

Section 2

Water resources programme 2015-2020





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Section 2.

Water resources programme 2015-2020

In this section we set out our progress on the WRMP14 programme and the activity we will have completed by the end of March 2020, which forms part of the Price Review process undertaken with Ofwat in 2014 (PR14)

- We present how we plan to meet the supply demand gap, accounting for the challenges of growth being higher than forecast and the need to transform leakage working processes to meet the asset management plan period 6 (AMP6) target by 2019/20
- We outline the learning from the start of the roll-out of our smart metering programme, our ambition to develop a smart network, and the work we have done with customers on water efficiency to reduce their consumption, which has won national awards
- We present an overview of the supply demand studies undertaken to inform the development of our Water Resources Management Plan 2019 (WRMP19)
- We describe where we are progressing schemes to mitigate the impact of our abstractions on the environment



A. Summary

- 2.1 By the end of March 2020, we will have delivered our AMP6 water resources programme which forms the first five years of our 25 year Water Resources Management Plan 2014 (WRMP14) programme. The plan includes leakage reduction, metering and water efficiency as well as a resource development programme in the London Water Resource Zone (WRZ) to maintain supply security. All WRZs are forecast to be in a surplus at the end of the period, excluding London which has a 24 MI/d deficit.
- 2.2 We will have nearly 400,000 more people in our supply area at the end of 2017/18 than was anticipated in WRMP14. We estimate that the total number of customers in our area will grow to 10.1 million by 2019/20. This equates to growth being 4% higher than forecast in WRMP14 and approximately 39 MI/d of additional customer demand.
- 2.3 We missed our leakage target for the first time in 11 years in 2016/17. There have been some challenges associated with embedding a new partnership alliance at the start of AMP6 to transform leakage detection and repair working processes, including improving the impact that these activities have on customer service. We are employing significant resources to reach our 606 MI/d target by March 2020. Our action plan has improved leakage find and fix performance in 2018 however, despite our efforts, overall leakage has been heavily affected by the extreme cold weather event in March 2018 and the hot, dry weather between April and July 2018 and remains stubbornly above planned levels. Whilst we continue our efforts to achieve our target of 606 MI/d by 2019/20, we have revised our forecast to a more realistic figure of 636 MI/d. This will still surpass our best ever leakage performance.
- 2.4 Our programme of progressive metering is underway in London with over 243,564 smart meters installed by the end of 2017/18. Due to the property make up in London, which includes a large number of flats, approximately 60% of the installations require an appointment with a customer to install an internal meter. There are challenges associated with engaging busy and transient customers to make these appointments. As a result we have accelerated the delivery of the fixed radio network across the London WRZ to enable more external meter installations and targeted additional customer side leakage repairs from bulk metering common supply pipes to housing developments with large private mains networks.
- 2.5 Resource development included in WRMP14 for the London WRZ is ahead of target and is forecast to deliver an extra 46 MI/d water into supply. The new schemes (Section D below) include water trades and groundwater development.
- 2.6 We have undertaken an extensive programme of supply demand studies to inform the development of WRMP19. The drivers for WRMP19 remain largely unchanged from WRMP14, although there is an additional water industry driver focusing on security of supply resilience and the need to consider more extreme drought events than have occurred in the previously used historical record. WRMP14 highlighted the need for a new large resource scheme (>150 MI/d) or combination of schemes from the mid-2020s, which has resulted in us undertaking a detailed programme of investigations and options appraisal in AMP6. Work is on-going to assess the wider benefits of smart metering. We have reviewed our household meter data and increased the WRMP14 estimate for customer reduction in water use after

meter fit from 12% to 17%. This finding aligns with savings reported by other water companies in the South East.

2.7 The remainder of this section is structured as follows:

- Introduction
- AMP6 Demand Management Programme
- AMP6 Resource Development Programme
- Update on Supply Demand Studies
- AMP6 Environment Programme
- AMP6 Supply Demand Balance

B. Introduction

2.8 All WRMPs start from a 'base year'. The base year for WRMP19 is 2016/17. Our activity through to 2020 was included as a part of the Price Review process undertaken with Ofwat in 2014 (PR14). In this section we set out the activity we will have completed by the end of March 2020.

2.9 Our performance each year is published on our website and reported to Ofwat in a process known as the Annual Return (AR). Further details are available on the Ofwat website. We also publish an Annual Review of the current WRMP, as required by the Environment Agency¹. Please refer to these documents for further details on our activity in this period.

C. AMP6 Demand management programme

2.10 Demand management is any activity that reduces the amount of water we need to put into supply. This includes the reduction of losses from our distribution system in transit to customers and in how much water our customers use. Typical demand management activities include:

- Leakage reduction – fixing leaks on the distribution network and customer supply pipes
- Metering – metering helps us and customers identify leaks and can reduce demand for water by raising awareness of how much is being used. As such it is an important 'enabler' for both leakage reduction and water efficiency
- Water efficiency – activity to enable customers to be efficient in their water usage and reduce wastage. This can be device led (e.g. tap inserts, efficient shower heads, trigger nozzles for hosepipes, etc) and/or advice led, to improve awareness

2.11 To 2020 we will deliver a number of demand management outcomes, which are summarised in Table 2-1.

¹ Environment Agency, Annual Review, June 2017- <https://corporate.thameswater.co.uk/About-us/Our-strategies-and-plans/Water-resources/Our-current-plan-WRMP14>).

Table 2-1: Activity within the AMP6 demand management programme

Activity	Unit	2015/16 Actual	2016/17 Actual	2017/18 Actual	2018/19 Forecast	2019/20 Forecast
Reported leakage²	MI/d	642.5	677.2	694.7	708.0	636
Leakage target³	MI/d	649.0	630.4	619.5	611.4	606.3
Optant metering	Nr	18,689	19,798	16,559	17,406	14,035
Progressive metering	Nr	42,083	103,422	98,053	56,436	- ⁴
Water efficiency	MI/d	7.05	11.82	11.57	10.97	6.61

Leakage

- 2.12 Leakage reduction is a key element of our plan to manage the balance between supply and demand. Total leakage has been reduced by 30% since the peak in 2003/04. Our leakage reduction plan also ensures that pipe bursts do not become more frequent and customers' supplies will be interrupted less frequently. A key feature of the AMP6 plan is to reduce leakage by a further 10% (59 MI/d) in the period 2015-20.
- 2.13 We currently estimate that 72% of leakage is from our water network and 28% is on customer supply pipes.
- 2.14 Leakage is primarily being reduced through:
- Repairing leaks reported to us by our customers
 - Proactively detecting and repairing leaks on our network, hidden underground, targeted through district meter areas
 - Undertaking free repairs of leaks for our customers on their underground pipework
 - Installing more household meters to allow us to better target customer side leakage activity, including the use of smart meters being rolled out as part of the Progressive Metering Programme (PMP)
 - Optimising pressures throughout our water network, ensuring fluctuations and excessive pressures are minimised, providing more constant pressures to our customers whilst reducing bursts
 - Replacing ageing mains, targeting those that leak and burst the most. This not only helps to reduce leakage but also to reduce future disruption and inconvenience to our customers

²These are based on the 'ODI methodology' assumptions and do not include an up-lift for the leakage consistency (shadow reporting) impact.

³Annual Return Table 10 consistent.

⁴To be reviewed and balanced with the revenue meter replacement programme which is prioritised in 2019/20.



- Introducing improvements in how we account for water use, both by our customers and by ourselves in our day to day management of the network
 - Using advanced monitoring on our trunk mains to detect small leaks before they burst and cause large scale disruption
 - Using advanced analytics to undertake flow balances across our network from abstraction to the customers' tap and all the meters in between, identifying and resolving imbalances through improving metering, network understanding, and ultimately targeted leakage reduction with in-pipe acoustic investigations on our large trunk mains
 - Through the coldest parts of the winter, injecting our network with warmer water from our desalination plant and underground reservoirs
 - Trialling new approaches to leak detection including the use of satellites and drones
- 2.15 Although replacing the oldest and leakiest parts of our network is the best way to make long-term sustainable reductions in leakage, detecting and repairing leaks still forms a key part of the leakage strategy to offset leakage recurrence levels that are well in excess of other companies. Currently we detect and repair some 65,000 leaks per annum, with an estimated leakage benefit value in excess of 400 MI/d.
- 2.16 Approximately one quarter of leakage comes from supply-pipe leaks from customers' own pipes. We offer our domestic customers a free leak repair and pipe relay service.
- 2.17 At the start of AMP6 we formed a new contracting partnership alliance (called the Infrastructure Alliance) to encourage better, smarter and more collaborative working. This has proved more complex than expected to implement and embed. These issues, along with the desire to always keep customers in supply throughout the leak repair process whilst working within traffic management restrictions, have hampered our ability to detect and repair leaks quickly and efficiently. In 2016/17 we missed our leakage target by 46.8 MI/d. This was the first time we had missed the target in 11 years. Our annual average leakage for 2017/18 is 694.65 MI/d. This exceeds our Company level performance commitment target of 620 MI/d and reflects the difficulties experienced in 2016/17 with increasing leakage during that year.
- 2.18 Given the magnitude of the failure to deliver our leakage target in 2016/17, Ofwat launched an investigation into our performance. In June 2017 we welcomed the conclusion of the investigation and as part of the agreement between Thames Water and Ofwat, £65 million will be paid back to customers, on top of £55 million in automatic penalties, making a total of £120 million returned to customers from our shareholders.
- 2.19 Following endorsement by Thames Water's Board in July 2018, in August 2018 we committed to steps in relation to leakage reduction performance and management of leakage reduction operations with Ofwat as part of our undertaking for the purpose of section 19 of the WIA 1991⁵.
- 2.20 Additional funding has also been committed to trunk mains rehabilitation in AMP6. After a series of bursts on our trunk mains network in 2016, we committed to undertake an independent Forensic Review (March 2017) and a Trunk Mains Strategic Review (October 2017) which are published on our website. The strategic review includes a high level

⁵ <https://www.ofwat.gov.uk/investigation-thames-waters-failure-meet-leakage-performance-commitments>



implementation plan to improve monitoring, asset information, risk management and event response. We continue to work with partners to develop our trunk mains investment programme. Our CEO is the water sector representative on the London Mayor's Infrastructure High Level Group (IHLG) and we support the formation of the proposed Infrastructure Coordination and Delivery Unit (ICDU) that promotes collaborative working between statutory undertakers. In September 2018 we will set out our trunk mains investment plan in our PR19 Business Plan submission to Ofwat.

- 2.21 In March 2018 we experienced freeze / thaw supply interruptions during the extreme cold weather. As part of our learning from this event we have installed a customer incident team in June 2018 to respond to all such events, updated our phone systems and social medial channels and enabled consistent messaging. The team will provide dedicated face to face support to customers 24/7 during supply interruption incidents with an explicit focus on proactively contacting vulnerable customers to provide support and bottled water until supplies are restored. We are also working with partners, including Local Authorities and AgeUK, to improve our Priority Services Register (PSR) which holds the contact details of vulnerable customers. The focus of these initiatives is to enable us to work together during an event both in using the data we hold and in giving our customers the support they need as promptly and effectively as possible.
- 2.22 We are employing significant effort to reach 606MI/d by March 2020. Through a combination of innovation, effort and understanding, we are working harder than ever. Compared with our position in 2016/17, we are now finding and fixing more leaks, reducing backlogs, speeding up repair times and improving our use of assets and data, compared with our position in 2016/17. However, despite our strenuous efforts to improve, there has been a frustrating disconnect between our efforts and our results, with overall leakage levels not reducing as we had hoped. Our current action plan will address this.
- 2.23 Our performance in 2018/19 has been heavily affected by two challenging weather events: the extreme cold weather in March 2018 – the Beast from the East; and the hot, dry weather between April and July 2018. Both have contributed to increases in leakage and we have struggled to recover our performance sufficiently to keep our original forecasts of 2019 year-end value and our 2019/20 average leakage level. Our current best view is that we have ended the year on 31 March 2019 at a spot value of 663MI/d, which is 30MI/d higher than our previous forecast of 633MI/d.
- 2.24 This means we begin 2019/20 at a higher level of leakage than we had expected to, which has a knock-on effect on our ability to reduce leakage during the year. We will continue our efforts to achieve our annual average leakage target in 2019/20 of 606MI/d, but from the experience of the past year, our forecast is likely to be more realistic, central figure of 636MI/d. This will still surpass our best ever leakage reduction performance.
- 2.25 We report six-monthly to Ofwat on our progress against our section 19 undertakings and monthly to Ofwat, the Customer Challenge Group and our customers on our progress with leakage. A monthly report is published on our website for customers to provide an update on the targets, performance, number of leaks fixed and leakage reduction activities (<https://www.thameswater.co.uk/help-and-advice/leaks/our-leakage-performance>).



- 2.26 In July 2017 Ofwat introduced the requirement to report leakage following the newly defined guidance developed by UKWIR⁶. This reporting is to be in the form of shadow reporting for the remainder of AMP6, 2016/17 to 2019/20, with the requirement that companies' leakage performance commitments will be set based on the new reporting methodology for AMP7. We have estimated that our reported leakage levels will increase by approximately 40 MI/d using the new methodology. It should be noted that not all the changes specified in the UKWIR report have been fully incorporated into our provisional estimate as we need to install additional pressure and flow monitoring equipment in the field as well as implement software upgrades before this can be achieved. We will be undertaking further works in AMP6 to become compliant with the new requirements by AMP7.
- 2.27 For further information on the leakage reduction options considered in our plan, see Section 8: Appraisal of demand options and Appendix M: Leakage.

Metering

- 2.28 Smart meter data supports demand management, water efficiency and leakage improvements. Smart meters provide greater insight into asset performance, improving the speed and effectiveness of decision making and enabling investments to be made more wisely. From a customer's perspective, smart meters put them fully in control of their bill. They help meet an increasing customer expectation to access services digitally and will change our role in the relationship from being just water supplier to trusted advisor on water and energy use.
- 2.29 In 2014 we started our transformation journey to deliver an industry leading smart metering programme. Key milestones of this transformation included:
- Appointing a new meter installation partner
 - Creating a smart metering operations centre to manage the millions of meter reads we would start to receive
 - Procuring a new meter, radio network and data capture supplier and starting to build our radio network
 - Developing a new customer journey and training our teams to become smart metering experts
- 2.30 Table 2-2 presents the total number of optant, progressive and bulk meters installed in AMP6 compared to the anticipated outputs over the period.

Table 2-2: Meter installations in AMP6

New meter installations		2015/16	2016/17	2017/18	2018/19	2019/20	AMP6 total
	Target	34,089	34,089	34,089	34,089	34,089	170,445
Optant metering	Actual/forecast	18,689	19,798	16,559	17,406	14,035	86,487
	Difference	-15,400	-14,291	-17,530	-16,683	-20,054	-83,958

⁶ UKWIR, Consistency of Reporting Performance Measures, July 2017, Report Ref No. 17/RG/04/5



New meter installations		2015/16	2016/17	2017/18	2018/19	2019/20	AMP6 total
	Target	40,000	110,000	109,990	109,990	71,020	441,000
Progressive metering	Actual/forecast	42,083	103,428	98,053	56,436	-7	300,000
	Difference	2,083	-6,572	-11,937	-53,554	-71,020	-141,000
Bulks	Actual/forecast	1,086	1,080	556	960	960	4,642

Progressive metering programme

- 2.31 In WRMP14 we planned to install 441,000 smart domestic water meters by the end of AMP6 as part of the Progressive Metering Programme (PMP), in order to contribute towards delivering 33.7 Ml/d of demand related savings.
- 2.32 Under the PMP we have installed 243,564 meters in the first three years of AMP6. This is in line with our revised delivery programme. However, the programme requires significantly more internal installations than originally envisaged, presenting challenges with respect to generating appointments with our customers. It was assumed that the majority of our meters would be fitted externally in the footpath. We have quickly learnt, however, that this is not the case and in fact, due to the property profile in London, approximately 60% of our meter fits require an appointment with a customer. Trying to engage a busy, transient population living largely in rented accommodation has been challenging. Our biggest obstacle to overcome is customer engagement; customers do not know who their water supplier is, let alone if they have a meter. Renters do not understand their responsibility in terms of getting a meter fitted and a small group of customers actively object to having a meter fitted. We have had to innovate and learn to develop our communication techniques quickly to open up new channels to enable customers to engage with us. One of our recent improvements has been launching an online appointment booking platform which has helped us digitalise our reach out to a wider demographic.
- 2.33 As a result of the challenges associated with internal meter installations the PMP is expanding into more London Boroughs than originally planned to progress external meter installations. This has required an accelerated roll-out of the fixed radio network across the London WRZ. The forecast number of progressive meter installations in AMP6 has been reduced to account for this issue and the number of targeted bulk meter installations has been increased to make up for the shortfall in demand reduction benefits by identifying and repairing additional customer side leaks. Work is currently in progress to develop and trial a more cost effective internal meter installation journey.
- 2.34 Our smart meters are helping us pinpoint leaks on customers' pipes more accurately than ever before. The data they collect alerts us to continuous flow, which is where the flow does not drop to zero over a sustained period of time, indicating that there could be a leak. We are now receiving more than six million reads per day through the fixed network, benefiting the wider business with increased data on consumption.

⁷ To be reviewed and balanced with the revenue meter replacement programme which is prioritised in 2019/20.



- 2.35 A number of customers will see an increase in their bill after the meter is installed. To manage this 'bill shock' we allow customers two years to switch over to a metered bill. We have now activated over 184,865 customers' accounts onto their two year bill comparison journey. We are using smart meter data to write to customers after three months, six months, 12 months and 18 months to let them know what their metered bill is likely to be compared to their current bill which is based on the rateable value of their home. The meter reads are also being used by our online customer platform 'my meter online', to populate daily usage graphs allowing customers to log in online regularly and view their water use. Work is in progress in 2018/19 to trial a shorter one year customer journey. Educating our customers on how much water they use, when they use it and how they can reduce it is a hugely important part of our programme. Smart water meter data allows us to engage with customers in many different ways which will be critical to our success in reducing water use. Updated analysis of our historic metering data shows that customer reduction in water use after a meter fit is approximately 17% which is higher than the 12% forecast for WRMP14. The benefits from the new smart metering programme data will be evaluated from the summer of 2018 when the first customers complete their two year journey and convert to a metered bill.
- 2.36 After fitting the meter we offer all our customers water efficiency advice and a personalised Smarter Home Visit. During this visit we spend time with the customer understanding their current water use behaviour, what they can do to reduce the amount of water they use and fit free water saving devices. The smart water meter data is highly influential in supporting this water efficiency message and it can be used to help customers understand their before and after water use. It also has the potential to be used in future water efficiency programmes, such as gamification, to help push water use savings even further.
- 2.37 We are not only using the smart meter data to detect leaks and reduce customer water use. We're also starting to build our first smart District Metered Areas (DMAs). These are areas within our water network where we know the amount of water we are pumping into it but not necessarily where the water then goes. By installing smart meters, our intelligence on where water is going (i.e. whether it is being used or lost through leakage) will vastly improve. This will help us plan for future investment and ensure we target leakage repair and mains replacement work in the areas with the largest benefit. Smart DMAs will also help us:
- Significantly improve the accuracy of our water balance calculations
 - Make sure we quantify customer side leaks better
 - Improve our understanding of night time consumption
 - Predict leaks before they become visible
 - Make better informed investment decisions with regard to the water network
- 2.38 There are also many indirect benefits of our smart water metering programme that we are only just starting to realise. For example, for customers to view their water use online they have to sign up for an online account. By driving sign ups we are helping to reduce the retail cost of our service as customers can make payments online, change billing details and access their bills etc. without having to call us.
- 2.39 We have saved nearly 13 MI/d in the first three years of the programme through a combination of locating and fixing leaks on our customers' pipes, fixing internal wastage



problems in their properties and by enabling customers to reduce their water usage as a result of having a meter.

- 2.40 The proportion of billed measured households is 40% of all households at the end of 2017/18 compared with 34% at the start of 2015/16.

Bulk metering

- 2.41 The bulk metering programme was developed to better understand demand and leakage on private mains networks. The programme is currently over-achieving as regards its leakage reduction targets and has saved 13.2 MI/d in the first three years of AMP6 through detection and repair of leaks on supply pipes to large blocks of flats.
- 2.42 The team has been working with specialist consultants to target bulk meter installations where there is a higher chance of customer side leaks being identified to improve the cost efficiency of the programme. The current threshold is blocks of flats in London with over 50 dwellings per building.
- 2.43 There are a limited number of these types of buildings with private mains networks within our supply area, so this benefit cannot be relied upon as continuing to be delivered in the long term. The programme is being extended to buildings with over 35 dwellings to make up for the shortfall in benefits from the progressive metering internal meter installations.
- 2.44 An Information Systems (IS) change project will provide the ability for bulk meters to be connected to the fixed radio network, allowing for improved ongoing data capture from the spring of 2017.

Optant metering

- 2.45 It was assumed that, with increased awareness of the benefits of metering through the roll-out of the PMP in London, there would be an uplift in applications from customers wanting to have a meter installed during AMP6 (25% in London and 5% in Thames Valley), compared to AMP5, leading to a total of 170,445 in AMP6 (approx. 34,000 / year).
- 2.46 The current optant meter installation rate is however, significantly below the WRMP14 forecast. During 2016/17 we successfully started the roll out of smart meters on the optant programme to utilise the benefits of the fixed radio network in London.
- 2.47 It is intended to use the historic optant approach to help drive successful internal installations. Customers who have opted for a meter will be more likely to provide us access to enable the installation. It is also proposed that the optant meter installations are rolled up into the PMP in London to ensure a more efficient delivery approach.
- 2.48 For further detail on metering see Section 8: Appraisal of demand options and Appendix N: Metering.

Water efficiency

- 2.49 Water efficiency is an essential part of our long-term plans to sustainably manage water usage. We are delivering the UK's largest ever water efficiency programme of nearly 40 MI/d in AMP6.



2.50 We are developing water efficiency initiatives for households, businesses, schools, local authorities and housing associations. Our customer engagement efforts include home visits, websites, multiple social media platforms, regional campaigns and online calculator tools.

2.51 We promote water efficiency to encourage our customers to save water, energy and money in a variety of different ways, and we work directly with our household and non-household (business) customers via a number of projects, including third party partnership schemes. These include:

- **Smarter home visits (SHVs):** The UK's largest in-home specific advice and fitting of water saving products for customers. The award winning scheme offers our customers a range of free water-saving products and tailored behaviour change advice to save water, energy and money. During the visits we also fix leaking toilets, plus offer selected customers free Benefit Entitlement Check and debt advice
- **Wastage fixes:** Wastage fixes of leaking toilets and taps, as identified through our SHV programme, have ramped up this year. A leaking toilet will waste between 200 – 400 litres a day, on average, and we have a programme running alongside our SHVs to do a one off free fix to households with 'leaky loos'
- **Smarter business visits:** We are offering business customers smarter business visits to fit free water saving devices (including urinal controls) and wastage fixes
- **Water saving freebies:** We offer all our water supply customers free water-saving products – including showerheads and timers, tap inserts, and toilet cistern devices
- **Water energy calculator:** We also provide a free to use water and energy calculator via our website (<https://www.thameswater.co.uk/Be-water-smart>). The calculator helps households to quantify how they use water in the home and their potential savings
- **Water efficiency schools programme:** We have one of the UK's largest schools education programmes for water efficiency, running across 40 to 80 schools each year
- **Water matters:** This is our schools and community engagement programme based in the River Kennet catchment, in partnership with an environmental group Action for the River Kennet (ARK)
- **Local authorities and housing associations:** We are working with a number of local authorities and housing associations and delivering in home water saving device installation, including a trial with Zap carbon linking it to an existing in-home energy and benefits programme being rolled out with London and Quadrant housing in London
- **Save water South East (SWSE):** This is a two year collaboration between Waterwise, the Environment Agency and six water companies in the South East. We have joint funded this partnership to promote water efficiency and increase awareness of water as a finite resource and create a water saving culture in the South East of England. This year, SWSE has started to build relationships with key stakeholders, run the innovative #Thinkwater campaign and also set up a water saving conference with local authorities and housing associations
- **Oxford water efficiency campaign** – during 2016/17 we ran two campaigns in Oxford to raise awareness of the supply demand deficit issue *"More people, less*



water to go around". This consisted of radio adverts, local media, posters at bus stops, and direct mail to households. The pre and post-campaign market research showed a very positive response to the campaign and helped to raise awareness of the water issues faced. We are using the results to help feed into future campaigns, and in autumn 2017 we developed the campaign further to show 'There's no substitute for water', to help customers really value water

- **Why be water smart animation** - We have produced a simple animation to help explain the complex issues around supply/demand deficit and to help our customers understand the wider issues around water resources and why it is important for us all to be water smart (<https://www.thameswater.co.uk/Be-water-smart/Why-be-water-smart>).
- 2.52 After three years of the AMP6 programme we have exceeded our target savings based on the Ofwat assumed savings methodology. However, we are aware that measured savings will be lower than the reported figure which includes an element of assumed water savings. To address the issue of the lower savings figures recorded from measured flow rates/volumes we have increased the scale of our core on-ground water efficiency initiatives with the aim of achieving the AMP6 targets using a greater share of programmes that can support a measured savings methodology. When we have robust water efficiency measured savings from our smart meter data we will change to measured savings and retrospectively adjust for the whole AMP.
- 2.53 Our efforts to improve the quality and increase the quantity of our water efficiency delivery were rewarded in 2016 with four national awards.
- 2.54 Our SHV programme won:
- Water Industry Achievement Award for Water Resource Management Initiative of the Year
 - UK Water Efficiency Award for Built Environment
 - UK Customer Experience Award for Utilities and Team- Customer at the Heart categories
- 2.55 We were also shortlisted in the Sustainability Leaders Awards and the Utility Week Awards for SHVs.
- 2.56 Our Clearwater Court bathroom refurbishment project (Propelair toilets, Cistermiser tap and urinal sensors) and large-scale rollout across our office buildings won the Institution of Civil Engineers – Chris Binnie award for sustainable water management.
- 2.57 In December 2017 we received the UK Eco Friendly Toilet of Year Award. Our SHV were also shortlisted in the SHIFT sustainable housing and EDIE Sustainability Leaders Awards.
- 2.58 In addition to promoting water efficiency activity to help customers use water wisely we committed to undertaking a trial of innovative tariffs in AMP6. The objective of the trial was to understand and quantify customers' responses to alternative tariffs and different communication approaches, as well as helping to understand the logistics, systems, and technology requirements and full costs of implementing tariffs in preparation for their roll-out in the period 2020-2025.



- 2.59 We have undertaken two studies to inform the innovative tariff trial:
- a desk based review of tariffs which have been trialled and adopted internationally⁸
 - an assessment of innovative charging options for Thames Water⁹
- 2.60 We also engaged customers, regulators and stakeholders, including Waterwise and the Greater London Authority (GLA), on our proposed approach. The key findings were to first prioritise measures which would positively engage customers on efficient water use. We have subsequently started an incentives scheme pilot in Reading targeting 3,000 homes. This is the first ever non-financial water efficiency incentives pilot, linked to smart meter data and a web based site. The scheme has been developed with Greenredeem, a recycling reward specialist. The pilot will test whether we can encourage households to reduce their water use in return for points and rewards vouchers. In 2017/18 we expanded the incentives scheme by offering it to over 140,000 customers with a smart meter in London. The learning from the incentive scheme will inform the development of future innovative tariffs which could be adopted in AMP9 when household meter penetration is greater than 65%, to ensure fair imposition on our customers.
- 2.61 Average household per capita consumption (PCC) has been reduced by over 20% since 2002/03. Average PCC is forecast to reduce to approximately 141 l/h/d by 2019/20, which will be 9 l/h/d lower than the WRMP14 estimate. In addition to the impact of metering and water efficiency interventions, reported PCC has been affected by the change in categorisation of large blocks of flats due to the introduction of the non-household commercial market in 2016. Historically a large block of flats, billed as a single entity, was counted as a single non-household property. These flats are now counted as household properties, in line with Ofwat's new eligibility criteria in 2016, and the number of the flats in the building (subsidiary properties) is included within the property count.
- 2.62 For further details see Section 3: Current and future demand for water, Section 8: Appraisal of demand options, Appendix M: Leakage, Appendix N: Metering and Appendix O: Water efficiency.

D. AMP6 Resource development programme

- 2.63 Resource development is any activity that increases the amount of water available for supply.
- 2.64 In AMP6 we are delivering a number of resource development schemes in the London WRZ. The schemes are a combination of groundwater development and water trades. By the end of the period we forecast we will be able to deliver an extra 46 MI/d water into supply during a dry year. Table 2-3 presents progress against targets for the delivery of our water resources development programme for AMP6:
- **Bulk transfer RWE Didcot:** 17 MI/d, resulting from an agreement with RWE npower to utilise water not abstracted following the closure of Didcot Power Station A. The scheme delivered a deployable output (DO) gain of 17 MI/d earlier than planned and

⁸ RPS Literature Review, October 2017

⁹ Review of Innovative Tariff Options, Nera, April 2015

was included in the 2013/14 London DO as reported in the AR14 Environment Agency Review

BT Essex and Suffolk Water (ESW) Chingford reduction: 17 MI/d, resulting from a new water trading agreement to reduce the volume of the existing raw water transfer to Essex and Suffolk Water (Northumbrian Water South), was delivered in 2014/15. This delivered a DO gain of 17 MI/d during periods of drought and low flow. This increase was included in the 2014/15 London DO as reported in the AR15 Environment Agency Review. Subsequently, a further 5 MI/d reduction in the export to ESW has been agreed in 2016/17. This has delivered a corresponding benefit of 6 MI/d to the London WRZ DO

- **Groundwater (GW) Tottenham borehole** delivers additional water from an existing private borehole. Delivery of the output was delayed from the original target date of 2015/16 due to access and construction challenges, but has since delivered an increase of 6 MI/d to the London WRZ DO in 2016/17. This is a significant increase against the original target DO benefit of 1.4 MI/d programmed in WRMP14
- **GW ELRED** will not now be delivered during AMP6. More detailed investigations have demonstrated that high turbidity in the raw groundwater requires a reduction of the ELRED source DO. As the scope of any solution has changed significantly, the original scheme has been deferred. A new solution is not currently included in our list of options for WRMP19, but the reduction in the ELRED source DO is reflected in our WRMP19 base position for London WRZ DO. This reduction is compensated by the increased output from the GW Tottenham Borehole scheme
- **Aquifer storage and recovery (ASR) Darent Valley (Horton Kirby)** is an innovative groundwater option whereby water is pumped into, and stored within, an aquifer when water is plentiful and then recovered in times of need. We have drilled a new ASR borehole to the south of Horton Kirby and two new observation boreholes. We have constructed new connections to the ASR boreholes that enable the Lower Greensand aquifer to be recharged with potable water and abstracted. Using these new assets we have carried out operational scale cycle testing, recharging the aquifer to increase storage then re-abstrating the stored water, while monitoring responses in the catchment. During the testing, which is ongoing, we are collecting hydraulic and water quality data to confirm the operational viability of ASR. The scheme has been deferred from AMP6 and is being re-evaluated as part of WRMP19 to increase the London WRZ DO by 5 MI/d
- **GW Honor Oak** was programmed to deliver an increase of 1.48 MI/d at the existing Honor Oak water treatment works in 2019/20. During development of the design for the scheme the scope of the solution required to deliver this output has increased significantly. As a result, the cost has increased significantly and the scheme has been deferred and re-evaluated as part of WRMP19



Table 2-3: AMP6 resource development schedule

London – AMP6 increases in WAFU	WRMP14 MI/d	Forecast MI/d	Actual/Forecast delivery (x)		AMP6 delivery schedule (x- planned, x- delayed)					Actual/Forecast delivery	
			2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20		
GW Tottenham BH	1.4	6			X	X					Benefit claimed
GW Honor Oak	1.48	0								X	Deferred
GW ELRED	0.95	0			X						Deferred
BT RWE Didcot	17	17	X		X						Benefit claimed
ASR Darent Valley (Horton Kirby)	5	5								X	Deferred
BT ESW Chingford reduction	17	17		X	X						Benefit claimed
Additional ESW reduction		6				X					Benefit claimed
Total AMP6 actual/forecast	42.83	51				12				17	
Cumulative total (target)			0	0	36.35	36.35	36.35	36.35	36.35	42.83	
Cumulative total actual/forecast			17	34	34	46	46	46	46	46	

E. Update on supply demand studies

- 2.65 We have undertaken a range of complex technical supply demand studies in AMP6 to refine our water resources planning for WRMP19.
- 2.66 We have held 29 forums and technical meetings with stakeholders to review and explain our approaches to develop our plan against the guidelines provided.

Demand forecast

- 2.67 Two UKWIR projects on forecasting household demand and developing population and property forecasts were completed in 2016¹⁰. We have used the output from these studies to inform our approach to develop the baseline demand forecasts.

We commissioned Edge Analytics to work with Local Authorities to develop ‘plan based’ population and housing forecasts for the period 2016 - 2045 and the University of Leeds to develop longer term ‘trend based’ forecasts from 2045 - 2100. With the publication of ONS2016 Nation Population Projection in November 2017 we commissioned Edge Analytics to produce a new 2045 – 2100 forecast for WRMP19.

- 2.68 New Multivariate Linear Regression household consumption forecasting models were developed with Artesia Consulting for each WRZ. These models have replaced the micro-component models used in WRMP14.
- 2.69 Servelec Technologies working with Teccura were commissioned to develop non-household forecast consumption for each WRZ.
- 2.70 For the detail of our demand forecast see WRMP19 Section 3: Current and future demand for water, Appendix E: Population and property projections, Appendix F: Household water demand modelling and Appendix G: Non-household water demand modelling. The results of these studies have illustrated that demand for water is forecast to significantly increase in our region, mainly driven by population growth.

Assessment of available resource

- 2.71 We have improved our water resources management system model, WARMS2, which is the tool we use to assess water resources Deployable Output (DO). The tool has been reviewed by recognised independent industry experts, HR Wallingford, and we have commissioned periodic audits to ensure the model remains fit for purpose, and have provided assurance to this effect for external stakeholders.
- 2.72 Sensitivity testing of WRMP14 showed vulnerability of the preferred plan to severe droughts not present in the historic record from 1920. For WRMP19 we commissioned Atkins to generate spatially and temporally coherent artificial drought data that models the current

¹⁰ UKWIR (2016) WRMP19 Methods – Household Consumption Forecasting. UKWIR (2016) Population, household property and occupancy forecasting.

climate and can be used to evaluate the sensitivity of our current water resource system and water resource options to different drought types than those in the historical record. The work was used to assess our resilience to more extreme drought events and to assess the reliable yield of new surface water resource options. The results illustrated that we were resilient to a worst historic drought in all WRZs but not resilient to a more severe 1:200 drought in London, SWOX, SWA or Kennet Valley. For further details see WRMP19 Section 4: Current and future water supply.

- 2.73 We are seeing changes to the raw water quality in our large raw water storage reservoirs supplying London and predict that this will continue with the increasing effects of climate change. Deeper reservoirs have better control measures to manage the raw water quality and therefore are more resilient to the impacts of climate change. Therefore any drawdown of the reservoirs will impact our treatment capability. This, coupled with our increasing concern with our ability to treat water in the lower levels of our reservoirs, is likely to reduce our DO by a notable amount, with algal blooms impacting a normal year and total reservoir water quality in a dry year. We have engaged the services of independent experts to undertake a quantitative assessment of the impact of these changes in raw water quality and quantity on the treatment capability as described in WRMP19 Appendix K: Process losses.
- 2.74 Our 'stock' of raw water storage reservoirs is very different to that of other water companies in the UK in that they generally comprise embankments with thin clay cores supported by sand and gravel shoulders. Two independent studies have been undertaken by Atkins¹¹ and AECOM¹² to review the probability of failure of this type of constructed reservoir. The analysis was to assist in the prediction of an event which would result in the 'loss' of a reservoir, either through failure or the need to drawdown a reservoir for a significant period of time, affecting the storage capacity and consequent resource availability. The results illustrated that due to the age and construction of this type of reservoir, the risk to loss of storage to undertake remedial repairs is 2.5 times higher than the UK average. The impact of any failure resulting in the requirement to draw down any one of the twenty five raw water storage reservoirs will have a significant impact on our DO, placing our customers at risk of a supply shortage during dry periods.

Water resource options

- 2.75 In WRMP14 we set out that a new large resource scheme (>150 Ml/d), or combination of schemes, is highly likely to be required to maintain security of supply in the region from the mid-2020s. In autumn 2014 we started a programme of work to examine resource schemes. The programme comprises multiple phases and we have worked extensively with regulators and stakeholders as we progress the work.
- 2.76 The process to develop our Constrained List of resource options is explained in detail in WRMP19 Section 7: Appraisal of resource options, Appendix P: Options list tables, and Appendix Q: Scheme rejection register.

¹¹ Atkins Reservoir Longevity report, April 2016

¹² AECOM Reservoir Longevity report review, February 2017

Demand management options

- 2.77 We are implementing a large programme of demand management activity from 2015 - 2020, comprising leakage reduction, metering and the promotion of water efficiency. The programme is planned to deliver approximately 107 Ml/d of savings. We are monitoring this programme as it is rolled out to ensure we are taking lessons learned into account in planning future activity.
- 2.78 In August 2016 we published our approach for developing demand management options for WRMP19¹³. We have considered a wide range of demand management options and screened the options to produce a shortlist of feasible options. We have engaged with stakeholders throughout this work. In March 2017 we published an updated screening report¹⁴, including comments from stakeholders, and set out the final constrained list of feasible options. The options are categorised into five areas:
- Metering
 - Water efficiency
 - Leakage
 - Incentive schemes
 - Non-potable options
- 2.79 We have undertaken a detailed feasibility study¹⁵ on the opportunities for the use of non-potable water to help to manage demand in London, and specifically the Opportunity Areas in London identified by the GLA. Further detail on this study is included in WRMP19 Appendix L: Water Reuse.
- 2.80 In June 2017 we published an updated feasibility paper¹⁶ setting out the costs and benefits of the feasible options and sought feedback from stakeholders on these.
- 2.81 The feasible options have been input into the DMA based Integrated Demand Management model to develop optimised demand management portfolios to input to the programme appraisal decision support tools alongside the resource options.
- 2.82 For more detail, see WRMP19 Section 8: Appraisal of demand options, Appendix P: Options list tables, Appendix Q: Scheme rejection register and the reports available on our website <https://corporate.thameswater.co.uk/About-us/Our-strategies-and-plans/Water-resources/Document-library/Past-meetings-minutes-and-presentations>.

Developing our preferred programme

- 2.83 Our WRMP14 method of programme appraisal found only a small pool of potential solutions to the supply-demand problem, using least-cost optimisation as the primary driver for the search and modifying the solutions in terms of other values including environmental and social costs. Sensitivity testing to different futures was carried out on the preferred plan.

¹³ Demand management options screening report, August 2016

¹⁴ Demand Management Options Screening report update, April 2017

¹⁵ Non-potable water reuse feasibility report, June 2017

¹⁶ Demand Management Feasibility paper, June 2017



- 2.84 For WRMP19 we have enhanced our decision making process based on UKWIR guidance¹⁷ to include for a longer planning horizon where appropriate and worked with Decision Lab Ltd (EBSA) and the University of Manchester (IRAS-MCS) to improve the functionality of our decision support tools such that they will generate a large number of potential investment programmes which will be optimised in terms of cost, but also with consideration of other parameters (referred to as metrics), including resilience, environmental effects, customer preference, intergenerational equity and deliverability, to ensure a best value programme is taken forwards.
- 2.85 We have also developed a new tool, PolyVis, to show how the different programmes perform against the range of metrics, improving the transparency of the process.
- 2.86 For the detail of this work, see WRMP19 Section 10: Programme appraisal and Appendix W: Programme appraisal.

Water Resources South East

- 2.87 We continue to work with Water Resources in the South East (WRSE), a collaboration of water companies, located predominantly in the South East of England, and regulators. The objective of WRSE is to develop a flexible and robust water resources strategy for the region.
- 2.88 WRSE has undertaken modelling to investigate the resilience of the region to a range of possible futures. The modelling has highlighted the vulnerable zones in the region, considered opportunities for transfers and greater connectivity to share resources across the region, and identified potential regional infrastructure investment. The output has been reviewed and commented on by WRSE members and it is intended that the output will be used to inform individual water companies' plans.
- 2.89 We requested that companies set out their future requirements from us and we have used this information in the development of WRMP19.

Market development

- 2.90 Ofwat has identified over recent years that the development of markets may be beneficial in stimulating the efficient use of existing resources to support resource development and in encouraging more innovation and involvement of third parties in demand management. There have been several developments in AMP6 to support the development of markets, which we have actively supported.
- 2.91 Ofwat introduced financial incentives for trades in AMP6, which requires companies to have an approved trading and procurement code. We were one of the early adopters of this approach and our code was approved by Ofwat in May 2016.
- 2.92 Ofwat have also introduced, following development via an industry working group which we actively supported, a requirement for water companies to publish market information using a

¹⁷ UKWIR (2016) WRMP19 Methods – Decision Making Process: Guidance Report Ref. No. 16/WR/02/10

common framework on their website. We published the first version of our market information alongside WRMP19¹⁸.

2.93 Further innovations to encourage increased use of existing water resources include:

- the development of a bid assessment framework to create more clarity and confidence to third parties that their bids to supply water resources, leakage or demand management services will be assessed fairly consistent with the principles of transparency, equal treatment/non-discrimination and proportionality
- development of access pricing for the bi-lateral market

2.94 We are supportive of these developments as we seek to make maximum use of the resources available and have been active in evaluating trading opportunities as set out in WRMP19 Section 7: Appraisal of Resource Options.

F. AMP6 Environment programme

2.95 This section discusses progress on schemes to reduce the environmental impact of public water supply. Water companies undertake these schemes through working closely with the Environment Agency to identify where abstraction may be having an adverse environmental impact and putting plans in place to address this impact if it is necessary to do so.

2.96 The mechanism by which this is achieved is through the Water Industry National Environment Programme (WINEP), through which the Environment Agency identifies and prioritises its requirements for water companies to undertake measures to improve the environment.

2.97 The process by which adverse environmental impact is assessed as present or likely is as follows:

- Firstly, the Environment Agency (EA) identifies sites where it has a concern that the impact of abstraction may be adversely affecting the environment
- Secondly, once the sites of concern are identified, an investigation is undertaken by the water company to determine the exact impact of the abstraction on the flow in a river or the water level in a wetland. This requires an understanding of the hydrology of the source, if the abstraction is from a surface water source, and of both the hydrology and the hydrogeology if the abstraction is from a groundwater source. If a significant hydrological impact is identified then the impact of the flow or water level in the water body on the ecology supported by that water body is assessed. This process of investigation may be undertaken quite quickly in simple cases where there is clear evidence of a direct impact or may take several years if the impact is complex, and it may require a programme of measurement and monitoring of hydrogeological and hydrological variables as well as ecology
- Thirdly, if an adverse impact on the environment is clearly demonstrated through this process of investigation, or in cases where it is not possible to demonstrate that no adverse impact is caused and the site is very sensitive (e.g. a site designated under

¹⁸ <https://corporate.thameswater.co.uk/About-us/our-strategies-and-plans/water-resources/water-resources-market-information>

the European Habitats Directive), then the next stage is to assess all the options available to address the impact. This is termed an options appraisal and is undertaken by the water company if the investigation concludes that it is necessary.

- Finally, if the options appraisal identifies that a feasible option is available to address potential or actual adverse environmental impacts caused by abstraction, it will be put forward for implementation. The decision as to whether the feasible option is implemented will normally need to take account of the costs and benefits of the option to determine whether it is cost-beneficial. In cases relating to abstraction sites in areas designated under the European Habitats Directive, a cost benefit assessment is not applied, although if the option has a high cost or is 'disproportionately costly' then consideration may have to be given to a different option or mitigation option as an alternative.

- 2.98 The WINEP sets out the requirements for investigations, options appraisals and scheme implementations that water companies are required to undertake.
- 2.99 During AMP6 a number of sustainability reductions, investigations and options appraisals have taken place or are currently taking place, in response to concerns raised by the Environment Agency regarding the impact of abstractions on the environment. These are identified and described below.
- 2.100 For information on future sustainability reduction schemes, see WRMP19 Section 4: Current and future water supply. There is considerable uncertainty as regards the long-term programme of sustainability reductions particularly in relation to the potential need for licence reductions to meet the requirement for 'no deterioration' in the quality of water bodies under the Water Framework Directive (WFD). We have not included an allowance for these in the baseline forecasts in WRMP19, but we have included scenario tests on how sustainability reductions, including 'no deterioration' measures, may affect our plan in WRMP19 Section 10: Programme appraisal. As part of this testing we have included scenario analysis to assess the impact of reducing abstractions at our water sources that are perceived to adversely affect chalk streams.

Licence reductions and mitigation schemes

- 2.101 The schemes identified by the Environment Agency as needing specific reductions or mitigation schemes during AMP6 are related to our abstractions at Axford, Ogbourne, Childrey Warren and Pann Mill. Additionally, a mitigation scheme to address the impact of abstraction from the Lower Thames is required to be implemented.

Axford

- 2.102 The sustainability reduction for Axford was identified following an investigation undertaken in AMP3 and options appraisal undertaken in AMP4. The required solution reduces the licence in low flow periods from 13 Ml/d to 6 Ml/d average and peak. This licence reduction required a network infrastructure solution and incorporates the delivery of the Ogbourne sustainability reduction (discussed below), the solution being common to both reductions.
- 2.103 The construction of this scheme commenced in AMP5 and was successfully completed to allow the reduction in the Axford licence from 1 April 2017. An allowance for emergency

abstraction in the event of infrastructure failure, such as a burst in the main transferring water from Farmoor to Swindon, has been included on the licence.

Ogbourne

- 2.104 The requirement for a sustainability reduction at Ogbourne was identified following an investigation in AMP4 followed by an options appraisal in AMP5 which was completed in 2013. The requirement identified was to reduce the licence at Ogbourne to zero MI/d. The scheme to deliver this licence reduction required a similar network modification to the licence reduction for Axford and so the solution for Axford incorporated the requirements for the licence reduction at Ogbourne, with the two reductions delivered to the same timescale. The Ogbourne abstraction licence was revoked from 1 April 2017. As for Axford, an allowance for emergency abstraction in the event of infrastructure failure has been included on the licence.

Pann Mill

- 2.105 A scheme for licence reduction at Pann Mill is required to reduce the risk of abstraction impacts on the River Wye in High Wycombe. The requirement for a sustainability reduction at Pann Mill was identified following an investigation and options appraisal in AMP5 which was completed in 2015. The licence reduction required is to reduce the average and peak licence from 22.73 MI/d to 9.5 MI/d. This will reduce the DO at Pann Mill from 16.8 MI/d to 9.5 MI/d. This scheme requires no infrastructure modification. However, in order to ensure the SWA WRZ retains sufficient supply/demand surplus to allow the licence reduction to take place, the average licence reduction will be accommodated by transfer of the licence volume to Medmenham. This will mean that the average licence limit at Medmenham will be increased from 45 MI/d to 52.3 MI/d. It is expected that this licence transfer will be completed by the end of March 2020. We are currently in discussion with the Environment Agency regarding the peak licence volume that we will retain at Pann Mill.

Lower Thames

- 2.106 The requirement for a mitigation solution to address the impact of abstraction from the Lower Thames was identified following an investigation and options appraisal in AMP5. The investigation identified that the Lower Thames abstractions had an impact on the ecology of the Thames Tideway, however the options appraisal and cost benefit assessment concluded that it was not cost beneficial to reduce the abstraction from the Lower Thames. The options appraisal identified the requirement to investigate further the oxygen levels in the reach of the Thames Tideway in the vicinity of the discharge from Mogden sewage treatment works (STW) and, if necessary, to develop a scheme to increase oxygenation during periods of low flow. Investigations and monitoring have been undertaken to assess the oxygen levels in the Thames Tideway and to identify the best mechanism to deliver the requirement for increased oxygenation. Work undertaken to improve the quality of the discharge from Mogden STW has been undertaken since the completion of the investigation and this has been taken into account in the determination of the scheme requirement. Water quality modelling of the Thames Tideway has been undertaken to determine whether a scheme is required, and it has been confirmed that a scheme is required and will be designed and implemented by March 2020.



Site investigations and options appraisals

AMP6 investigations

- 2.107 A number of investigations at abstraction sites within areas with no statutory designation for environmental protection were initiated in AMP6 to identify the potential environmental impacts caused as a result of abstraction. Table 2-4 outlines the investigations. Regular progress updates have been provided to the Environment Agency and these investigations are due to be completed in 2019. The Environment Agency has used the interim findings of these investigations to inform the requirement for sustainability reductions and included this in the WINEP. The requirement for further option appraisals has also been confirmed following the outcome of these investigations.
- 2.108 The AMP6 investigations to date have led to a requirement for potential sustainability reductions for Bexley and Hawridge abstractions and these have been identified in the WINEP. These investigations have been assessed as sufficiently certain to be included in the WRMP baseline. These sources are currently at the options appraisal stage and this process will include a cost benefit assessment of the licence reductions and this may mean that an alternative solution is implemented, for example, river restoration or augmentation. Our approach has been agreed with the Environment Agency. The confirmation of the requirement for any sustainability reduction will be determined following completion of options appraisals in each case. We have completed investigations for the Lower Lee and the Upper Darent (Sundridge and Westerham) and these have proceeded to option appraisals. For both these cases it has been confirmed that sustainability reductions are not required. Similarly, for the Upper Darent (because no adverse impact is demonstrated to be caused by the abstraction), and for the Lower Lee (because it would not be cost beneficial to make any reduction), no sustainability reductions are proposed. The investigations at Sundridge and Hawridge were undertaken with South East Water and Affinity Water respectively, as they also operate sources that have the potential to have an impact on the watercourses being investigated.

Table 2-4: Environmental investigations in AMP6

Investigation	Water body	Completion date	WRZ
Lower Lee	Lower Lee	31/04/2017	London
Sundridge and Westerham	Upper Darent	31/03/2017	London
Bexley	River Cray	31/12/2018	London
Hawridge	River Chess	31/09/2018	SWA
Darent Review	River Darent	31/12/2018	London

AMP6 options appraisals

- 2.109 The investigations described above to determine the impact of water abstraction at sites in non-statutorily designated areas have been or are being carried out to determine whether our abstractions may be contributing to adverse environmental impacts and whether option

appraisals are required. Work to date has confirmed that options appraisal is required in most cases. In addition an options appraisal is required for Waddon which was investigated in AMP5 and has an adverse environmental impact on the Waddon Ponds. Table 2-5 outlines the options appraisals underway or likely to be required in the current period. Some further work is required beyond March 2018 in some cases.

Table 2-5: Environment options appraisals in AMP6

Options appraisal	Water body	Completion date	WRZ	Status
Lower Lee	Lower Lee	31/12/2018	London	Ongoing
Bexley	River Cray	31/12/2018	London	Investigation and OA Ongoing
Sundridge and Westerham	Darent	31/12/2018	London	Ongoing
Waddon	Waddon Ponds and River Wandle	31/06/2018	London	Ongoing
Hawridge	River Chess	31/09/2018	SWA	Ongoing

Eel screens

- 2.110 There is a requirement¹⁹ to install screening at all water abstraction intakes where the abstraction has the potential to result in the entrainment of eels and where it is cost beneficial and feasible to do so.
- 2.111 The 2009 Regulations require all abstraction intakes to be reviewed to determine the requirement for screening protection and to implement a screening solution by an agreed date. It has been confirmed that the majority of our intakes on the Lower Thames and Lower Lee will require screening with other intakes in the Thames Valley also likely to require screening, but at a greater aperture size. The implementation of these requirements must be carried out in such a way that they do not affect abstraction volumes. Where compliance with the regulations was not possible by 2015 the Environment Agency has issued an exemption to allow implementation of a suitable solution at an agreed date. In the interim period mitigation measures may be required.
- 2.112 We have investigated specific requirements for all our intakes and developed detailed environmental and engineering design specifications to enable the screening programme to be rolled out during AMP6. The installation of these screens will need to be undertaken having regard to the Water Framework Directive requirement to improve the status of fish where the water body is not achieving good status as a result of entrainment at abstraction intakes.
- 2.113 The first screen to be installed was at Walton and was completed in March 2017. It is being used as a pilot to enable experience to be gained through its operation to inform the design of

¹⁹ Under the Eel (England and Wales) Regulations 2009, which arise from European Commission's Eel Recovery Plan 2007



the other screens to be rolled out by the end of AMP6. Installation of the screen at Hampton was completed in April 2018.

- 2.114 The cost of these screens was not included in the WRMP14 but was included in our Business Plan for PR14.

River restoration

- 2.115 We are required to undertake river restoration at a number of sites in AMP6 as a result of environmental obligations identified in the WINEP. This requirement arises as a result of water abstractions adversely impacting on watercourses and the need to mitigate this impact. We will undertake river restoration at eight sites where we are either undertaking sustainability reductions or where an adverse impact caused by abstraction on a watercourse has been identified but it is not cost beneficial to implement a sustainability reduction. These river restoration requirements are shown in Table 2-6 and will be completed by March 2020.

Table 2-6: River restoration required in AMP6

Abstraction source leading to river restoration requirement	Water body	Completion date	WRZ	Status
New Gauge	River Lee distributary	31/03/2020	London	Ongoing
North Orpington	River Cray	31/03/2020	London	Ongoing
Waddon	Wandle	31/03/2020	London	Ongoing
Pann Mill	River Wye	31/03/2020	SWA	Ongoing
Farmoor	River Thames	31/03/2020	SWOX	Ongoing
Ogbourne	River Og	31/03/2020	SWOX	Ongoing
Childrey Warren	Letcombe Brook	31/03/2020	SWOX	Ongoing
Pangbourne	Sulham Brook	31/03/2020	Kennet	Ongoing

Heavily modified and artificial water bodies

- 2.116 We are required to undertake mitigation works at a number of Heavily Modified and Artificial Water Bodies (HMWBs) in AMP6 as a result of obligations identified in the WINEP. HMWBs are sites designated under the WFD for the heavily modified nature of the water body due to measures such as flood defence, navigation or water supply. The requirement is to undertake works where it has been identified as beneficial to enable the water body status to be as close to good potential as possible. The works required are to improve habitat at a number of our reservoirs and aqueducts where it is possible to do so without compromising the water supply function of the water bodies. The assessments so far undertaken have identified the requirement to install floating reed beds at a number of our reservoirs in the Lee Valley. Assessment has also been undertaken for the potential to address vegetation growth, spread of Invasive Non-Native species, and sedimentation in the New River and Staines aqueduct. This assessment has shown that it is not necessary to implement any measures in the Staines aqueduct and that weed removal needs to be continued on the New River; but that it can be implemented in a more efficient manner to minimise weed regrowth.



Abstraction incentive mechanism

- 2.117 Since 2016/17 we have implemented the Abstraction Incentive Mechanism (AIM). AIM's objective is to encourage water companies to reduce the perceived impact of water abstraction at sites that are considered environmentally sensitive and is designed to complement existing management tools e.g. NEP Sustainability Reductions and Hands-Off Flows. Implementing AIM should not impact security of supply or DO and there is no capital investment for the scheme. We have implemented AIM at five sites where it was not cost beneficial to undertake licence reductions using the existing management tools or licence reductions have been implemented but reduced abstraction rates could be implemented earlier during the onset of low flows.
- 2.118 The five sites included in AIM are: Pangbourne, Axford, Pann Mill, North Orpington and New Gauge. These sites were selected in consultation with the Environment Agency, Ofwat, local stakeholders and the Customer Challenge Group.
- 2.119 During the first year of implementation, 2016/17, river flows remained above the AIM constraints and therefore no abstraction reductions were implemented. During 2017/18 all of the five sites have been triggered at various points throughout the summer/autumn and we have been able to reduce abstractions at each source such that we were compliant with AIM at all our sources for 2017/18. Our expectation is to continue to comply with AIM in 2018/19.



G. Supply demand balance from 2015/16 to 2019/20

- 2.120 The supply demand balance for AMP6 is shown below, taking into account the impact of the demand management programme, the resource development programme and the sustainability reductions resulting from the WINEP.
- 2.121 There have been some notable changes in the supply demand positions from that forecast in the WRMP14, principally in London, where leakage levels and overall demand are higher than planned.
- 2.122 Population growth at the end of 2017/18 is higher than forecast in WRMP14, with approximately 400,000 more people requiring water in our region. Most of this growth is in the London WRZ. Based on the local authority plans, we estimate that the number of customers in our area will grow to over 10.1 million by 2019/20 (+4%).
- 2.123 The 2017/18 reported leakage was 75.2 MI/d above the 2017/18 target. A recovery plan has been implemented with the aim of achieving the WRMP14 leakage target by 2019/20. Our performance in 2018/19 has however, been heavily affected by two challenging weather events: the extreme cold weather in March 2018 – the Beast from the East, and its freeze thaw impact, as well as the hot, dry weather between April and July 2018. Both have contributed to increases in leakage which means while we will continue our efforts to achieve our target of 606 MI/d, we have revised our forecast to a more realistic, central figure of 636 MI/d. This will still surpass our best ever leakage reduction performance and support reducing some of the deficit.
- 2.124 There are nearly 200,000 fewer measured properties than forecast in WRMP14. This reflects both delays experienced with the conversion of properties where meters have been installed as part of the progressive metering programme to a measured bill account, and a lower uptake of Optant meters than forecast. Work is underway in 2018/19 to reduce the two year customer journey to a measured bill account to one year.
- 2.125 The supply demand balances presented in Table 2-7 reflect the best information available at April 2018 for WRMP19 baseline data lockdown. The data is based on AR17 and includes for an updated forecast of our position to the end of the AMP6 period. All WRZs are in surplus by 2019/20, excluding London which has a 24 MI/d deficit.
- 2.126 Following the work undertaken for WRMP19, and as part of the Environmental Performance Assessment, a review of the supply demand balance in London was undertaken. The review has identified a number of areas for improvement in the supply demand balance in London. These include accounting for investments that prevent the reoccurrence of historical impacts which have caused outages, so reducing the outage allowance and increasing Water Available for Use (WAFU), and also reviewing our Headroom methodology to ensure that it reflects an appropriate allowance for uncertainty for 2019/20. Potentially these types of measures could lead to the supply demand position in London returning to a surplus by 2019/20. We provide an annual progress report to the Environmental Agency setting out our performance against our supply and demand commitments which we publish on our website at <https://corporate.thameswater.co.uk/About-us/our-strategies-and-plans/water-resources/our-current-plan-wrmp14>.



Table 2-7: AMP6 supply demand position

WRZ	Item	Volume				
		2015/16	2016/17	2017/18	2018/19	2019/20
London (DYAA)	Demand	2079	2114	2094	2126	2057
	Headroom	81	89	80	106	122
	Supply	2171	2166	2165	2160	2155
	Balance	11	-37	-9	-72	-24
SWOX (ADPW)	Demand	326	329	332	331	330
	Headroom	10	11	13	14	16
	Supply	370	369	359	358	355
	Balance	34	30	14	14	9
SWA (ADPW)	Demand	167	176	182	176	170
	Headroom	5	4	5	6	6
	Supply	194	197	197	197	190
	Balance	22	17	11	16	14
Kennet Valley (ADPW)	Demand	120	122	125	124	122
	Headroom	4	4	4	5	6
	Supply	152	152	152	151	151
	Balance	27	25	22	23	23
Guildford (ADPW)	Demand	62	62	63	63	63
	Headroom	2	2	2	2	3
	Supply	68	68	68	68	68
	Balance	5	5	3	3	3
Henley (ADPW)	Demand	19	19	19	19	19
	Headroom	1	0	1	1	1
	Supply	26	26	26	26	26
	Balance	6	6	6	6	6