

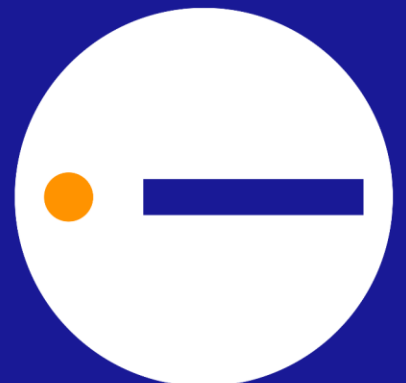
Portsmouth Water

A review of current PCC levels compared to those anticipated when AMP7 targets were set

Project reference: 2691

Report number: AR1545

2023-09-26



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Client: Portsmouth Water

Version	Author(s)	Reviewed by:	Description	Date
1	Joe Cahill, Dave Gough, Dene Marshallsay	Dave Gough	Final	26/09/2023

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Executive summary

Portsmouth Water experienced high levels of per capita consumption (PCC) in the first two years of AMP7, which has resulted in PCC levels remaining higher than expected despite an active water efficiency programme. Portsmouth Water's current projection for PCC at the end of AMP7 is 155.8 l/head/day. This could leave Portsmouth Water with a PCC which is about 16 l/head/day above their current performance target for AMP7.

This is likely to result in a high penalty and creates a significant uncertainty about the scale of performance commitments in AMP8, and the amount of resource required to drive PCC down to the levels expected by Defra.

This review looks at existing evidence that could explain why PCC remains high. It has compared Portsmouth Water's PCC with that of other companies in England and reviewed existing studies into post COVID water use and the behaviours that influence them. The main findings are as follows.

For Portsmouth Water the variation in PCC from 2020 to 2023 is significantly greater than the variation in PCC pre 2020 and the scale of performance commitment targets. The shape of the PCC trend from 2020 to 2023 is similar to the trends for other companies across England and Wales, and this suggests a range of widespread external factors could explain the underlying increase in PCC.

From the review of evidence and research we can be confident that the increase in PCC during the first year of COVID (2020-2021) was directly related to the COVID pandemic combined with the hot dry weather during the summer period. Evidence also suggests that some of these changes in societal practices are persisting, with hybrid working becoming the norm for a significant part of the population. This will result in people spending more hours of the day in their homes, and people spending a significant proportion of the day in a different location to their workplace.

Additionally, there is evidence showing that the peak summer weather has led to an increase in PCC during this period, more than would normally be expected because of the residual impacts from COVID. There are also other factors, such as the cost-of-lining crisis, the drought and introduction of temporary use bans in 2022 that could act to reduce the level of PCC in 2022.

All these factors lead us to conclude that the levels and variability of PCC are more uncertain going forward, and we cannot assume that PCC levels will continue to reduce to target levels despite the continuing action to reduce consumption through water efficiency activity.

Whilst there is very strong evidence on the impact of COVID during the year 2020-21, there is less evidence on the direct impact on PCC as we emerge from COVID and a new normal which includes hybrid working.

Therefore, Portsmouth Water with a group of other water companies have been active in defining a collaborative study to analyse a range of data over the period from 2021 to 2023 to provide specific evidence on the impact of COVID and the other external factors during AMP7. This will also allow more detail models to be developed to improve the prediction of future household consumption under a range of possible scenarios. This project expected to start this Autumn, with outputs expected in 2024.

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1 Introduction and background

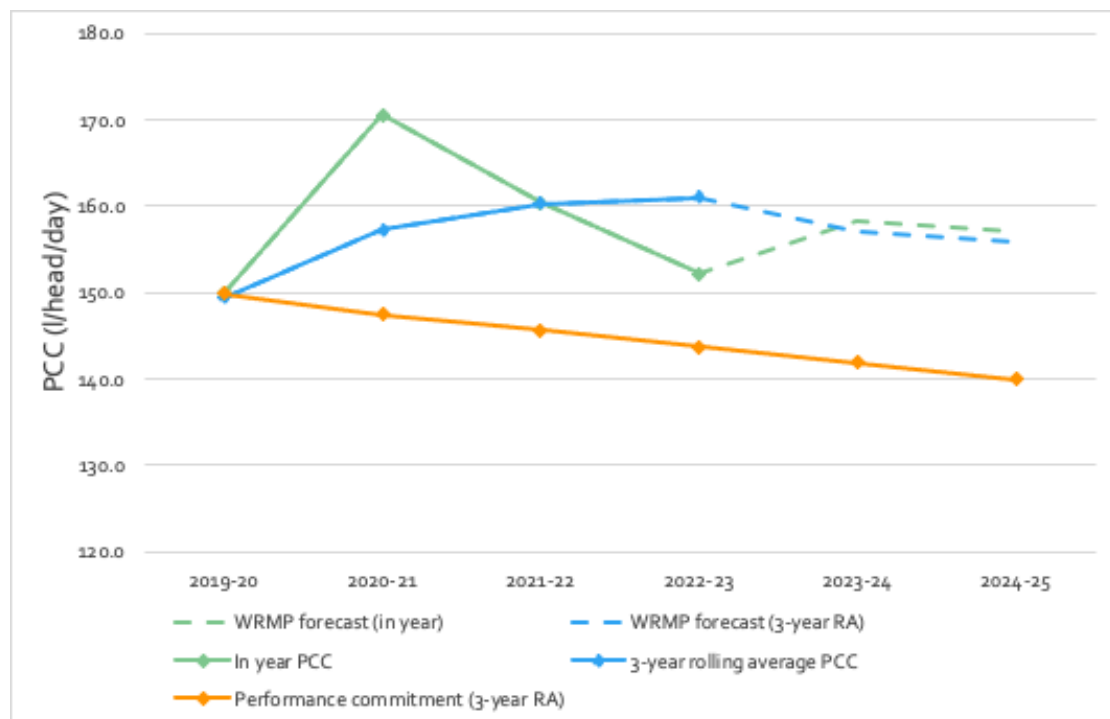
For the reporting year 2022-23, Portsmouth Water’s per capita consumption (PCC) level is higher than expected at a level of 152.5 litres/head/day. As a 3-year rolling average, used for the Performance Commitment (PC), the PCC figure is 161 compared to a target for 2022-23 of 143.7 l/head/day. This has raised concerns within Portsmouth Water that the company:

- could fail the end of AMP7 PCC target, incurring performance commitment penalties, as the current PC for PCC is set at 139 l/head/day and the expected outturn for AMP7 is around 155 l/head/day,
- could incur more severe PC penalties in AMP8 as Ofwat may set the PC from the expected AMP7 outturn resulting in an AMP8 target of 125 l/head/day starting from a PCC of 155 as opposed to 139 l/head/day.

The second bullet point is of more concern as it is likely that the PCC reduction from 155 to 125 will need to be funded out of base totex, and the PC penalties in AMP8 will be significantly higher than they are in AMP7. The current (AMP7) under performance payment is £33,000/l/head/day, the anticipated AMP8 under performance payment is £267,000/l/head/day, an 8-fold increase.

Portsmouth Water’s reported PCC for AMP7 so far compared to the AMP6 outturn (2019-20) and the AMP7 performance commitments, are shown in Figure 1.

Figure 1 PCC levels in AMP 7 compared to the performance commitments



Between 2019-20 and 2020-21 (first covid-19 year) the PCC increased by 14%, by 2021-22 the PCC level was still 7% higher than the 2019-20 level, and the last reporting year (2022-23) the PCC is still above the 2019-20 level (by 2%).

The high levels of PCC in the first two years of AMP7 are having a large impact on the 3-year rolling average (blue line in Figure 1) such that by 2022-23 the 3-year rolling average PCC is 161.0 l/head/day compared to a target level (orange line) of 143.7 l/head/day, i.e. 17.4 l/head/day higher than the target.

The dotted lines in Figure 1 show the projected in-year and 3-year rolling average PCC values from the Water Resource Management Plan (WRMP). These would result in the end of AMP 3-year rolling average PCC being 155.8 (l/head/day), or 15.9 l/head/day above the PCC end of AMP performance commitment.

This report explores whether Portsmouth's performance is significantly different from other companies and presents an explanation for the potential causes of the PCC levels experienced so far in AMP7.

2 How does Portsmouth compare to other companies?

Figure 2 shows a plot of the in-year PCC (green line), the 3-year rolling average PCC (blue line) and the PCC performance commitments (orange line) for each of the water companies¹.

Figure 2 Per capita consumption data for all companies in AMP7



Whilst the scale of PCC is different for each company, the shape of the changes in PCC for the first 3 years of AMP7 are similar in that each company saw an increase in PCC from 2019-20 to 2020-21, followed by a reduction over the subsequent two years. In every case, the 3-year rolling average PCC is above the performance commitment target for 2022-23. In this respect the PCC trend to date for AMP7 for Portsmouth Water is in line with the trend experienced by other companies.

¹ The following companies, WSH and SWB, have not been included as they are currently under investigation by Ofwat relating to leakage and PCC.

In Figure 3 we have calculated the variance in PCC from 2017-2020 (blue bars) and the variance in PCC from 2020 to 2023 (orange bars) and compared these to the variance in the performance commitment over the period 2020 to 2023 (green bars).

Again, Portsmouth is like all other companies in that the variance in PCC over the period 2020 to 2023 is higher than the variance in PCC pre 2020 and the variance in the performance commitments.

Figure 3 Variance in PCC pre and post 2020 compared to performance commitments

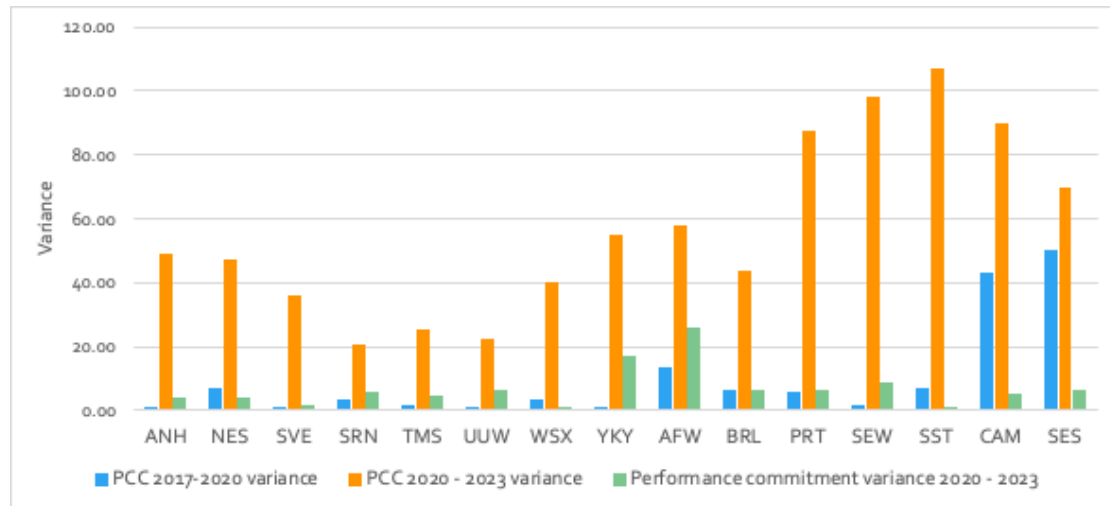
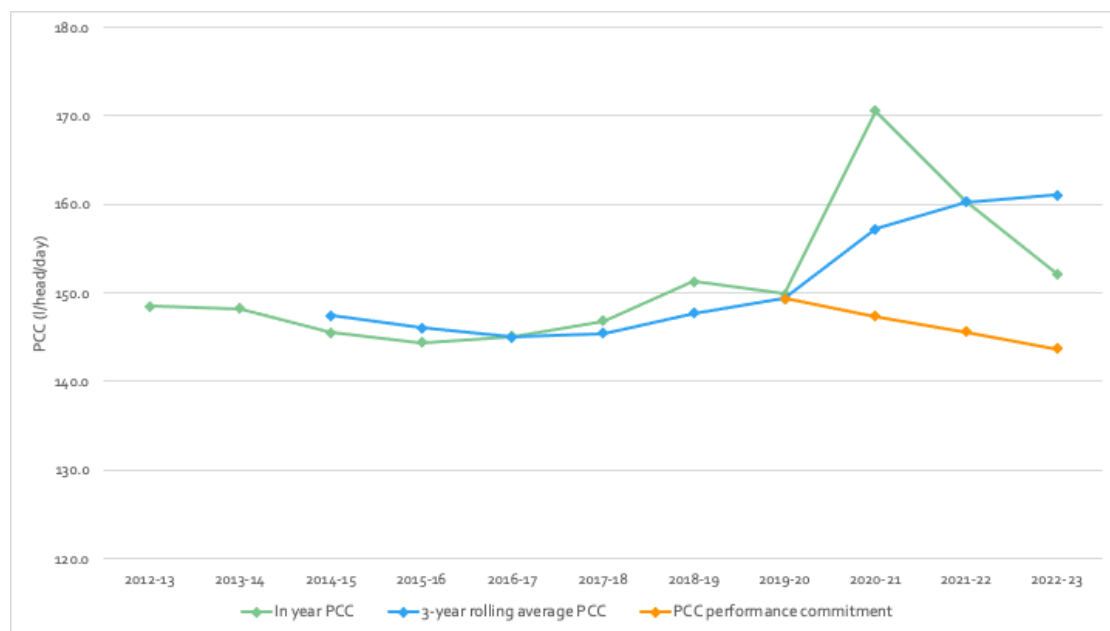


Figure 4 shows the PCC (in year and the 3-year rolling average) for Portsmouth Water from 2012 to 2023 compared to the PCC performance commitment from 2020 to 2023 .

Figure 4 Portsmouth variation in PCC from 2012 to 2023



For Portsmouth Water the variation in PCC from 2020 to 2023 is significantly greater than the variation in PCC pre 2020 and the variation in performance commitment. The shape of the PCC trend from 2020 to 2023 is similar to the trends for other companies.

3 Potential causes of the variation in PCC

As shown in the previous section the trend in PCC from 2020 to 2023 is similar for many companies, this would indicate a series of common factors could be involved. These are examined in the following sections.

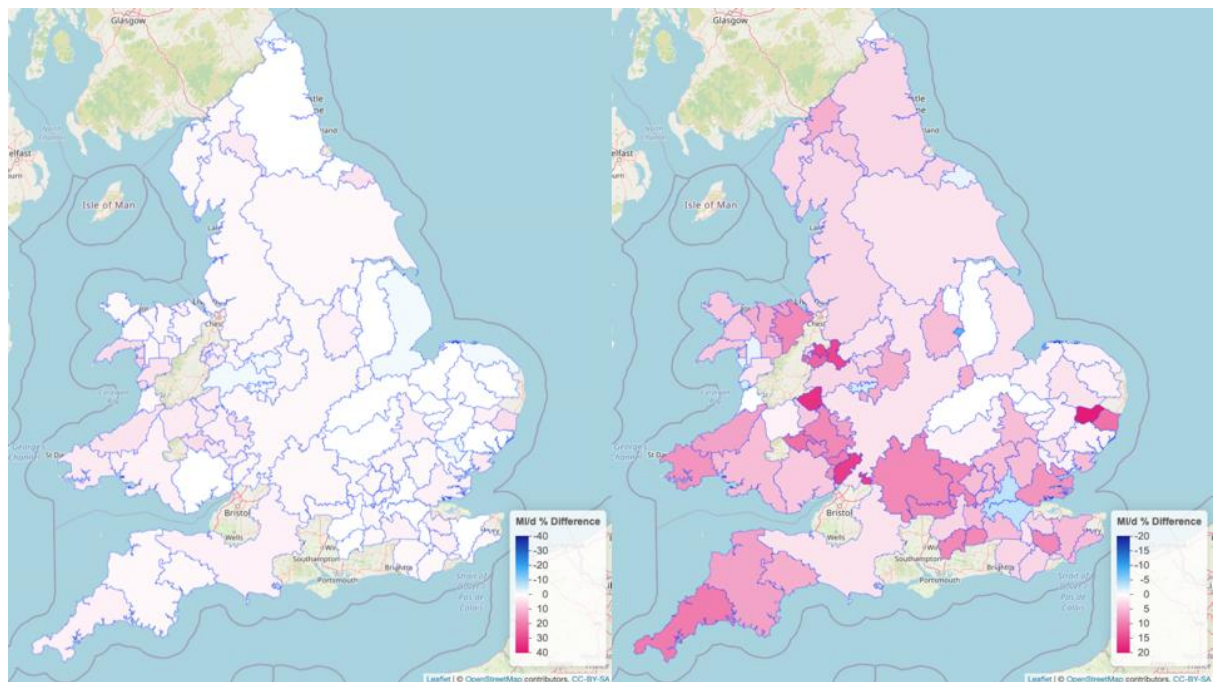
3.1 COVID-19 impact on demand

The COVID-19 pandemic resulted in a UK wide lockdown starting on the 20th March 2020. The COVID policies and measures put into place have had a profound impact on society and day to day life. People spent more time at home and less time in their workplaces. Travel within and outside of the UK reduced. This has changed the way people use water. The location, types and drivers of water use has changed.

Artesia produced evidence during the first year of COVID for most water companies². Between March and October 2020, water use in homes increased by between 9% and 13% across England and Wales. Water use in commercial properties and workplaces decreased. Overall, the total demand increased during 2020 up by an estimated 2.6%. This pattern is consistent, but the amount varies between regions. When we look at area level data and samples of individual households, we see that patterns of water use have changed in the home.

To illustrate the overall impact from January to October 2020, we can look at distribution input data at water resource zone (WRZ) level. Figure 5 shows the change in total demand from pre-COVID on the left, to during COVID up to October 2020 on the right.

Figure 5 A map depicting showing total demand differences pre and post COVID period



² The impact of COVID-19 on water consumption during February to October 2020 (Artesia, 2021)

Blue shading indicates a reduction in total demand, pink shading indicates an increase in total demand. For the majority of WRZs in England and Wales there is an increase in total demand during 2020 that we believe is due to COVID-19 and the policies implemented to control the spread of the virus. Whilst the change in Portsmouth Water is now shown on this map, total demand will have increased due to the large increase in PCC.

The expected diurnal patterns we see in water have also changed. We saw during COVID flatter usage patterns throughout the day, with fewer properties following the regimented behaviour we normally observe. People had more time to invest in water using activities throughout the day. Behaviours such as showering later in the day, cooking and cleaning activities were less time constrained. People also used water in different locations, due to furloughs and people working from home and not commuting into their work places.

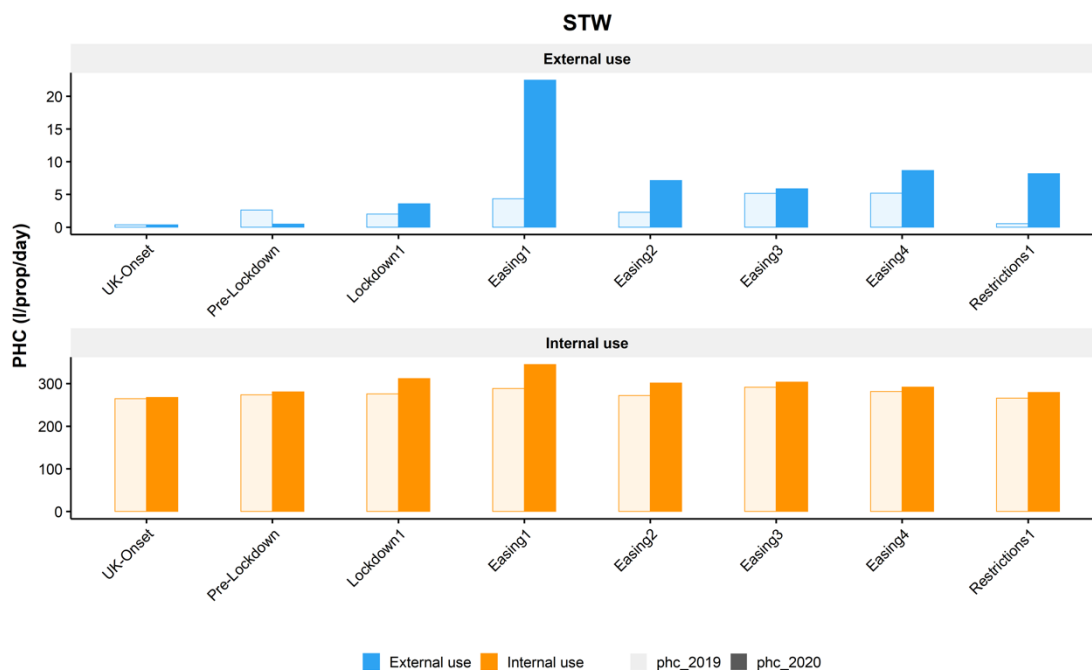
In total, more water was used through the day in the home. There was anecdotal evidence of increased sanitation and hygiene, but this is difficult to separate from people simply spending more hours at home during the day³. Consistently though, in all the data provided to Artesia, household consumption was higher even where total demand of a geographical region may have dropped.

Weather had a big influence on household demand in 2020 with significantly hotter and drier periods during April to August. This resulted in significant increases in garden use, as well as increased consumption within home during hot and dry weather. Before the onset of COVID water companies were able to predict the relationship between weather and household demand very well. During COVID, there was a heightened response, over and above what would normally be seen. With children at home all week, people furloughed and older people shielding, this was not surprising. Welfare and entertainment outweighed water saving in a similar way to single use plastic vs hygiene during the pandemic.

An example of the change in internal and external consumption is shown in Figure 6. The top line shows external use (blue) and the bottom line is internal use (orange). This clearly shows that the peak increase in consumption during easing 1 was driven by outside use, and we also see increased internal use through the whole period.

³ Alda-Vidal, C., Smith, R., Lawson, R. and Browne, A.L., 2020. Understanding changes in household water consumption associated with Covid-19.

Figure 6 Variation in internal and external water use during stages in COVID restrictions



3.2 Why water use remained high post COVID

To further the exploration of why PCC levels in Portsmouth are higher than anticipated we draw on wider behavioural evidence. Artesia’s Social Science Service explored the ‘how and why’ behind water consumption, gathering evidence and insight into households’ water using behaviours. In 2022, Artesia conducted a collaborative project with several water companies that aimed to explore the everyday water using behaviours of households across the UK. Across July to September 2022, we conducted a mixture of interviews, home tours, focus groups and consumption data analysis with 22 households, and generated a snapshot into everyday water using routines⁴. We explored how the Covid-19 pandemic, cost of living crisis and drought conditions (hot and dry weather) had caused disruption in water using behaviours and potentially lead to increases and changes in PCC. Key insights included:

- 1) **Hot and drying weather was seen and experienced in outdoor spaces. This contributed to changing outdoor water using practices, including increases in outdoor water use to adapt to prolonged hot and dry conditions.** People enrolled in new and amended garden water regimes, ranging from new watering practices to changes to usual routines e.g. extra evening waters. Across the sample, hosepipe bans and calls for restraint had some affect (e.g. people abandoning certain plants or grow spaces as they could not be maintained) but some households still continued to water their outdoor spaces. It also included new outdoor leisure and play activities, including the purchasing of supermarket 'special buy' hot tubs, lazy spas, and pools. This often coincided with school holidays, weekends/bank holidays and/or family or community events. **These changes to outdoor watering practices are likely to have**

⁴ Cahill, J., Hoolohan, C., Lawson, R. and Browne, A.L., 2022. COVID-19 and water demand: A review of literature and research evidence. *Wiley Interdisciplinary Reviews: Water*, 9(1), p.e1570.

occurred in the Portsmouth area leading to increases in PCC figures as households adapted to hot and dry conditions.

- 2) **In addition to the above, the first 'extreme temperatures' experienced in the UK saw widespread changes to everyday personal hygiene routines as people attempted to keep cool.** Households enrolled in extra showers to their daily washing routines to keep cool and freshen up. Four out of the five hottest days on record have occurred since 2020⁵, and in 2018 we experience the longest hot and dry period since 1976⁶. While only short lived, as these extreme temperatures are predicted to become more normal⁷ in the UK in the medium term. **Potential increases in water consumption as a result may drive up PCC figures as we head into AMP8.**
- 3) **The cost-of-living crisis has had and continues to have an impact on when, how, and why people consume water.** People discussed the cost-of-living crisis and in particular the connection between water and energy usage. They noted how energy prices influenced how, when, and why they completed certain practices, such as doing the laundry, washing the dishes, having a shower or heating a hot tub. People renegotiated water using behaviours to reduce energy usage (and by association water usage). **We do not yet know the long-term effects of these changes but in altering how, when, and why water using behaviours are completed it may have had a medium - long term impact on the amount of water used and PCC figures.**
- 4) **The pandemic and 'new normal' have had a substantial impact on water using behaviours in the home.** We observed a clear change in everyday life for some households because of the Covid-19 pandemic. Several participants had new working routines, including increased hybrid working and full-time working from home. This resulted in water using behaviours being relocated into the home that may have previously been conducted at work or outside the home as well as a decoupling of certain activities from the working days rhythm for example, laundry completed as a 'work break' during the day instead of slotted around the 9-5 routine, and showers relocated to gyms or completed at home also as a 'work break' or a relaxation/post work activity. **While the pandemic legacy is only now being realised, this evidence reveals what the long-term impacts of the societal upheaval could be. Changes to how people lead their lives have had and will continue to have substantial impacts on the amount of water they use, but also when people consume water and why people use it.**

Overall, behavioural evidence collected at Artesia reveals how recent shock events have had and continue to have significant and deep impacts on household water using behaviours. This has driven up PCC and altered the drivers and routines that underpin how people use water in the home. These changes to water using behaviours are outside of the control of PW and largely because of the large-scale societal upheaval we have experienced across AMP7.

Wider behavioural evidence across the water industry adds to these conclusions. For example, academic evidence on the impact of the covid-19 pandemic on everyday routines

⁵ <https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2022/july-heat-review>

⁶ <https://www.artesia-consulting.co.uk/blog/New%20report%20provides%20insights%20into%20what%20drives%20peak%20water%20demand>

⁷ <https://www.metoffice.gov.uk/research/climate/understanding-climate/uk-and-global-extreme-events-heatwaves>

and water using behaviours indicates that it led to an increase in PCC in homes, with potentially deep and lasting changes to how people conduct their everyday life⁸ (working routines, socialising etc.) changing water using habits.

Similarly, early industry evidence found the cost-of-living crisis was having a significant impact on water usage, for example in June 2022, Thames Water and Yougov found that over half of adults in England had taken action to reduce the amount of water they used⁹.

A further complication is that during the summer of 2022 most of England and Wales experienced a drought, and Temporary Use Bans (TUB) were introduced by six water companies, including Southern Water's Hampshire and Isle of Wight areas which border Portsmouth Water. The findings from a recent UKWIR study show that Temporary Use Bans have a significant effect on household consumption and distribution input. Whilst Portsmouth did not introduce a TUB, it is likely that consumption by customers in Portsmouth were impacted by the communications about drought and TUBs, which may have suppressed levels of PCC in 2022-23.

Despite the profound effect of these shock events on water behaviours and PCC, published industry evidence on how and why they have affected water consumption is thin on the ground. Beyond some industry publications and Artesia's own research, detailed exploration of how PCC has changed is missing. This is needed to understand how water using behaviours have potentially changed, how this impacts PCC and water company reporting numbers as well as to re-evaluate water companies' abilities to reduce PCC in line with industry targets and what water efficiency activities are possible/what support will be needed.

3.3 Water efficiency activity

During AMP7 Portsmouth Water have been implementing their plan to reduce PCC through an increased level of water efficiency interventions compared to AMP6. Inevitably, the COVID pandemic disrupted the water efficiency activities in the first year of the AMP, but Portsmouth Water have continued to implement their water efficiency plans to reduce PCC. These have included:

- Influencing the consumption habits of their customers through setting up a new water efficiency website "Get Water Fit". The 'Get Water Fit' platform provides Portsmouth Water customers the opportunity to complete a water usage and appliance detail questionnaire and offers water saving devices which are tailored to the respondents circumstances. This was accompanied by a communication plan to encourage water efficiency and provide water saving tips through social media and community events.
- Setting up a water portal to interact with customers and change their water use behaviour through the provision and use of personalised information. This included a large email campaign to encourage customers to sign up to the portal and promote water efficient behaviour.

⁸ Greene, M., Hansen, A., Hoolohan, C., Süßbauer, E. and Domaneschi, L., 2022. Consumption and shifting temporalities of daily life in times of disruption: undoing and reassembling household practices during the COVID-19 pandemic. *Sustainability: Science, Practice and Policy*, 18(1), pp.215-230.

⁹ Households turn off the taps to save cash during cost-of-living crisis. Available at: <https://www.thameswater.co.uk/about-us/newsroom/latest-news/2022/jun/households-turning-off-the-taps#:~:text=As%20the%20cost%20of%20living,water%20they%20use%20this%20year>

- Trialling the use of Leakbot, a small device installed within the customers’ properties to detect the presence of continuous flow and potential internal leaks and plumbing losses. The trial showed that 24% of installed devices identified a potential leak, and for those leaks repaired the average saving was approximately 8% of household consumption.
- Implementing a smart metering trial to test a novel retrofit smart meter device, known as ‘Jellyfish’. The trial was intended to evaluate the technology and use this evidence to inform Portsmouth Water’s future smart metering programme. The trial was successful in identifying properties with continuous flow, which resulting in savings through repairing leaking WCs and customer side leakage.

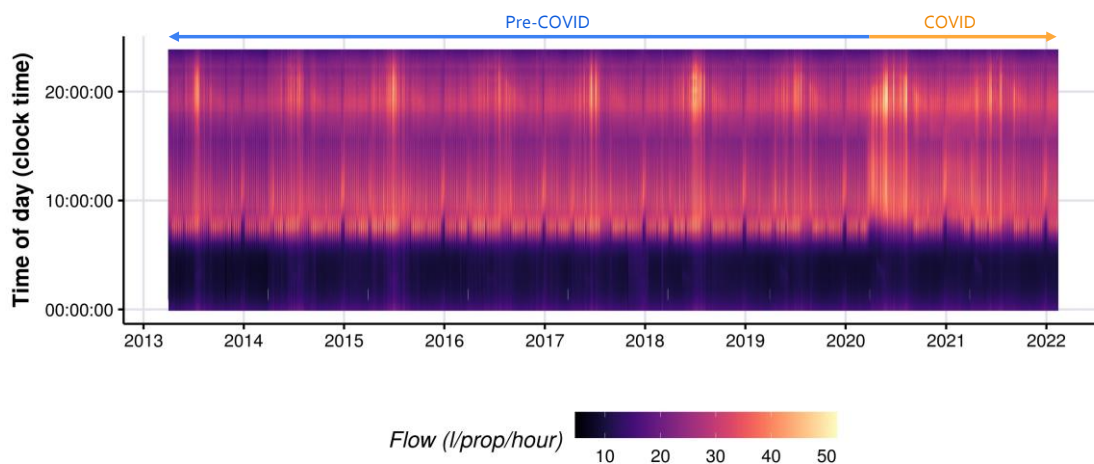
Portsmouth Water are continuing to deliver water efficiency interventions and are using the lessons learnt to improve their future programmes for the rest of this AMP.

3.4 The changes in the PCC metric

In addition to causing an increase in household water consumption, the COVID pandemic has potentially changed the consistency of the PCC metric. PCC is defined as total household consumption divided by total population (for an area) in the reporting year.

Year on year comparisons of PCC rely people using water in the home in a similar way year on year. Pre COVID when we aggregate water use, there has been a very consistent pattern of water use in society which has been driven by a consistent working and schooling behaviours. Figure 7 shows the mean 15-minute water consumption data for about 200,000 properties over 9 years. The horizontal axis is days, the vertical axis is the hour of the day (midnight to midnight) and consumption in litres/property/hour is shown by the colour scale. This is not from Portsmouth Water’s customers but is an area within the Southeast of England. For the pre COVID period this illustrates a consistent pattern of water use week on week, disrupted by school holidays and periods of peak weather. Throughout this period patterns of working remained consistent, with a majority of the population working at their place of work.

Figure 7 Daily patterns of water use for 200,000 properties



Post COVID (March 2020) the patterns of water use became highly disrupted, due the factors discussed earlier in this report. One of those factors is more people working at home than during pre-COVID times. This means that on average it is likely that people will spend more

hours in their homes using water than they did pre-COVID. If this is the case, then for a consistent total population, the PCC metric is now different compared to the pre-COVID metric.

4 Conclusions

The high levels of PCC in the first two years of AMP7 are having a large impact on the 3-year rolling average such that by 2022-23 the 3-year rolling average PCC is 161 l/head/day compared to a target level (orange line) of 143.7 l/head/day. Portsmouth Water's projection for PCC at the end of AMP7 from their WRMP is 155.8 l/head/day as a 3-year rolling average. This could leave Portsmouth Water with a PCC which is about 16 l/head/day above their current performance target for PCC.

This is likely to result in a high penalty and creates a significant uncertainty about the scale of performance commitments in AMP8, and the amount of resource required to drive PCC down to the levels expected by Defra.

For Portsmouth Water the variation in PCC from 2020 to 2023 is significantly greater than the variation in PCC pre 2020 and the scale of performance commitment targets. The shape of the PCC trend from 2020 to 2023 is similar to the trends for other companies across England and Wales, and this suggests a range of widespread external factors could explain the underlying increase in PCC.

From the review of evidence and research we can be confident that the increase in PCC during the first year of COVID (2020-21) was directly related to the COVID pandemic combined with the hot dry weather during the summer period. The evidence suggests that this is due to:

- Changes in water use behaviours during this period including outside water use and water use within the home.
- People spending longer in their homes each day than before the COVID pandemic arrived.
- People re-locating their water use from their place of work to the home due to furloughs and the need to work from home.

Evidence also suggests that some of these changes in societal practices are persisting, with hybrid working becoming the norm for a significant part of the population. This will result in people spending more hours of the day in their homes, and people spending a significant proportion of the day in a different location to their workplace. This in turn has the potential to increase the PCC metric.

In 2022 we also experienced the two hottest days on record, which resulted in a significant increase in demand on those days. Also, in 2022 society started to experience a significant cost of living increase, which was not matched by increases in wages. There is some evidence that this has caused PCC to be lower, as people modify their water use due to increased energy bills. In the same year most of England was in drought and six companies, including Portsmouth's neighbour Southern Water introduced Temporary Use Bans. Therefore, it is likely that PCC in the year 2022-23 has been impacted by hybrid working, hot dry weather and the cost-of-living crisis.

There is always going to be a level of uncertainty when trying to predict what is going to happen for the remainder of AMP7 and into AMP8. However, based on the evidence currently available we can expect the following:

- hybrid working will continue to persist over the next few years whilst companies and society adapt to a new way of working. This could result in higher water use in homes

and some relocation of water use away from employment areas to domestic areas compared to pre-COVID periods.

- Peak temperatures and drier weather will become more frequent, increasing the probability of peak summer water use.

The impact of the cost of living is more uncertain, the evidence is more limited and suggests that in 2022-23 it could be responsible for reducing PCC as customers attempt to save energy costs. We do know that wages are catching up with the increased cost of living, which may lessen this impact. If this happens then we may see this impact on consumption reduce, resulting in an increase in PCC.

All these factors lead us to conclude that the levels and variability of PCC are more uncertain going forward, and we cannot assume that PCC levels will continue to reduce to target levels despite the continuing action to try and reduce consumption through water efficiency activity.

Whilst there is very strong evidence on the impact of COVID during the year 2020-21, there is less evidence on the direct impact on PCC as we emerge from COVID and a new normal which includes hybrid working. This is due in part to the other external factors that act on PCC and complicate our understanding of PCC, including peak weather, drought interventions and the cost-of-living crisis.

Therefore, Portsmouth Water alongside a group of other water companies have been active in defining a collaborative study to analyse a range of data over the period from 2021 to 2023 to provide specific evidence on the impact of COVID and the other external factors during AMP7. This will also allow more detail models to be developed to improve the prediction of future household consumption under a range of possible scenarios. This project expected to start this Autumn, with outputs expected in 2024.

We also recommend that Portsmouth Water continue with their planned water efficiency programme and identify specific opportunities that could help improve PCC reporting performance.