would be costly to replicate for those already at comparatively good levels'*. Furthermore, unlike some of our other PCs such as mains repairs, we have greater management control over customer contacts on appearance, taste, and odour, and therefore agree that the average of our three best years is an appropriate target for this PC.

Furthermore, we note that this target is particularly stretching due to the additional challenge we face in AMP7. Due to the need to reduce reliance on our chalk water sources to protect water courses, we are planning to provide alternative sources of water to our customers in AMP7. The main alternative will come from our connection with Anglian Water's Grafham Treatment works, which is classified as surface water

[34] Ofwat's exact methodology is the best three years from 2011. However, Affinity Water was established in 2012 and this is reflected in our calculation of the PC target.

and has a different chemical composition from the groundwater that is currently supplied to our customers in the north and east parts of our central region.

When it is necessary to increase the volume of water imported due to increased demand or operational incidents, the proportion of Grafham Water in the network will increase and takes on more characteristics of surface water. Unlike Affinity Water, Anglian Water uses a process called chloramination to add residual disinfectant to the water produced at their works. The presence of chloramines in the water when the source is switched from groundwater to Grafham Water results in an increase in taste and odour complaints from our customers.

Furthermore, Grafham Water will strip chalk build up on customers' pipes if supplied for a few weeks. As we will need to supply a larger volume of water for longer durations, this raises the likelihood of water discolouration. Whilst we are moving to mitigate this with the construction of a new conditioning plant, the treatment process will change the way we disinfect, further raising the risk of taste and odour reports. We expect that this change will affect circa 316,000 properties across our catchment area which could lead to a significant increase in our contact rate by 0.21[35] (customer contacts per 1,000 of population).

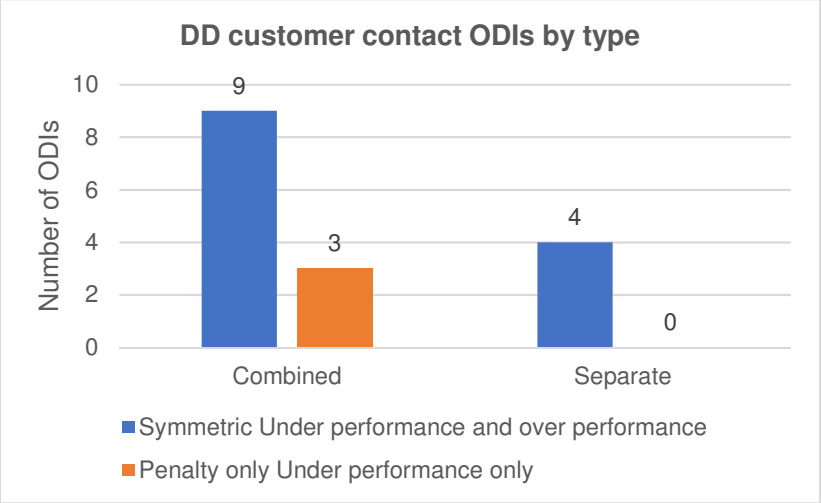
Despite these challenges, we are not making an upward adjustment to our target rate in recognition of Ofwat's challenge on the level of stretch in relation to our previously proposed water discolouration contacts only PC.

Similarly, we set out P10 and P90 values based on our historic performance, at 0.9 and 0.7 respectively.

6.7 Our rationale for underperformance and outperformance payments

As part of our new combined PC, we are proposing a financial ODI with both underperformance payments and outperformance payments. This reflects our ambition to maintain our position as an industry leader and incentivises the right behaviour to do so. Furthermore, this is in line with the wider industry where 13 out of the 16 companies (excluding Affinity) have customer contact ODIs that include an outperformance payment and underperformance payment.

Figure 23: Draft determination customer contacts (appearance, taste, and odour) ODIs by type



Source: Ofwat draft determinations, Affinity Water analysis

[35] Based on an average population per property of 2.42

Whilst we have not had an opportunity to engage with our customers specifically on this new combined measure, wider industry evidence for specific PC provides strong evidence that customers in general support outperformance payments in relation to customer contacts on appearance, taste, and odour.

6.8 ODI rate for our new PC

In our DD feedback, Ofwat have intervened to adjust the ODI rate for our previous water discolouration PC, increasing it from -£0.492m to -£2.044m. We acknowledge this adjustment to the ODI rate and find that based on industry precedent, it is appropriate to extend this water discolouration ODI rate both to wider appearance, and to taste and odour. Consequently, we apply Ofwat's DD rate to our new combined measure.

6.8.1 Extending the ODI rate to wider appearance

In our response to IAP, we proposed a PC relating to customer contacts on water discolouration. In comparison, our new combined PC will cover customer contacts on all areas of appearance (as defined by DWI), which includes water discolouration.

We have reviewed Ofwat's decisions for other companies to understand whether it is appropriate to extend the water discolouration customer contact ODI rate to wider appearance customer contacts on appearance. In the case of Northumbrian Water, the company proposed a PC on discoloured water contacts in its IAP response. At DD, Ofwat intervened to extend this definition to the wider 'appearance' definition but did not make an intervention on ODI rates. We conclude therefore that it is appropriate to use the same ODI rate for customer contacts relating to water discolouration and wider appearance[36].

6.8.2 Extending the ODI rate to taste and odour

We also assess whether it is appropriate to extend the same ODI rate for appearance to 'taste and odour'. We have reviewed the proposed ODI rates for other companies who propose separate ODIs and find that for three of the four companies, the same rate is used for both PCs. In the absence of specific WTP work on 'taste and odour', we keep with industry precedent and acknowledge Ofwat's proposed ODI rate for our new combined PC which we note is within Ofwat's 'reasonable range' for both underperformance and outperformance payments.

Table 20: Draft determination ODI rates on customer contacts for companies with separate PCs

Company	Appearance ODI underperformance rate	Taste and Odour ODI underperformance rate
Bristol Water	-0.935	-0.935
Northumbrian Water	-1.133	-1.133
South-East Water	-2.554	-0.803
Southern Water	-4.632	-4.632

Source: Ofwat draft determinations, Affinity Water analysis

Similarly, we note that in the case of Welsh Water, Severn Trent Water, South-East Water, and United Utilities, their outperformance payment is set equal to their underperformance payment and we apply the same approach to setting our ODI rates for this PC.

[36] PR19 draft determinations. Northumbrian Water – delivering outcomes for customers actions and interventions, page 23.

6.8.3 Caps and collars

We also set out our proposed caps and collars for this PC at the P90 and P10 respectively which have themselves been set based on our historic performance.

6.9 Conclusion

We are proposing to revise our water discolouration PC to a combined measure, extending it to cover water discolouration, taste and odour, and appearance.

Furthermore, we have set ourselves a challenging PC rate reflecting our desire to continue leading the industry and aligned our PC with the rest of the sector. We have also acknowledged Ofwat's intervention on our original water discolouration customer contacts ODI rate, applying this to our new PC which will further incentivise us to maintain our position as an industry leader.

Our new PC is defined as follows:

- PC definition: Customer contact rate on appearance, taste, and odour.
- PC target of 0.80 each year (customer contacts per 1,000 population), with a P10 and P90 of 0.9 and 0.7 respectively.
- Outperformance and underperformance payments at a rate of -£2.044m and £2.044m respectively.
- Cap and Collar: Set at our P10 and P90 values

7 Technical point: AFW.OC.A40 – Outperformance payments for river restoration

7.1 Purpose of this section

Table 21: Ofwat actions addressed in this section

Action reference	Intervention area
AFW.OC.A40	Outperformance payments for river restoration

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customers actions and interventions

This section addresses Ofwat's intervention on outperformance payments for river restoration.

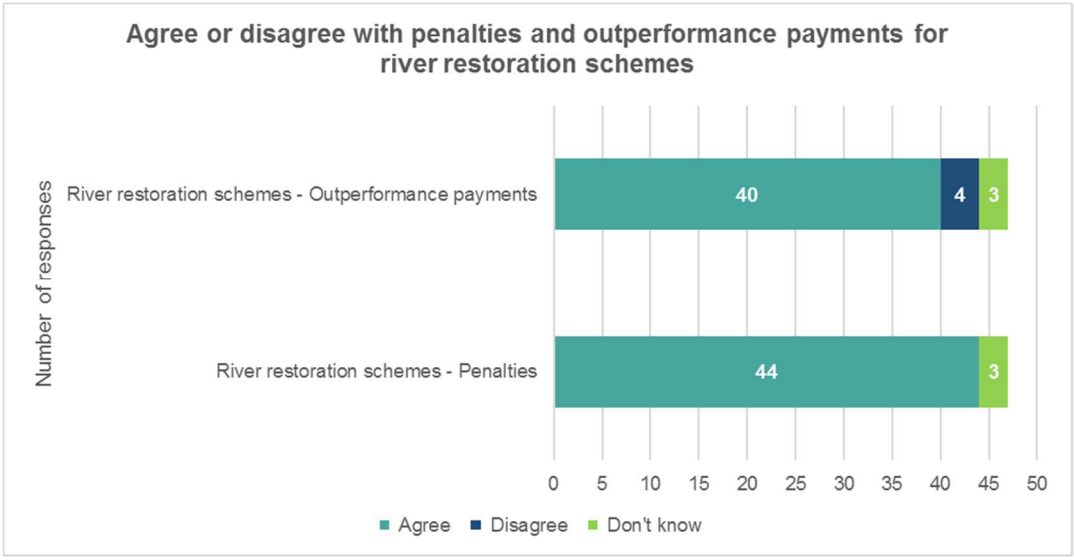
Ofwat has previously requested additional evidence to support outperformance payments for the early delivery of river restoration schemes. We submitted new evidence in response on the 18 June 2019, titled 'AFW Willingness to Pay Appendices'. Ofwat were unable to take this evidence into consideration in preparation of our DD which removed outperformance payments for river restoration.

Noting that the additional information we provided on customers research was not in time to be taken into consideration at DD, we restate, with the support of customers, our outperformance incentive for early delivery of river restoration schemes.

7.2 Customer support for outperformance payments

Our customer engagement exercise included environmental ODI focus groups to better understand the level of customer support for the structure of ODIs relating to environmental measures which includes river restoration schemes. These sessions found that our customers were strongly in favour of outperformance payments

Figure 24: Support for ODI rates for river restoration schemes



Source: AFW Willingness to Pay Appendices, June 2019

We are therefore restating our outperformance payment incentive for early delivery of river restoration schemes based on evidence of strong customer support. These are set out in Table 22 below.

Table 22: Our DD response on river restoration outperformance payments

	2020/21	2021/22	2022/23	2023/24	2024/25
Outperformance payments for early delivery of schemes (£m)	0.216	0.216	0.216	0.216	0.216

Source: Affinity Water DD response

7.3 Conclusion

We have set out the results from our customer engagement which demonstrates strong support for outperformance payments for river restoration schemes.

This evidence was not taken into account in our DD. We therefore restate our outperformance incentive for this measure.

8 Technical point: AFW.OC.A3 – Revised PC for Value for Money

8.1 Purpose of this section

Table 23: Ofwat actions addressed in this section

Action reference	Intervention area
AFW.OC.A3	VFM PC targets

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customer actions and interventions

This section describes the revised PC for VFM, setting out a new survey question to measure customer perception of VFM and associated PC targets.

In our IAP feedback, Ofwat challenged us on the discontinuation of our PR14 VFM survey PC and suggested that we consider retaining a measure of VFM. In response, we have undertaken further engagement with our CCG to develop a VFM measure that is fit for purpose for the AMP7 period and reflects our ambition to ensure customers and communities remain at the centre of our business. This was in development at the time of submitting our IAP response and we did not submit PC targets for the VFM measure.

In its DD, Ofwat set out PC targets for our old VFM measure, which was measured on a percentage basis. We have now collaboratively developed a new VFM measure through a joint workshop with the CCG. We set out this new survey question, and the associated PC targets, which are now measured on a 1-10 scale. These replace Ofwat's DD PC targets, which were set in % units based on our AMP6 VFM measure.

8.2 Key conclusions

We set out a new VFM measure and stretching PC levels.

Ofwat's DD and our represented plan with PC targets for this new measure are set out below.

Draft determination

Table 24: Draft determination for Value for Money

	Units	2020/21	2021/22	2022/23	2023/24	2024/25
PC target	AMP6 (old) PC Survey score	70%	71%	73%	74%	75%

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customer actions and interventions

DD response

Table 25: Our DD response on Value for Money

	Units	2020/21	2021/22	2022/23	2023/24	2024/25
PC target	New PC Survey score	7.60	7.65	7.70	7.75	7.8

Source: Affinity Water DD response

8.3 Structure of this section

The remainder of this section is structured as follows:

- Section 8.4. Setting PC targets for our new VFM measure. This section sets out our new VFM survey questions which we have developed in conjunction with our CCG.
- Section 8.5. Setting PC targets for our new VFM measure. This section sets out the PC targets for our new VFM measure.
- Section 8.6. Conclusion. Summary of our new VFM PC.

8.4 Our new VFM survey question

As we set out in our IAP response, we have been working in collaboration with our CCG to develop a VFM measure that provides us with more customer focused feedback on the perception of VFM throughout AMP7. This new VFM measure will replace the VFM measure we used for our PC in AMP6 which was based on a VFM index comprising of various different measures.

Over the AMP6 period, in parallel with monitoring the VFM PC index, we have also measured as a single VFM question and our joint proposal is to move to this single measure for AMP7. The question we have been asking and will continue to ask customers about VFM perception involves providing a value between 0 and 10 (consistent with C-MeX scale) and focuses on customers that say they know what their bill size is. The question is worded as: *Thinking about your water supply service, overall how would you rate the value for money of the services you receive from Affinity Water?*

8.5 Setting PC targets for our new VFM measure

We are moving to a new VFM measure which is measured on a scale of 0-10. This is a change from our previous VFM PC which was a percentage measure. In its DD, Ofwat set PC targets based on our old AMP6 PC in percentage terms which is no longer applicable to our new VFM measure. Instead, we are proposing equally stretching performance levels for the PC through AMP7 which we set out below.

Table 26: Proposed AMP7 PC levels of VFM

2020/21	2021/22	2022/23	2023/24	2024/25
7.60	7.65	7.70	7.75	7.8

Source: Affinity Water

These targets are based on continuing the improvement we delivered over the AMP6 period. We set out our scores during the AMP6 period in the table below (note this is not the current PC but an internal only measure we have been reporting). This demonstrates that the levels we are setting for AMP7 are stretching, assuming a further 0.2-point improvement during the AMP.

We note that we will be running a supplier tender process before April 2020, and if we do change supplier for the research there is a chance this will affect the scores even with maintaining consistency on the methodology. The levels we are committing to here are based on current known performance levels and a challenging future target.

Table 27: AMP6 achievement of VFM survey

2015/16	2016/17	2017/18	2018/19	2019/20
7.40	7.50	7.50	7.60	7.60

Source: Affinity Water

8.6 Conclusion

We are proposing a new VFM PC based on the survey question 'Thinking about your water supply service overall, how would you rate the value for money of the services you receive from Affinity Water''. This has been developed in conjunction with our CCG and reflects our joint desire to have a measure that provides more customer-focused feedback than our AMP6 measure.

To reflect our ambition to continually challenge ourselves to deliver value for our customers, we have set out stretching AMP7 targets for this PC, representing a 0.2 improvement over the period.

9 Technical point: Clarification of PC unit for per capita consumption

9.1 Purpose of this section

This section clarifies the measurement unit of our per capita consumption measure.

Ofwat did not identify the measurement unit of our PC targets as an intervention in its DD. However, we note that in the published DD PC appendix[37] Ofwat has defined the PCC targets on a percentage reduction basis, defining the measurement unit as *'Percentage reduction from 2019-2020 baseline, reported to one decimal place. The volumetric levels resulting from the application of the percentage reduction in litres/person/day (l/p/d) reported to one decimal place.'*

Our IAP response and associated data tables (OC2) clearly set out our PCC targets in absolute values of litres/head/day (*l/h.d*).

9.2 Clarification and response

To clarify, we maintain that the measurement units for our PCC target is l/h/d and not a percentage reduction profile. This is consistent with our App 2, IAP response, and aligns with our WRMP.

For reference, these are presented in Table 28 below.

Table 28: Our PCC targets and measurement units

	Unit	2020/21	2021/22	2022/23	2023/24	2024/25
PCC target (3-year rolling average)	l/h.d	149.0	144.1	140.5	136.4	132.6

Source: Affinity Water IAP response

9.3 Conclusion

Our PCC target measurement units are in l/h.d.

[37] Ofwat, PR19 draft determinations. Affinity Water – Outcomes performance commitment appendix. Page 12.

10 Technical point: Revised name for cyber security and resilience

10.1 Purpose of this section

This section sets out the title change of our 'cyber security and resilience' PC to 'IT Resilience'.

In our IAP response we submitted a PC titled 'cyber security and resilience', which relates to the minimisation of unplanned interruptions to IT services. We propose to rename this PC to 'IT Resilience' to better reflect the definition of this PC. The PC definition, units, and targets will remain unchanged.

10.2 Clarification and response

In our IAP response, we submitted a PC relating to the number of unplanned interruptions to IT services and measured through our IT Incident Impact Score. This PC was titled 'cyber security and resilience'.

Further discussions with our IT team found that this measure related more to 'IT resilience' than 'Cyber security'. To ensure that our PC titles accurately reflect the PC definition, we propose to rename this PC to 'IT resilience'.

We are not proposing any change to the PC definition, measurement unit, or targets.

10.3 Conclusion

We are renaming our 'cyber security and resilience' PC to 'IT Resilience' to better reflect the PC description.

This will not change any elements of the PC including the definition, measurement unit, or targets.

11 Technical point – AFW.OC.A19 (risk of severe restrictions in a drought)

11.1 Purpose of this section

Table 29: Ofwat actions addressed in this section

Action reference	Intervention area
AFW.OC.A19	***Sector wide action*** The company should provide a full set of intermediate calculations (at a zonal level), for the underlying risk calculations. The company should confirm that their performance commitment levels are reflective of their water resources management plan position.

Source: Ofwat PR19 draft determination, Affinity Water – Delivering outcomes for customer actions and interventions

This section addresses Ofwat's request for additional information with regards to our risk profiles for severe restrictions in a drought.

In its DD feedback, Ofwat have requested a sector wide action to provide a full set of intermediate calculations, at a zonal level, for risk of severe restrictions in a drought. Furthermore, Ofwat have requested that companies should confirm their PC levels are reflective of their water resources management plan and identify which programmes of work will impact the risk profile forecasts.

Specific to Affinity Water, Ofwat recognise that PC levels are sufficiently stretching but query whether we are able to achieve our zero risk forecast in year 1 given the current non-zero risk, as well as some of our supply-demand components. We set out further information on each of these areas below, in addition to providing intermediate calculations.

11.2 Clarification and response

We provided interim calculations as part of our response to the IAP in April 2019 and they remain the same in the absence of further guidance. We confirm that the calculations are reflective of our final Water Resources Management Plan (WRMP) position and includes the potential that we have access to drought orders and permits. Furthermore, we confirm that no programmes of work impact our risk profile forecasts as evidenced by our flat profile. We resubmit these calculations to Ofwat alongside our DD response as set out in section 11.4.

In terms of explanation we note the following:

Table 30: Response to Ofwat queries on severe restrictions in a drought risk profile

Ofwat query	Our explanation
The PC level is sufficiently stretching but may be unrealistic in year 1 given the starting non-zero risk.	The reason that our risk is zero across all WRZs during the 2020 - 2025 period: the policy contained within our WRMP is that we will be able to use the Drought Orders and Permits named in our Drought Plan to meet the 1-in-200 year drought risk until we deliver the Sundon scheme in 2024. This scheme, combined with the demand management savings we have committed to by that point, will allow us to cease reliance on Drought Orders and Permits in 2024/25. We confirm that we achieve supply/demand balance in all WRZs in all years through the use of Drought Orders and Permits up to that point.
Some of the supply-demand components included do not follow expended trends, such as demand and supplies staying constant through the 2020-2025 period.	Our demand forecast does vary across the period, as shown in our intermediate calculations. Although we have population growth, we have incorporated our Water Saving Programme (WSP) (metering plus initial household audits) into our baseline demand forecasts, which means that baseline demand falls slightly, even before our interventions are considered. The additional household demand and leakage commitments within our plan then mean that demand reduces through AMP7. Population growth is therefore offset by our WSP programme. Similarly, our supply forecasts do vary, as we include the delivery of the first stage of the Runley Wood Greensand scheme and the Sundon scheme within the supply programme. However, these are offset in 2024/25 by our 36.3Ml/d sustainability changes, so the net change on supply capability at a company level is very small. The sustainability changes are therefore offset by new supply side schemes such as the Sundon treatment works.

Source: Affinity Water DD response

11.3 Conclusion

We confirm the following points:

- Our risk profile calculations are reflective of our final WRMP.
- Our calculations include the potential that we will have access to drought orders and permits.
- No programmes of work impact our risk profile forecasts.

We set out our responses to Ofwat's specific queries in Table 30 and summarise these points below:

- We confirm that we achieve supply/demand balance in all WRZs in all years through the use of Drought Orders and Permits up to 2024/25, by which time the Sundon scheme combined with the demand management savings will allow us to cease reliance on Drought Orders and Permits.
- We confirm that our supply and demand forecasts do vary across the period. Population growth is offset by our WSP programme, and sustainability reductions offset by new supply side schemes such as the Sundon treatment works.

We also resubmit our calculations to Ofwat alongside this DD response.

11.4 Supporting documentation

Table 31: Supporting documentation for our response on risk of severe restrictions in a drought

Document reference	Description	Relevant section
AFW-OD-Appendix 1	Drought resilience – Risk of severe restrictions in drought calculations	**Section 11.** Technical point – AFW.OC.A19 (risk of severe restrictions in a drought)
AFW-OD-Appendix 2	Drought resilience metric – certainty grade calculations	**Section 11.** Technical point – AFW.OC.A19 (risk of severe restrictions in a drought)

Source: Affinity Water DD response

Appendix A Supply interruptions over 12 hours

We have represented in Section 4 that we do not accept the financial ODI for supply interruptions over 12 hours that Ofwat introduced at the DD. This is because there is double counting with mains bursts repairs, supply interruptions ≥3 hours and GSS payments for interruptions over 12 hours. We also represent that the overall financial exposure relating to what is effectively a single issue (supply interruptions are caused by bursts) is disproportionate.

This appendix is therefore provided for information. It includes a test of the level of collar likely to be needed to avoid double counting with supply interruptions ≥3 hours (in the 'analysis of collar' section). The collar that Ofwat set implies double counting with the supply interruptions ≥3 hours penalties.

We tested the level of penalty relative to Northumbrian Water's penalty rate, correcting for relative company size and found the penalty Ofwat set at DD to be disproportionately large. We also compared the level of stretch between Northumbrian Water's PC and our PC, again scaled for size of customer base.

A.1 Analysis of collar

We tested the number of properties that would fall outside the supply interruptions ≥3 hours penalties to test the robustness of the 775 properties collar that Ofwat set at DD. The table below sets out our reasoning and our findings.

Table 32: Setting a collar to avoid duplication with supply interruptions ≥3 hours

	2020/21	2021/22	2022/23	2023/24	2024/25	Scale variables
A. Target for supply interruptions ≥3 hours PC (HH:MM:SS)	00:05:24	00:04:48	00:04:12	00:03:36	00:03:00	
B. Percentage of customer minutes driven by supply interruptions > 12 hours based on 2015-19 performance (%)						30.4%
C. Apply percentage to the interruptions ≥3 hours target (A x B) to get customer minutes due to >12 hour interruptions that are not subject to an underperformance incentive (HH:MM:SS)	00:01:39	00:01:28	00:01:17	00:01:06	00:00:55	
D. Household properties in 2020/21 (properties, nr)						1,408,608
E. . Convert customer minutes lost back to minutes (C x D) (minutes)	2,315,125	2,057,889	1,800,653	1,543,417	1,286,181	

	2020/21	2021/22	2022/23	2023/24	2024/25	Scale variables
F. Minutes lost per event for events >12 hours based on 2015-19 performance (minutes per interruption)						173,741
G. Convert back to number of events (E x F) (nr)	13.325	11.845	10.364	8.883	7.403	
H. Average number of properties per event (based on actual 2015-19 performance) (properties per event)						59
I. Number of properties (G x H, rounded to nearest property) – this is an estimate of the number of customers per year not subject to penalties under the ≥ 3 hour ODI (properties)	786	699	611	524	437	
J. Average number of properties not affected by interruptions (Average of row I) – this is the average level for a collar (properties)						**611**

Source: Affinity Water analysis

The analysis above shows that a collar of 600-620 would be more appropriate to avoid the impact of double counting this PC.

A.2 Analysis of ODI rates

Given that Ofwat have intervened to harmonise our PC definition to a different (and more onerous) definition than our AMP6 commitment, the rates should be in line with Northumbrian Water's.

The rates for Northumbrian Water are around half those applied for Affinity Water, and when scaled the rates per % of connected households are 1.4x Northumbrian Water's rates. Hence, we believe our underperformance rate should be lower on a like for like basis. Our analysis suggests a rate of -£0.00456m per property would be in line with the underperformance rate for Northumbrian Water. Our reasoning on rates is set out in the table below.

Table 33: Analysis of our ODI rate compared with Northumbrian Water

Analysis of level of underperformance	Northumbrian Water	Affinity Water
Penalty rate (£m per property)	(0.00331)	(0.00646)
Affinity Water rate as a multiple of Northumbrian Water rate		1.95
Average number of connected households in AMP7 (000)	1,444.738	1,990.845
Penalty per 1% of properties (£m)	(0.0659)	(0.0933)
Affinity Water rate as a multiple of Northumbrian Water rate (adjusted for company size)		1.42
Affinity Water rate scaled to Northumbrian Water (adjusted for company size, £m per property)		(0.00456)

Source: Affinity Water analysis

Yorkshire Water has a PC relating to supply interruptions over 12 hours. The measure is number of events rather than number of properties. Hence, it is not directly comparable with Affinity Water's PC. Severn Trent also has a resilience PC relating to percentage of customers whose service to the tap can be restored within 24 hours of a single failure event in their normal supply route. Again, this is not comparable with our PC.

A.3 Analysis of stretch

We undertook an analysis of our targets versus Northumbrian Water's to establish the relative level of stretch for both companies. Our analysis is presented in the table below.

Table 34: Analysis of our level of stretch for supply interruptions over 12 hours compared with Northumbrian Water

Analysis of level of stretch	Affinity Water (cumulative)	Northumbrian Water (cumulative)
Total number of customers affected in AMP7 if the company meets its targets (properties)	1,600	2,250
Average number of connected households in AMP7 (000)	1,444.738	1,990.845
Total as a percentage of average connected households (%)	0.1107%	0.1130%

Sources: Affinity Water analysis of Ofwat draft determination, analysis of AFW IAP response tables, table R1

If both companies meet the committed performance levels throughout AMP7, a relatively lower proportion of Affinity Water customers than Northumbrian Water customers will be affected by supply interruptions over 12 hours.

Although it would appear that our target is flat, we are in fact improving on a per customer basis. Our performance as a percentage of connected households is reducing over AMP7. If we meet our targets in 2020/21, 0.0227% of our customers would be affected, and in 2024/25 this would drop to 0.0216% of our customer base impacted.

We could not compare our target with Yorkshire Water's targets because we do not have data on the number of properties per event for Yorkshire Water.

Appendix B Risk of severe restrictions in a drought calculations

This appendix is provided separately.

Appendix C Certainty grade calculations

This appendix is provided separately.