PR24

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DRAFT WATER RESOURCES MANAGEMENT PLAN 2024

EXECUTIVE SUMMARY - DRAFT FOR CONSULTATION

AUGUST 2023

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NORTHUMBRIAN WATER – OUR STORY

Welcome

We are pleased to present our revised draft Water Resources Management Plan 2024 (dWRMP24), which sets out how we intend to maintain a secure supply of water for our customers and businesses while protecting and enhancing the environment.

The climate is changing and the latest projections indicate that while the winters may well be wetter, the summers will be drier and we can expect summer river flows to be lower. This is particularly concerning for water stressed regions in the South and East of England.

In the North East, we've always had an eye on the future, recognising that we are a long-term business and must make sure we provide resilient water supplies and look after the environment for our current customers, but that we must also do the same for future generations. We enjoy resilient water supplies in the North East thanks to our 25 upland impounding reservoirs, including Kielder Reservoir. Kielder is the largest man-made reservoir in Europe and due to the Tyne Tees Transfer scheme, which enables us to move water around the region, supports river flows and our water abstractions on the rivers Tyne, Wear and Tees.

We have updated our supply and demand forecasts for this revised dWRMP24 and confirm that we have sufficient water resources to meet forecast customer demand, even during the most extreme of droughts. This is good news for customers and our region, and provides great opportunities for businesses wanting to operate or expand in our region as well as for economic growth and jobs.

Nevertheless, we are not complacent. Fresh water is still a finite and precious resource which we mustn't take for granted. It is still going to be really important for us all to play our part in saving water. Reducing leakage from our networks and reducing customer demand (known as per capita consumption, or PCC) will mean that we:

- Abstract less water from the environment. This will leave more water in our rivers allowing them to function more naturally.
- Treat less water meaning we will use less energy and chemicals at our treatment works and use less energy pumping water around our network.

Reducing water use at home can save money for customers who are on a water meter. Being efficient with hot water use, for example with filling baths, can also help to save on gas or electricity bills, which has never been more important. Consequently, we are proposing in our revised dWRMP24 the following programme of demand management measures.

Reducing leakage and customer water use

Leakage levels from our network and from our customers' homes are at an average level for the water industry but still higher, for example, than our sister company Essex & Suffolk Water, which has one of the lowest leakage levels in the industry. Consequently, we recognise that there is a lot more to do and so our preferred plan, in line with Government expectations, is to reduce leakage by a further 55% by 2049/50. Innovation is key and we will use latest technology to make our network smart to help us identify leaks more quickly.

When customers pay by the volume of water they use, it is the fairest way of charging them for their water use and we have promoted the benefits of this widely. 40% of our customers now have a water meter and are charged by how much they use.

While we are not proposing to compulsory meter our customers, going forward, we will work with our customers to help them understand whether moving to a smart water meter, similar to the ones used for electricity and gas, is right for them. We also propose to replace customer's existing water meters with a smart meter. They have many benefits and will provide information to customers so that they can make more informed choices about how they use water. They will also help customers identify when they might have a leaking pipe or toilet and will help us support high water use customers become more water efficient.

We are proud of our award-winning water efficiency programmes. These have included our 'Water's Worth Saving' home visits to the highest users, The Ripple Effect educational resources for children, and our Leaky Loos programme repairing leaking toilets of customers for free. We plan to upscale this important work from 2025 to help our customers use less water.

Our metering and water effciency strategies will help us meet national targets for reducing customer water demand including reducing Per Capita Consumption (PCC) to 110litres/person/day by 2050.

We have also developed a new non-household water efficiency strategy to support reductions in Business Demand. Working collaboratively with business, retailers, local planning authorities and the Environment Agency, our strategy should enable us to reduce business water demand by 9% by 2038.

Increasing supplies

The forecast demand savings from our demand management options means that we will have sufficient water supplies to meet forecast demand for water and so we are not proposing to develop any new water resource schemes.

Water transfers to other water companies

Thanks to Kielder Reservoir, we have more water than we need, even in the most extreme of droughts. Consequently, we've been working with our regulators, regional water resources planning groups and neighbouring water companies to identify whether some of our surplus water could be transferred by new pipelines to other water company areas where there is a shortage. We've worked closely with both United Utilities to investigate the viability of a transfer out of Kielder reservoir into United Utilities supply area and with Yorkshire Water to investigate a transfer from the River Tees

(supported by our Cow Green and Kielder Reservoirs). The transfer to United Utilities is not included in United Utilities' preferred plan although we will continnue to work with them to explore whether it could be a longer term option to support national water supply resilience. However, a transfer is included in Yorkshire Water's plan from 2040 and so this is also included in our preferred plan.

Protecting and enhancing the environment

We want the best outcome for the environment and we know that if it is not protected, not only will important habitats and species be lost but the water quality in our rivers and reservoirs will deteriorate. This would mean we have to use more energy and chemicals to treat the water before we can distribute it to our customers.

We have always monitored the effects of our abstractions on the environment and taken timely action to make sure they remain sustainable. As our understanding of the environment improves, so does our understanding of how much water needs to be left in it. Recent investigations in our Berwick supply area have concluded that while the maximum amount of water we are currently abstracting each year is sustainable, the maximum amount we could take out of each abstraction point would not be. Consequently, we have planned on the basis that the maximum licensed quantity stated in our abstraction licences (the permits that allow us to legally abstract water), will be reduced to sustainable levels. We also closely monitor the effects of water releases from our upland reservoirs and amend these when needed.

As part of our current Water Industry National Environment Programme (WINEP) (2020-25), we have also implemented measures to reduce the transfer of Invasive Non-native Species (INNS) both into and out of our rivers and reservoirs. We've continued with our programme to install eel screen on abstraction intakes and fish passes on weir structures. We have now developed our part of the 2025-30 WINEP with regulators and stakeholders including the Rivers Trust. We continue to put forward partnership schemes, that if supported by our regulators, will deliver multiple benefits including improved water quality, biodiversity net gain and flood risk reduction.

Consultation

We wouldl like to thank all those who submitted a response to the consultation on our dWRMP24. We have reviewed them all and prepared a consultation Statement of Response. This confirms the changes we have made to the dWRMP24 as a result of the consultation responses and the reasons for doing so. We will be submitting our revised draft WRMP24 to Defra on 31 July 2023 and envisage, subject to Defra approval, that we will publish our final plan in Autumn 2023.

We look forward to sharing our final WRMP24.

Heidi Mottram
Chief Executive Officer

CONSULTATION

We develop our draft WRMP24 between April 2020 and October 2022 taking account of:

- pre-consultation feedback from regulators; and
- feedback received during and following a pre-consultation webinar in January 2022 where we shared our initial baseline supply demand balance position, the planning assumptions used in developing the forecasts and our ambition to reduce leakage and customer demand (Per Capita Consumption or PCC).

We submitted our draft WRMP24 to Defra on 3 October 2022 and then invited statutory consultees, our customers, and other interested stakeholders to comment on it. The consultation took place over a 12 week period between Friday 18 November 2022 and Friday 24 February 2023. Our dWRMP24 was available for review on our website https://www.nwg.co.uk/responsibility/environment/wrmp/nw-draft-water-resources-management-plan-2024-consultation.

We asked consultees to share their views on our dWRMP24 including those on:

- Our projections of future water needs including those of our customers, businesses and the environment; and
- Our preferred plan including:
  - Our demand management options to reduce leakage by 50% by 2049/50; smart metering; and water efficiency programmes; and
  - In the long term, potential raw water transfers to other water companies.

Consultees were asked to send their written representations on our dWRMP24 to the Secretary of State for Environment Food and Rural Affairs which were then made available to us at the end of the consultation period.

Our regional water resources group, Water Resources North (WReN) has also prepared a regional plan which sets out how it will address the need for resilient and sustainable water supplies at a regional and national level. WReN's regional Plan has informed our Northumbrian Water draft WRMP24 and was consulted on at the same time as our draft Plan.

We have prepared a consultation Statement of Response which describes:

a. our consideration of the consultation responses;
b. the changes that we have made to the dWRMP24 as a result of the consultation responses and the reasons for doing so and where no change has been made to the dWRMP24, the reason for this; and
c. how we have taken account of the third round of regional reconciliation planning in which water transfers between companies and regions were agreed.

If our Statement of Response and revised draft WRMP24 are approved by Defra, we envisage that we will be directed to publish our final WRMP24 on our website (www.nwg.co.uk/wrmp) in Autumn 2023.

1. INTRODUCTION

1.1 PLANNING FOR A SECURE, SUSTAINABLE SUPPLY OF WATER

1.1.1 Overview

Under sections 37A to 37D of the Water Industry Act 1991, we are required to prepare and maintain a Water Resources Management Plan (WRMP) every five years (reviewed annually) which sets out how we intend to achieve a secure, resilient and sustainable supply of water for our customers and a protected and enhanced environment, both now and in the long term.

This document is the Executive Summary of our revised draft WRMP and has been developed as part of the Price Review 2024 process (PR24) and so is known as dWRMP24.

This revised draft has been updated to take account of our consultation statement of response which is published on our website (www.nwg.co.uk/responsibility/environment/wrmp/nw-draft-water-resources-management-plan-2024-consultation/) and confirms if and how we have taken into account each of the consultee's responses.

It forecasts supply and demand for each of our Water Resource Zones (WRZs) (see Figures 1 and 2 overleaf) from 2025 to 2085, to identify appropriate solutions to meet future pressures, albeit with a focus on the statutory minimum 25 year planning period (2025 to 2050).

1.1.2 Our Current Plan (WRMP19)

Our current WRMP 2019 is the starting point for our new dWRMP24. Our WRMP19 preferred plan only required demand management options to maintain a supply surplus in each of our Water Resource Zones (WRZ). This includes:

- Measures to reduce leakage from our network and from our customers' homes by 15% from 2019/20 levels by 2025.
- A water efficiency and optant metering programme to support reducing Per Capita Consumption (PCC) to 118/litres/head/day by 2040.

1.1.3 Our dWRMP24

We are required to produce a final Best Value Plan with no supply deficits in any WRZs over the planning period. Based on our dWRMP24 baseline supply and demand forecasts, which use the latest PR24 planning assumptions and take account of WRMP19 customer demand reduction programmes up to March 2025, we are forecasting a baseline supply surplus in our Berwick and Fowberry Water Resource Zone (WRZ) and a small baseline supply deficit in the Kielder WRZ. The supply deficit in the Kielder WRZ is not caused by of a lack of water resources but because of pumping station constraints that could easily be resolved through additional pumping capacity. However, this is not required because a supply surplus is restored by demand savings from our PR24 preferred demand management options (e.g. leakage reduction, smart metering and water efficiency programmes).

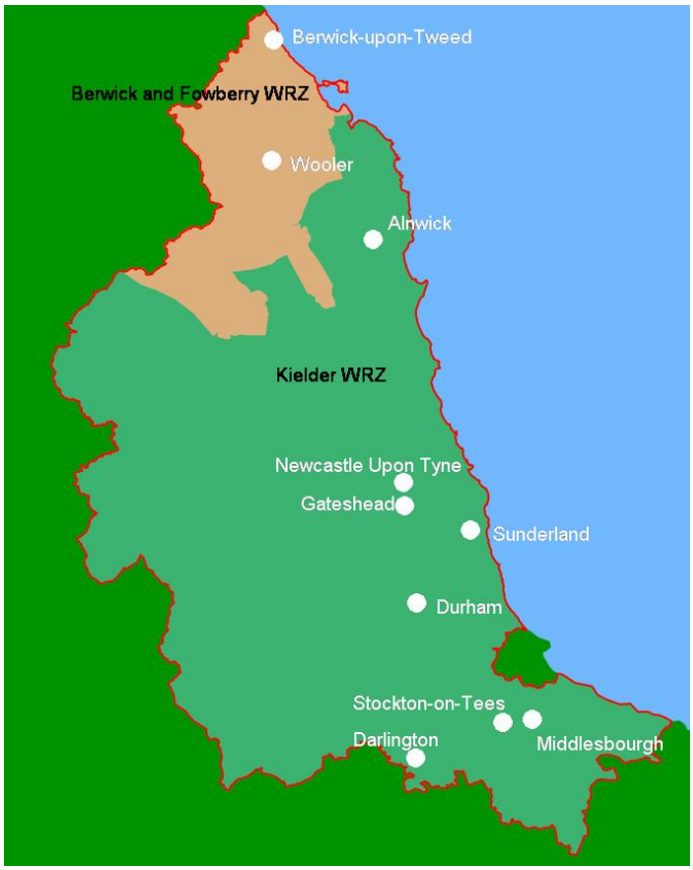

Figure 1: Kielder And Berwick & Fowberry Water Resource Zones

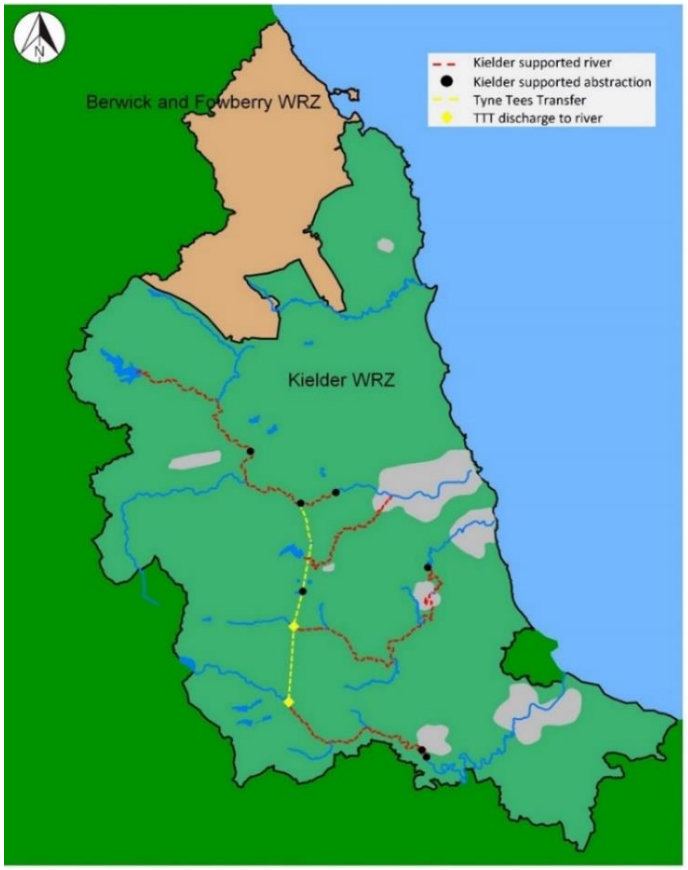

Figure 2: Kielder Reservoir And The Tyne Tees Transfer System

While a supply surplus has been maintained in the Berwick & Fowberry WRZ, it is less than presented in our WRMP19. This is due to planned sustainability reductions**.** These are applied where a Water Industry National Environment Programme (WINEP) environmental investigation has concluded that an abstraction is not sustainable (could have an adverse impact on the environment). Consequently, the abstraction licence annual licensed quantity (the amount of water we can abstract from an abstraction point, such as a borehole, in a 12-month period) is reduced to a sustainable level as agreed with the Environment Agency. Following AMP6 and AMP7 investigations, our Berwick area licences are currently limited to agreed sustainable rates until a new borehole is operational in 2024. We have included these constrained rates in our WRMP24 baseline supply forecast.

The causes of the baseline Kielder supply deficits are:

- **Climate change:** We have used the latest Climate Projections 2018 (CP18) which predict a more significant impact on summer river flows, than the previous CP09 projections.
- **1 in 500 supply resilience:** We are required to plan for 1 in 500-year supply resilience from 2040.
- **Non-household demand:** Our latest non-household demand forecast includes new demand from a very large development at Teesside consisting of net zero carbon capture plants, hydrogen plants, power generation plants and free ports. There are also plans for gigafactory power plants in two other locations in the North East of England.

- **New methods:** We have used new statistical methods for forecasting supply and demand, specifically the use of stochastic hydrological data for supply forecasts.

Table 1 summarises the changes in planning assumptions between our WRMP19 and our dWRMP24 along with the change in supply and demand.

Table 1: Summary Of Changes In Planning Assumptions

ASPECT		WRMP19	WREN PLAN	WRMP24	CHANGE IN SUPPLY / DEMAND (Ml/D)
Demand	Impact of Pandemic on consumption	X	✓	✓	+16
	New non-household potable water demands	X	✓	✓	+38
Supply	AMP6/7 WINEP Abstraction Licence Sustainability Reductions (From 2024)	X	✓	✓	-2.52
	Environmental Destination Abstraction Licence Sustainability Reductions (From 2045)	X	✓	✓	0
Climate Change	CP Projections	CP09	CP18	CP18	-35
Drought Resilience	Increase drought resilience	1 in 200	1 in 500	1 in 500	-33
Methods	Use of stochastic DO method	X	✓	✓	

In producing our preferred Plan, we have considered government policy as set out in the Water Resources Management Plan Direction 2022 and in a regulatory document called Government Expectations for Water Resources Planning (Defra, 2022) including the requirement to:

- Improve supply resilience by planning to raise customer levels of service for a Level 4 drought plan restrictions (stand pipes and rota cuts) from 1 in 200 years to 1 in 500 years by 2040.
- Reduce household Per Capita Consumption (PCC) to 110l/head/day by 2049/50 as well as working with retailers to implement actions to reduce Business Demand by 9% by 2037/38 (excluding growth).
- Reduce leakage by 50% from our 2017/18 leakage levels by 2049/50 with water companies helping customers reduce water demand and water lost through leaks by adopting consistent approaches to support repair and replacement of supply pipes.
- Install smart meters as a standard.
- Adapt to climate change.
- Demonstrate a step change in rectifying overreliance on unsustainable water sources.

2. DEVELOPING OUR PLAN

2.1 WATER RESOURCES MANAGEMENT PLAN PROCESS OVERVIEW

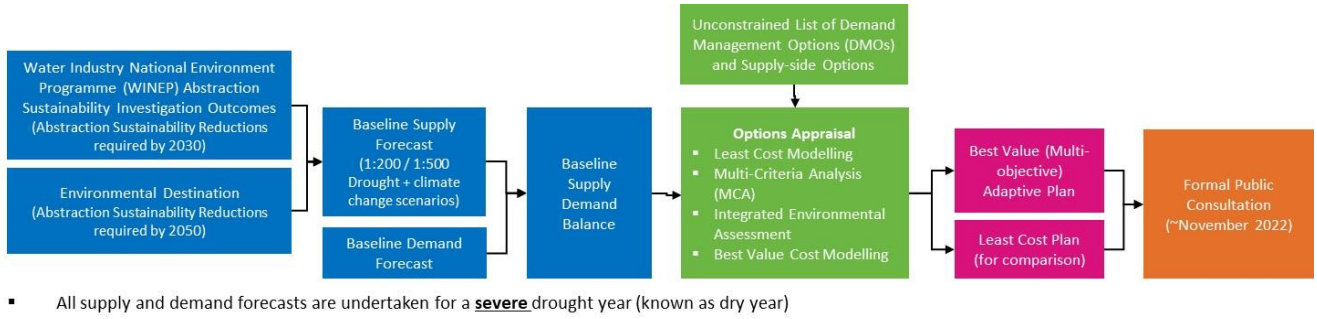

Figure 3: Water Resources Management Plan Process Overview

Figure 3 above provides an overview of the process we have followed in preparing this water resources management plan.

We have:

- Developed our plan in line with the Water Resources Planning Guideline (WRPG) taking account of among others, our Drought Plan, Local Authority Plans, the Governments 25-year environment plan and river basin management plans.
- Completed a Water Resource Zone (WRZ) Integrity Assessment, which concluded that each zone meets the Environment Agency definition and so no changes have been made.
- Completed a problem characterisation assessment, which at the time, concluded that supply deficits were not forecast and so any supply demand issues were of lower complexity and well understood. Consequently, 'current' approaches (Economics of Balancing Supply and Demand, EBSD) would be appropriate to use. However, as per the WRMP24 guidance we have followed a 'fully risk based' approach to supply modelling using stochastically generated data sets to explore the yield response to drought severity.
- Prepared baseline supply forecasts of what water resources are available over the planning period, including lower limits on some of our abstraction licences (known as sustainability reductions). We have considered further long-term abstraction licence reductions, known as Environmental Destination, which are required by 2050 to make sure sufficient water is left in the environment so that it is resilient to the effects of climate change. However, these were not needed for our operating area.
- Prepared baseline demand forecasts which forecast how customer demand (household and non-household raw water and potable) will change without any additional water company interventions.
- Compared baseline supply and demand forecasts to establish whether there is a supply surplus or a supply deficit at any point across the planning period (2025 to 2085).

- After the demand savings from our preferred demand management options that are needed to meet national targets for leakage and demand reduction, we are forecasting a supply surplus across the planning period in both our WRZs. Consequently, we have not needed to identify further supply side options.

We have then prepared a:

- Preferred Best Value Plan (Preferred Plan);
- Least Cost Plan;
- Core Plan (Only includes no / low regret options); and
- Best Environment Plan.

In all cases, the final plan adjusts our baseline forecasts to take account of the demand savings from our chosen demand management options.

There are uncertainties associated with preparing both baseline and final plan supply and demand forecasts and therefore with our Preferred Plan. For example, there are uncertainties around:

- How water company and government measures to reduce customer demand, known as Per Capita Consumption (PCC), will reduce over time.
- How quickly the climate will change and as it does, how this will affect rainfall patterns and totals, river flows, reservoir refill and groundwater recharge.
- How resilient the environment will be to climate change and whether water company abstraction licences will need to be reduced further in the future to make sure enough water is left in the environment so that it is able to be resilient to future climate change.

Consequently, we have undertaken sensitivity testing using among others, Ofwat's Common Reference Scenarios including:

- Low and High Climate Change
- Low and High Technology
- Low and High Abstraction Reductions
- Low and High Demand

In all cases, we maintain a final plan supply surplus in both our WRZs.

2.2 NATIONAL AND REGIONAL PLANNING

The Environment Agency published the Water Resources National Framework (WRNF) in March 2020. It identifies that with climate change and growth in customer demand, if no action is taken between 2025 and 2050, around 3,435 million extra litres of water per day will be needed for public water supply to address future pressures.

Given the long-term water resources constraints, particularly in the South and East of the country, the WRNF confirmed the need for consideration of regional and inter-regional solutions to support national water resources resilience.

Five regional water resources planning groups have been formed with an obligation to set out how they will contribute to the regional and national need. This requirement has presented opportunities for collaboration between regions and other water sectors to develop sustainable solutions, especially in the early stages, in advance of preparing water company dWRMP24s.

Our operating and supply area is covered by Water Resources North (WReN) (**https://www.waterresourcesnorth.org)** which has used the WRNF expectations summarised above to help shape its approach to regional planning and its draft regional plan.

WReN has developed and consulted on a regional plan which which supports the Government's 25-year environment plan and which has an objective to '…leave the environment in a better condition than we found it'. It has:

- Carried out a resource assessment informing the needs of the region including that from public water supply, other sectors (including energy and agriculture) and the environment.
- Prepared a preferred best value plan with an agreed level of environmental ambition that identifies the best value strategic options to meet multi-sector water demands.

It has explored water resource resilience at a national, regional and water company level and has considered water transfers within and between different regions including Water Resources West (WRW) and Water Resources East (WRE). To make sure regional groups have iteratively appraised solutions and their plans are aligned with each other as far as is feasible, national reconciliation workshops have been held through 2021 and 2022. A further round of reconciliation meetings were held after consultation on the draft WRMP24s. This concluded that the Kielder reser to United Utilities Transfer was still not required as there are other better value options.

Importantly, WReN's regional plan informs the water companies' dWRMP24s although has allowed them to refine smaller, local level solutions that are not strategically significant at a regional level.

Regional plans and strategic options have been developed in parallel with our dWRMP24 and the other water company WRMPs. We have ensured alignment through a series of regular sessions with all the water companies within the regional plan, in particular through weekly meetings to discuss modelling between companies and at regional level.

An overview of how WReN's plan has informed our dWRMP24 is presented below.

Baseline and Final Plan Supply Demand Balance

Baseline supply demand balance forecasts covering the planning period 2025 to 2085 have been prepared at a regional level for public water supply as well as for the energy and agricultural sectors. These compare the baseline supply and demand forecasts to determine when there is a supply deficit or a supply surplus at any point across the planning period.

For public water supply, the individual water companies have prepared their own baseline supply demand balance forecasts and have provided them to WReN for use in regional planning. For consistency, the same baseline forecasts have therefore been used for both the regional and water company plans.

Per Capita Consumption (PCC)

The Government requires water companies to plan to reduce Per Capita Consumption (PCC) to 122/lhead/day by 2038 and 110/litres/head/day by 2050. Along with WReN, we have adopted this planning assumption and have developed demand management options to achive these targets accordingly.

Leakage

Water companies within WReN plan to reduce leakage to different levels reflecting their local positions but have shared the demand savings achieved with WReN.

The national water industry target is to reduce leakage by 50% from 2017/18 leakage levels by 2049/50. We are planning to reduce leakage by 55% by 2049/50.

Environmental Destination

The Government's 25 Year Environment Plan aims to improve the environment for the next generation with specific targets for sustainable abstraction. The WRNF builds on this, setting clear expectations for achieving and maintaining sustainable abstraction to 2050 and beyond.

The Environment Agency provided regional groups with an initial assessment of long-term abstraction sustainability under a number of scenarios including 'Business As Usual' and 'Enhanced'.

Further analysis has been carried out to assess whether long-term sustainability reductions are required at a water company abstraction licence level. For our Berwick & Fowberry WRZ, sustainability reductions have been agreed as an outcome of our 2015-20 and 2020-25 WINEPs and so no further reductions under environmental destination are

required. Likewise, no further reductions are required for our Kielder WRZ as Kielder reservoir and the Tyne Tees Transfer system allow us to regulate flows during all droughts.

Intra and inter-regional water transfer options

The opportunity for inter-regional transfers between Water Resources North and Water Resources East and Water Resources North and Water Resources West have been assessed by the regional groups. However, it was agreed at national reconciliation workshops that these would not provide best value.

United Utilities

A 100Ml/d raw water export directly from Kielder Reservoir to United Utilities, either to support resilience within United Utilities own supply area or to facilitate a transfer of water south into serious water stressed areas with a supply deficit, has been considered.

This raw water export is not included in either Water Resources West's or United Utilities Best Value Plans and so has not been included in Water Resources North's or our Best Value Plans. This is because there are many other supply options with a lower unit cost (i.e. £/Ml) that provide better value for money.

Yorkshire Water

Raw water exports of varying magnitudes (40Ml/d up to 140Ml/d) from the River Tees to Yorkshire Water, supported by Kielder Reservoir via the Tyne Tees Transfer system have been considered. However, a 140Ml/d raw water export known as the River Tees to York Transfer is included in Yorkshire Water's and WReN's preferred final plan from 2040 and so we have also included it in our preferred final plan.

We have carried out initial stochastic modelling that showed that with the raw water transfer, the 1-500 DO for the Kielder WRZ dropped to a return period of 1 in 79 years. This was unacceptable so the pumping capacity of Riding Mill was increased by 140Ml/d (to 410Ml/d), to make use of more Kielder Reservoir water. This resulted in the 1-500 DO being restored to the final plan value of 827Ml/d.

2.3 ENGAGEMENT

We recognise the importance of engaging with stakeholders and customers and have done so throughout the development of our dWRMP24. We have actively engaged with our customers through online surveys with current bill payers, a panel survey with future household and non-household customers, and face-to-face surveys to reach audiences that are digitally disengaged or people who haven't been sufficiently engaged through the online survey. Our customer's preferences with regard to demand management options have been considered when setting our preferred final plan (see Section 8.5.3 of our main WRMP24 report). In summary, customers strongly support reductions in water company leakage and of water meter options, they prefer traditional water meters over smart meters. Nevertheless, our smart metering programme necessarily forms an important component of our preferred final plan because without it, we will not meet national targets for PCC (i.e. 122l/head/day by 2038 and 110l/head/day by 2050).

We have engaged with:

- stakeholders through pre-consultation webinars held in January 2022. We engaged with 49 individuals representing a wide range of organisations, including regulators, councils, environmental stakeholders, landowner management groups, other water companies and retailers.
- local planning authorities to:
    - inform our household property and population forecasts and household demand forecasts.
    - understand future non-household growth to inform our non-household demand forecast.
- non-household retailers, businesses and specifically with large users to inform our non-household demand forecast; and
- with the Environment Agency, Natural England and wider environmental stakeholders in the development of our 2025-30 Water Industry National Environment Programme (WINEP). This includes new integrated catchment schemes that will support the delivery of outcomes for the Government's 25 Year Environment Plan and for Local Nature Recovery Strategies.

A significant amount of engagement regarding supply, demand and environmental ambition has been carried out at a regional level through Water Resources North and its Stakeholder Steering Group. Representatives include those from Energy UK, National Farmers Union, environmental groups, Broads Authority, the Environment Agency and water companies. The outcomes of this customer engagement is reported in Appendix 7 of WReN's regional plan which can be found here:www.waterresourcesnorth.org/our-region/wren-regional-draft-plan/

3. OUR BASELINE SUPPLY FORECAST

3.1 APPROACH

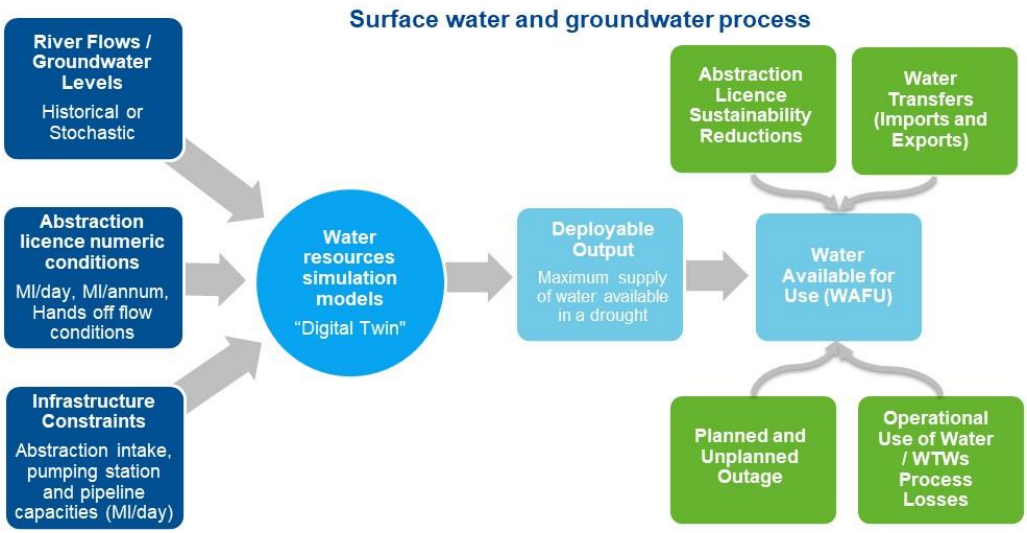

Figure 4: Supply Forecast Process Overview

We have prepared a baseline supply forecast following the Water Resources Planning Guideline for each of our WRZs (see Figure 4 above). This confirms the amount of Water Available For Use (WAFU) in Ml/d in each WRZ across the planning period.

WAFU is plotted on a graph against forecast demand to show the baseline supply demand balance (see Section 5). Where forecast demand is greater than forecast supply in a given year and demand management options do not restore a supply surplus, then new supply schemes will be required.

We have used our Aquator water resource model to determine the deployable output of our Kielder WRZ. For our Berwick & Fowberry WRZ and the groundwater site in the Kielder WRZ, we have used groundwater models developed by British Geological Survey.

3.2 SCENARIOS

We have prepared supply forecasts for 1 in 200 and 1 in 500-year resilience scenarios and for Low (RCP2.6), Central (RCP6) and High (RCP8.5) climate change scenarios using the latest CP18 projections. Our baseline and final plan supply demand balance calculations are based on the central (most likely) planning assumptions. The low and high scenarios have been used for sensitivity testing.

3.3 RESULTS

Our baseline supply demand balance forecasts are shown in section 5 below. The supply forecast part of the calculations have been particularly affected by the following factors:

Climate Change (CP18): This is the first time we have used the CP18 Climate Projections and our assessments confirm that the most likely impact of climate change on deployable output of our surface water sources is 35Ml/d greater than was shown using the previous CP09 projections. However, our groundwater deployable output assessments show that in our Fell Sandstone and Magnesium Limestone groundwater sources are resilient to the effects of climate change as winter rainfall and therefore groundwater recharge is unlikely to change.

1 in 500 Resilience: Our 1 in 500-year deployable output assessments take account of more extreme droughts than those in our 1 in 200-year assessment, and result in a reduction in our surface water deployable output assessment. Moving to 1 in 500 year drought resilience and when using stochastic methods to determine deployable output results in a 33Ml/d reduction in baseline DO.

4. OUR BASELINE DEMAND FORECAST

4.1 OVERVIEW

We have prepared a baseline demand forecast following the Water Resources Planning Guideline (WRPG) for each of our WRZs. A wide range of demand components have been included as illustrated in Figure 5 below.

The baseline normal year demand forecast is the building block for the dry year and critical period forecasts these are then adjusted to provide figures for two climate change scenario forecasts.

The starting point for our demand forecast is the base year (2021/22) population served in combination with the projected growth in population annually over the WRMP period. We have used Local Authority Plan housing growth evidence from all local authorities and have selected the "Plan-based scenario" as our central scenario.

Our demand forecast includes assessments for household and non-household water use, installation, changes in technology, changes in customer behaviour, weather patterns, climate change and the impact of Covid. These influences on demand enable us to make assumptions on future consumption.

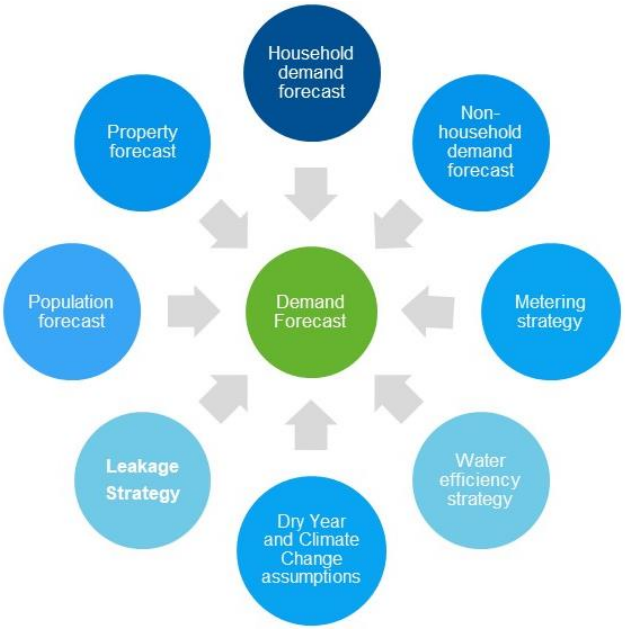

Figure 5: Inputs Into The Baseline Demand Forecast

The baseline demand forecast incorporates the following conditions:

- Customer demand without any further water efficiency or metering interventions from 2025/26 onwards;
- normal rates of optant, selective and meter replacements from 2025/26;
- leakage remains static from 2025/26; and
- population and property growth forecast using Local Authority (LA) Housing Planned growth.

4.2 RESULTS

Our demand forecasts predict a total population growth of 12% by 2049/50, which includes a 14% increase in Berwick population and an 12% increase in Kielder population. The average annual number of new homes is forecast at 97 in Berwick and 6,691 in Kielder.

The per capita consumption (PCC) is forecast to reduce by 6% over the next 25 years as a result of optant metering from 145.8 l/hd/d (2025) to 136.79 in 2049/50 for Northumbrian Water.

Our non-household demand is forecast to increase by 40% by 2049/50 which includes a 17% increase in Berwick and a 41% increase in Kielder.

The overall result of the baseline demand forecast on normal year Distribution Input (DI) is that in 2049/50 DI is forecast to increase from 705.24 Ml/d (base year) to 735.29 Ml/d (2049/50). Berwick will have an increase in demand of around 0.49 Ml/d higher than today in 2049/50 and Kielder demand is forecast to be around 29.6 Ml/d higher than today in 2049/50.

5. BASELINE SUPPLY DEMAND BALANCE

5.1 OVERVIEW

For each WRZ we have prepared:

- Baseline supply forecasts that predict the quantity of water that will be available both as an average across the year and during a critical period (known as Water Available for Use (WAFU));
- Baseline household and non-household demand forecasts which, along with an allowance for leakage from our network and from customer properties (known as Distribution Input (DI)); and
- An allowance for all the uncertainties in our supply and demand forecasts (known as Target Headroom).

Target Headroom uncertainties include accuracy of meters measuring abstractions and Distribution Input, variation in our future demand forecasts, uncertainty in the future impacts of climate change, risks of future pollution impacts on supply availability, and risks of changes to our abstraction licences for sustainability or other reasons.

To allow for these factors we have followed industry standard practice by including a margin between supply and demand to allow for potential variations due to uncertainty. This margin is known as 'headroom', and we have calculated appropriate values of headroom for each planning scenario considered in dWRMP24.

Where the supply forecast is greater than the sum of the demand forecast and target headroom allowance, then there is a supply surplus. Conversely, where the supply forecast is less than the sum of the demand forecast and target headroom allowance, then there is a supply deficit. The baseline supply demand balance for our WRZs are presented below.

5.2 BASELINE SUPPLY DEMAND BALANCE GRAPHS

Figures 6 and 7 below present a baseline supply demand balance graph for each of our WRZs. The supply forecast is based on the deployable output of our water sources / systems under a 1 in 500 drought scenario. The graphs show that we are forecasting 1 in 500 year drought supply deficit in our Kielder WRZ and a supply surplus in our Berwick & Fowberry WRZ. The main cause of the supply deficit in the Kielder WRZ are climate change, NHH (Non-household) growth and a move from 1in 200 to 1 in 500 resilience.

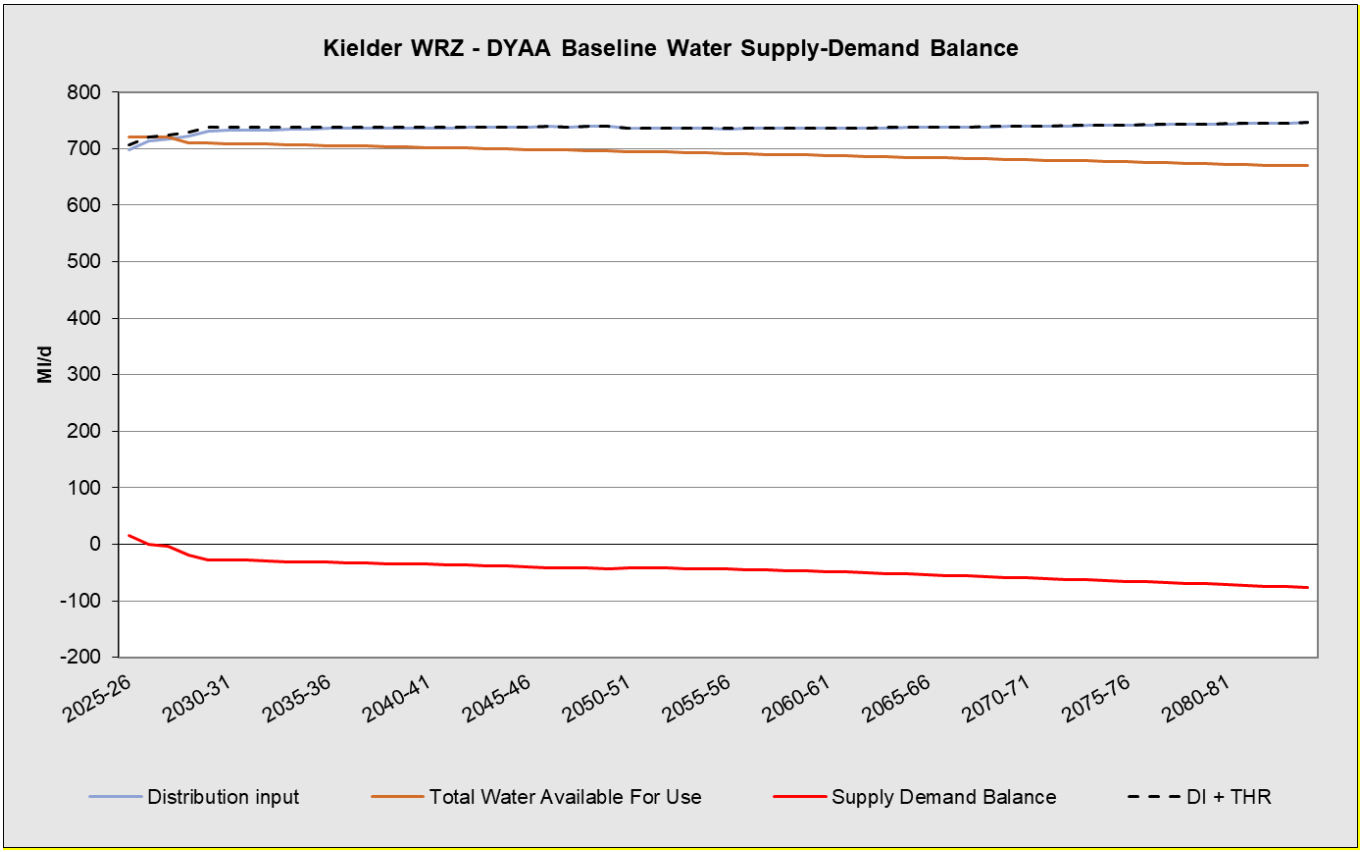

Figure 6: Kielder WRZ Baseline Supply Demand Balance Graphs

Table 2: Summary Of Kielder WRZ Supply Demand Balance

Water Resource Zone	End of AMP7	End of AMP8	End of AMP9	End of AMP10	End of AMP11	End of AMP12
	2024/25	2029/30	2034/35	2039/40	2044/45	2049/50
Kielder	25.13	-27.46	-31.43	-34.59	-38.90	-43.35

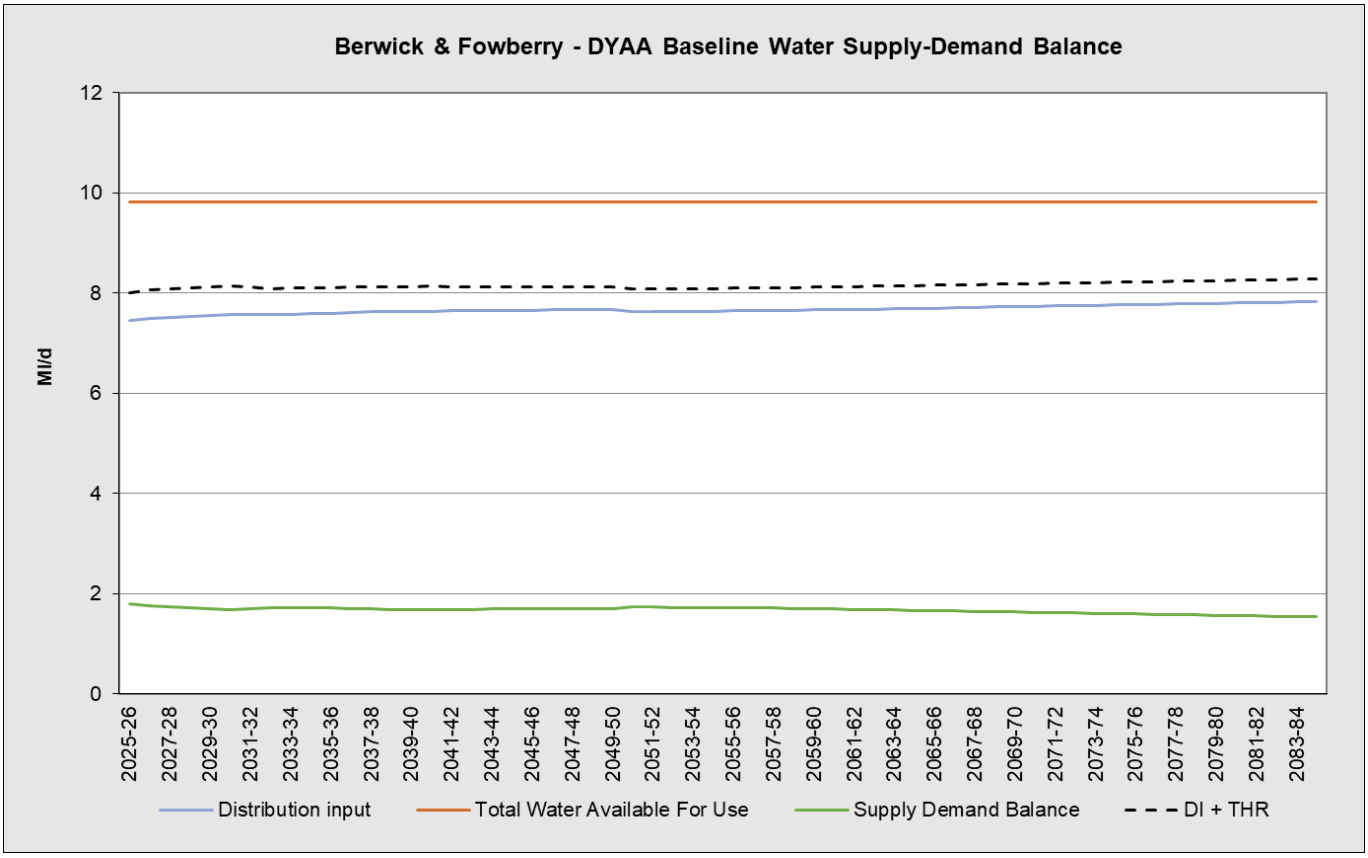

Figure 7: Berwick & Fowberry Baseline Supply Demand Balance Graphs

Table 3: Summary Of Berwick & Fowberry WRZ Supply Demand Balance

WATER RESOURCE ZONE	END OF AMP7	END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP11	END OF AMP12
	2024/25	2029/30	2034/35	2039/40	2044/45	2049/50
Berwick	1.98	1.70	1.72	1.69	1.70	1.69

The supply deficit in the Kielder WRZ is not caused by of a lack of water resources but because of pumping station constraints, which could easily be resolved through the addition of additional pumping capacity. However, this is not required because a supply surplus is restored by demand savings from the demand management options in our WRMP24 our preferred final plan.

6. OUR BEST VALUE PLAN

6.1 OVERVIEW

The aim of our dWRMP24 is to present a long-term preferred Best Value Plan (Preferred Plan), to ensure a secure supply of wholesome drinking water for customers and to protect and enhance the environment.

The objectives of our dWRMP24 are to:

- Achieve a secure, resilient, and sustainable supply of water for our customers, moving to a 1 in 500 level of resilience by 2040.
- Protect and enhance the environment, making sure our abstractions are sustainable both in the short and long term.
- Reduce leakage from our network and from customer's homes, contributing to a national target of 50% reduction from 2017/18 leakage levels by 2049/50.
- Reduce customer demand to 110l/head/day by 2049/50.
- Reduce Business Demand by 9% by 2037/38 (excluding growth).
- For all our meters to be smart meters by 2035.

Our objectives have been chosen because they align with:

- Our own Purpose, Vision and Values;
- Our current performance commitments and ODIs;
- Water Resources North's regional plan objectives;
- Government expectations for water companies WRMP24s including outcomes of the 25 Year Environment Plan and our local River Basin Management Plans; and
- The overall requirements of the PR24 Water Resources Planning Guideline.

We have taken an iterative process in developing our final preferred plan. We have:
i) developed a baseline supply demand balance for both our water resource zones;
ii) identified demand management options and corresponding demand savings to meet government expectations and the following national targets:
- 50% reduction in leakage by 2050;
- 110l/head/d PCC by 2050; and
- 9% reduction in non-household demand by 2038 and 15% reduction by 2050.

For our draft WRMP24, once the demand management option savings were applied to our final plan Distribution Input forecast, a supply surplus was maintained in Berwick and restored in Kielder water resource zones. Consequently, no supply side options were needed for the Kielder zone.

A precautionary options appraisal was undertaken for the Berwick & Fowberry zone as prior to publishing our draft WRMP24, there was a risk that WINEP outcomes may have resulted in a supply deficit. However, ultimately, this was not the case.

The position remains the same for our revised draft WRMP24 which also reports a baseline surplus for the Berwick & Fowberry zone and a baseline deficit for the Kielder water resource zone, but with central demand management options restoring a supply surplus in Year 1.

6.2 PREFERRED DEMAND MANAGEMENT OPTIONS (DMOS)

6.2.1 Overview

Of our low, medium (central) and high feasible demand management options, we have selected central options for our preferred final Plan. This is because they allow us to meet government expectations regarding smart meters and national targets for leakage, PCC and non-household demand reduction (see Table 4 below).

Table 4: Savings and Cost of DMOs

ASPECT		AMP 8 SUPPLY GAIN / DEMAND SAVING ML/D	AMP 8 TOTAL COST £M
Leakage	55% reduction by 2049/50 compared to 2017/18 leakage levels	28.01	14.4
Metering	Enhanced optant and whole area metering programme, fully smart by 2035.	12.64	74.8
Water efficiency	Household medium activity level results in a 0.97 l/hd/d saving Non-Household activity level results in 9% saving on consumption (excluding growth)	20.59	26.2
Total		60.63	115.4

Our leakage, metering and water efficiency strategies are summarised below.

6.2.2 Leakage

In WRMP19 we committed to a 10% reduction per AMP up to 2045, if this approach was extended by a further AMP, then the 50% reduction would be achieved by 2050. In WRMP24 we have replaced this with a glidepath to hit the different percentage reductions in 2050 from the 2017/18 base position. A glidepath profile was selected based on the affordability and deliverability of our plan. It would be more expensive to reduce leakage quicker and then maintain at a lower level over the remaining planning period. The 15% target reduction in the current AMP is very challenging to meet and further reductions will only get harder and more expensive to deliver in future. There is some uncertainty around

how the long-term targets can be achieved, as we try to drive beyond the unavoidable annual real losses (UARL), so an iterative approach is most appropriate to learn and improve our assumptions as we progress.

Our preferred plan is to deliver a 55% reduction in leakage by 2050. This means that we are committed to a 50% reduction companywide (40% by 2050 in ESW), in line with the national target. We believe this is a fair approach based on the current leakage performance in each region and the ability to deliver future targets.

6.2.3 Metering

Customers paying by the volume of water they use is the fairest way of charging customers and we have promoted the benefits of this widely. Our preferred metering option includes enhanced optant metering and whole area metering schemes with all meters being fully smart by 2035. This has been selected due to the surplus supply in 2025-30, but acknowledges that natural optant metering numbers have declined in recent years. Smart meters have many benefits and will provide information to customers so that they can make more informed choices about how they use water. They will also help customers identify when they might have a leaking pipe or toilet and will help us support high water use customers become more water efficient.

6.2.4 Household Water efficiency

We plan to upscale our important water efficiency programme from 2025 to help our household customers to use less water and reduce their Per Capita Consumption (PCC). Our proposed water efficiency programme includes two core elements:

- £8.2 million of base funded household water efficiency activity which, along with our smart metering programme and government interventions (e.g. mandatory white goods labelling and the updating of Building regulations), will reduce PCC to 110l/head/day by 2050. Measures include:
    - Top 5% Highest Users Visits
    - Unmeasured property engagement
    - Internal leakage repair – education and visits
    - Find and Fix Teams - bulk supply
    - Educational interactions (Digital)
    - Digital Engagement
    - National Campaign
    - Toilet Rebates
    - Home Flow restrictions
- £3.4 million of enhancement funding to engage with our customers on smart water meters to support them in reducing their water use and to provide an enhanced customer experience.

6.2.5 Non-household Water Efficiency

Following engagement with a range of organisations including regional groups, MOSL, water retailers, wholesale water companies and consultants, we have developed a new non-household water efficiency strategy for this revised draft WRMP24. It includes £4.8 million of enhancement funding to support businesses reduce their current annual average water use by the national target of 9% by 2037/38. Measures include:

- Information provision (e.g. more detailed water consumption data)
- Infrastructure and Leak Investigation
- Water Efficiency Solutions for non-household domestic-type water use (e.g. staff toilets and canteens)
- Water Efficiency Solutions for Mixed-type Use
- Consultancy support for industry

6.3 SUPPLY OPTIONS

As confirmed above, our preferred demand management options restore a supply surplus in the Kielder WRZ and increase the supply surplus in the Berwick & Fowberry WRZ.

6.4 WATER EXPORT OPTIONS

6.4.1 Feasible Water Export Options

Kielder reservoir has a surplus of raw water after the requirements of our household and non-household customers have been met. Consequently, as illustrated below, new raw water exports have been considered as part of developing regional plans.

The schemes include:

- A range of raw water exports directly from Kielder reservoir to United Utilities either to support resilience within United Utilities own supply area or to facilitate a transfer of water south into serious water stressed areas with a supply deficit. We have undertaken more detailed assessments with United Utilities on a 100Ml/d export. New United Utilities assets would include a new abstraction licence, reservoir intake and pumping station and a raw water strategic pipeline.

- A range of raw water export from the River Tees to Yorkshire Water, supported by Kielder reservoir via the Tyne Tees Transfer system. As agreed with Yorkshire Water, we have particularly focused on a 140Ml/d option known in Yorkshire Water's WRMP as DV7a(vi) Tees to York Pipeline - NWL import 140 Ml/d option. New Yorkshire Water assets would include a new pump in a currently empty NWL pumping station bay and a raw water strategic pipeline. Additionally, an upgrade of Riding Mill Pumping Station would also be required including the installation of an additional pump and a new electrical supply.
- A 15Ml/d export of treated water from our Darlington WTWs to Yorkshire Water.

6.4.2 Potential Transfer to United Utilities

Jointly, with United Utilities, we have undertaken a significant programme of modelling to explore the availability of raw water to export. Water availability was established by determining the maximum volume of water that can be transferred in accordance with the proposed utilisation patterns from United Utilities, without leading to a simulated failure of the Kielder WRZ of more often than 1 in 500 years.

On the basis of availability, a 100Ml/d raw water export from Kielder reservoir to United Utilities is feasable. However, it is not included in either Water Resources West's or United Utilities' Best Value Plans and so has not been included in Water Resources North's or our Best Value Plans. This is because there are other supply options with a lower unit cost (i.e. £/Ml) that provide better value for money.

Since consulting on our draft WRMP24, United Utilities has confirmed that it now considers its headroom position to be more resilient and so the Kielder Reservoir to UU Transfer (100Ml/d) has still not been included in either its preferred final plan or any adaptive pathways.

Water Resources North and Water Resources West have also considered the Kielder reservoir to United Utilities Transfer as an option to support security of supply and increase resilience for other water companies. A robust reconciliation process has been followed by the regional groups with the last round still concluding that the transfer was not required. This is largely because of the high unit costs (£/Ml/d) associated with the scheme and that there were other better value feasible options.

We note RAPID would like us to continue to investigate the Kielder reservoir to UU transfer and so we will continue to work with Yorkshire Water, United Utilities, Water Resources West and Water Resources North after our respective revised draft WRMPs have been submitted.

6.4.3 River Tees to York (Yorkshire Water) Transfer

A range of raw water export options from the River Tees to Yorkshire Water (YW) have been considered (15, 50, 80 and 140Ml/d), supported by Kielder reservoir via the Tyne Tees Transfer system as required, to assess the impact of various transfers to YW on the Kielder WRZ. YWs modelling identified the 140Ml/d transfer from the river Tees as a preffered plan solution to their defificts, and as such have included it in their best value plan.

In order to assess the effect of such a transfer on the availability of water in the Kielder WRZ we carried out stochastic modelling, the results of which showed that with a raw water transfer of 140Ml/d from the River Tees to Yorkshire Water the 1-500 DO for the Kielder WRZ dropped to a return period of 1 in 79 years. Clearly, this is unacceptable so the pumping capacity of Riding Mill was increased by 140Ml/d (to 410Ml/d), to make use of more Kielder reservoir water, this resulted in the 1-500 DO being restored to the final plan value of 827Ml/d. Therefore in order for us to supply a raw water transfer of 140Ml/d to YW, significant investment would need to be made by YW to upgrade the pumping capacity at Riding Mill along with the electical supply to Riding Mill as well as installing their own abstraction pumps on the river Tees.

It should be noted that when providing a 1 in 500 level of supply resilience to our customers, the surplus of water in Kielder reservoir means we can only provide a raw water export to one of the companies and so as things stand, this will be to Yorkshire Water only.

Since consulting on our draft WRMP24, we have re-confirmed with Yorkshire Water its position on importing raw water from NWL. Yorkshire Water has confirmed that the River Tees to York Transfer (140Ml/d) is still selected for inclusion in its preferred final plan although it is now needed by 2040 and not 2050. Consequently, we have agreed to include it in our preferred final plan too.

6.5 FINAL PLAN SUPPLY DEMAND BALANCE

Figures 8 and 9 below present the final plan dry year annual average supply demand balance graphs for both WRZs. The Water Available for Use and Distribution Input forecasts takes account of our preferred demand management options (leakage, metering and water efficiency) and the River Tees to York Transfer.

6.5.1 Kielder WRZ Final Plan Supply Demand Balance

The baseline potable supply demand balance graph for the Kielder WRZ confirmed a small supply deficit throughout the planning period. However, the final plan potable supply demand balance shown in Figure below shows a supply surplus across the planning period from 2025 to 2084. This is due to demand side drought measures increasing our 1-500 deployable output, along with demand for water decreasing as a result of our metering, water efficiency and leakage strategies.

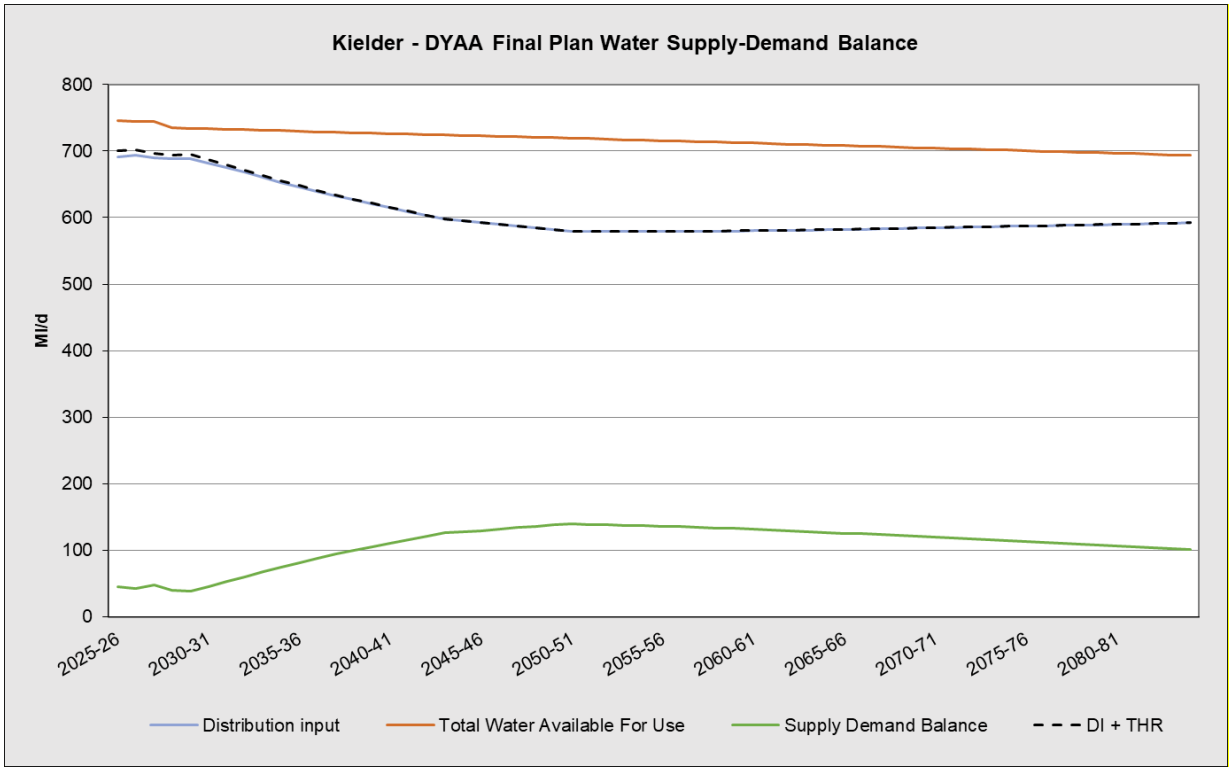

FIGURE 8 : KIELDER WRZ DRAFT WRMP FINAL PLANNING SUPPLY DEMAND BALANCE

TABLE 5: KIELDER WRZ SUPPLY SURPLUS

KIELDER WRZ	END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP111	END OF PLANNING HORIZON
YEAR	2029/30	2034/35	2039/40	2044/45	2049/50
Balance of Supply (excluding headroom)	44.71	77.85	105.98	128.38	138.50
Balance of Supply (including headroom)	38.98	75.07	105.00	127.89	138.37

6.5.2 Berwick and Fowberry WRZ Final Plan Supply Demand Balance

The baseline supply demand balance graph for the Berwick and Fowberry WRZ showed that a supply surplus was maintained across the full planning period. The supply surplus in the final plan supply demand balance shown in Figure 9 is slightly higher reflecting our final plan metering, water efficiency and leakage strategies.

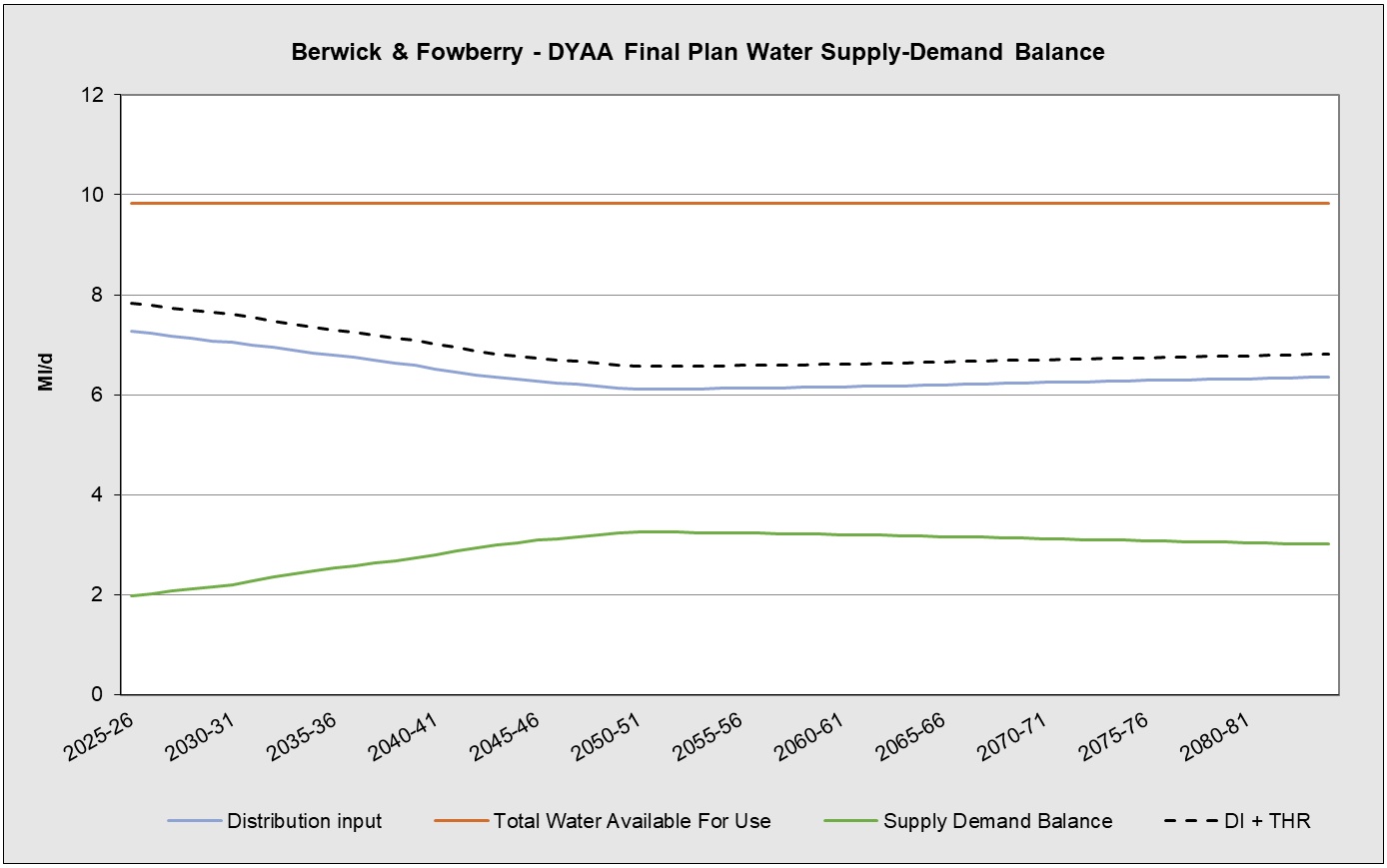

FIGURE 9: BERWICK AND FOWBERRY FINAL PLAN SUPPLY DEMAND BALANCE

TABLE 6: BERWICK & FOWBERRY WRZ SUPPLY SURPLUS

BERWICK AND FOWBERRY WRZ	END OF AMP7	END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP111	END OF PLANNING HORIZON
YEAR	2024/25	2029/30	2034/35	2039/40	2044/45	2049/50
Balance of Supply (excluding headroom)	2.74	2.99	3.24	3.51	3.68	2.74
Balance of Supply (including headroom)	2.17	2.48	2.74	3.05	3.23	2.17

7. TESTING OUR PLAN

7.1 OFWAT COMMON REFERENCE SCENARIOS

7.1.1 Overview

We have carried out sensitivity analysis for both WRZs using Ofwat's common reference scenarios with high and low parameters for climate change, demand, technology and environmental ambition (see Table 7 below). However, no long-term abstraction sustainability reductions under Environmental Destination are required for our Northumbrian Water region and so they have not been included in the scenario testing.

TABLE 7: OFWAT COMMON REFERENCE SCENARIO ASSUMPTIONS

OFWAT	SUPPLY	DEMAND COMPONENT	CLIMATE CHANGE
Preferred Plan	Final Plan 1-500 Deployable Output, 90th percentile Outage Allowance, Low Risk Target Headroom	**Growth**: Uses population, property and occupancy forecasts derived from local plans published by local councils. **Building regulations and product standards**: Assumes the introduction in 2025 of a mandatory government-led scheme to label water-using products. **DMOs**: Final plan DMOs	UKCP18 RCM projections, RCP8.5, 50th percentile scaled to RCP6.0.
Low Climate Change	Final Plan 1-500 Deployable Output, 90th percentile Outage Allowance, Low Risk Target Headroom	Preferred Plan with: UKWIR 'Impact of Climate Change on Water Demand. Most-likely effects of climate change the 50th percentile	UKCP18 probabilistic projections, RCP2.6, 50th percentile
High Climate Change	Final Plan 1-500 Deployable Output, 90th percentile Outage Allowance, Low Risk Target Headroom	Preferred Plan with: UKWIR 'Impact of Climate Change on Water, least likely (maximum) effect of climate change of demand the 90th percentile	UKCP18 RCM projections, RCP8.5, 50th percentile.
High Demand	Final Plan 1-500 Deployable Output, 90th percentile Outage Allowance, Low Risk Target Headroom	**Growth**: Uses population, property and occupancy forecasts derived from local authority housing need forecasts. **Building regulations and product standards.** Assumes the introduction in 2025 of a mandatory government-led scheme to label water-using products. **DMOs**: Low demand DMOs	UKCP18 RCM projections, RCP8.5, 50th percentile scaled to RCP6.0.
Low Demand	Final Plan 1-500 Deployable Output, 90th percentile Outage Allowance, Low Risk Target Headroom	**Growth:** Uses population, property and occupancy forecasts derived from ONS population and household projections. **Building regulations and product standards**: Assumes the introduction in 2025 of a mandatory government-led scheme to label water-using products. **DMOs**: High demand DMOs	UKCP18 RCM projections, RCP8.5, 50th percentile scaled to RCP6.0.
Slow Technology	Final Plan 1-500 Deployable Output, 90th percentile Outage Allowance, Low Risk Target Headroom	**Growth**: Uses population, property and occupancy forecasts derived from local plans published by the local council. **Building regulations and product standards:** Assumes no change over the period to 2050. **DMOs**: Low demand DMOs	UKCP18 RCM projections, RCP8.5, 50th percentile scaled to RCP6.0.

OFWAT	SUPPLY	DEMAND COMPONENT	CLIMATE CHANGE
Fast Technology	Final Plan 1-500 Deployable Output, 90th percentile Outage Allowance, Low Risk Target Headroom	**Growth:** Uses population, property and occupancy forecasts derived from ONS population and household projections. **Building regulations and product standards**: Assumes the introduction in 2025 of a mandatory government-led scheme to label water-using products. **DMOs**: High demand DMOs	UKCP18 RCM projections, RCP8.5, 50th percentile scaled to RCP6.0.

No supply deficits are caused by any of the scenarios and so we are confident that our best value plan which only comprises demand management options is sufficient to maintain a 1:500 year supply surplus in both WRZs and is a is a no regrets plan.

7.1.2 Results

Table 8 below compares the supply demand balance for the Kielder Water Resource Zone for our central planning scenario against each of the Ofwat common reference scenarios and peak week demand (dry year critical period).

Table 8: Kielder WRZ Ofwat Common Reference Scenarios Supply Demand Balance

SCENARIO NAME		END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP11	END OF AMP12
Preferred Plan	SDB	39	75	105	128	138
Peak Week (DYCP)	SDB	13	57	96	126	142
Low Climate Change	SDB	51	88	118	141	152
	Change from Preferred Plan	12	13	13	13	14
High Climate Change	SDB	11	41	65	81	85
	Change from Preferred Plan	-28	-34	-40	-47	-53
High Demand Scenario	SDB	27	43	61	73	79
	Change from Preferred Plan	-12	-32	-44	-55	-59
Low Demand Scenario	SDB	54	96	132	161	177
	Change from Preferred Plan	15	21	27	33	39
Slow Technology	SDB	9	19	28	34	38
	Change from Preferred Plan	-30	-56	-77	-94	-100
Fast Technology	SDB	49	87	122	148	162
	Change from Preferred Plan	10.26	11.82	16.50	20.19	23.42

Table 9 below compares the supply demand balance for the Berwick & Fowberry water resource zone for our central planning scenario against each of the Ofwat common reference scenarios and peak week demand (dry year critical period).

Table 9: Berwick & Fowberry WRZ Ofwat Common Reference Scenarios Supply Demand Balance

SCENARIO NAME		END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP11	END OF AMP12
Preferred Plan	SDB	2.17	2.48	2.74	3.05	3.23
Peak Week (DYCP)	SDB	2.23	2.22	2.19	2.20	2.20
Low Climate Change	SDB	2.15	2.46	2.72	3.03	3.21
	Change from Preferred Plan	-0.01	-0.01	-0.02	-0.02	-0.02
High Climate Change	SDB	2.15	2.45	2.71	3.01	3.19
	Change from Preferred Plan	-0.02	-0.03	-0.03	-0.03	-0.04
High Demand Scenario	SDB	2.41	2.66	2.86	3.06	3.17
	Change from Preferred Plan	0.25	0.18	0.12	0.01	-0.05
Low Demand Scenario	SDB	2.58	2.95	3.27	3.63	3.84
	Change from Preferred Plan	0.41	0.47	0.53	0.58	0.61
Slow Technology	SDB	2.24	2.37	2.44	2.56	2.65
	Change from Preferred Plan	0.07	-0.11	-0.29	-0.48	-0.58
Fast Technology	SDB	2.51	2.88	3.19	3.53	3.73
	Change from Preferred Plan	0.35	0.40	0.45	0.48	0.50

The tables confirm that both our WRZs remain in surplus even under the different scenarios we have tested and so there is no need for any adaptive pathways.

7.2 ALTERNATIVE SMART METERING SCENARIO

Our final preferred plan includes demand management options that are needed to meet national leakage and demand reduction targets. For deliverability reasons, our preferred plan uses a linear delivery profile although the demand savings are still sufficient to maintain a supply surplus in the Berwick & Fowberry WRZ and to restore a supply surplus in the Kielder WRZ early in AMP8. The demand savings in the Kielder WRZ result in a supply headroom of 39Ml/d by

the end of AMP8 and so we have considered an optimised smart metering programme whereby a proportion of the programme is deferred to AMP9.

Our preferred plan is to deliver the smart metering programme by 2035 using a linear profile with 50% of the programme being delivered in AMP8 and 50% in AMP9. However, for the purposes of this scenario, we have assumed 25% of the programme is delivered in AMP8 and 75% in AMP9. Under this scenario, the interim PCC target of 122l/head/day by 2037/38 would still be achieved as 100% of the meters will still have been replaced with smart meters by 2034/35 although AMP8 demand savings would be less.

We have also considered further scenarios whereby only 50% and 75% of the smart meter programme is delivered by the end of AMP 9. In both cases, the PCC target of 118 l/head/day by 2040 was not met and so this is discounted as a feasible option.

While deferring a proportion of the smart metering programme to AMP9 still allows us to meet the interim PCC target of 122l/head/day by 2037/38, we have discounted this as a feasible option in favour of our smart metering preferred plan which is still being based on a linear delivery profile (i.e. split equally across AMP8 and 9). This is for the following reasons:

- **Asset Availability:** A linear profile spreads the risk of unforeseen challenges with smart meter availability. For example, we have seen a significant impact of both Covid lockdowns and the war in Ukraine on component availability the latter of which is ongoing. Spreading the numkber of smart meter installs equally over two amps therefore spreads the risk. We also expect to see a significant growth in smart meter installs across the industry in 2025-2035 which will put further significant pressure on the manufacture and supply of smart meters and so a linear approach protects us against supply and demand constraints across the industry as a whole;
- **Availability of skilled workforce:** With a surge in smart meter installs across the industry in AMP8 and AMP9 there is going to be a significant demand on skilled workforce to support the installs and in life management of the assets. Increasing installation and replacement activity not only puts pressure on asset and field activity but also support services e.g. our planning and scheduling teams and contact centres. A linear rollout profile allows us to partner with outsource agencies or to recruit, develop and retain skilled resource at the right levels for both AMP8 and AMP9 reducing the impact of a spike in additional headcount and associated cost in AMP9;
- **Meter Replacement Success Rate**: 25% of our meters are internal and therefore require appointments to be made with customers. Pilot activity has indicated that only 20% of customers respond to these requests to book an appointment and it takes 3.5 contacts per household to secure a replacement. So spreading these installs equally across AMP8 and AMP9 allows us to better manage the risk of no access and ensure higher rates of replacement success. If we fail to secure an appointment in AMP8 we can re-try in AMP9, however If we push them out into AMP9 there is a higher risk of still having a significant number of meters that we have not been able to replace due to access issues;
- **Future AMP impacts of a nonlinear approach:** Pushing more metering activity into AMP9 creates a lumpy replacement profile for future years. As the smart meters we are installing have a 15 year life time that means we are going to have a significant AMP of meter replacement activity again in 2045-2050 (assuming no change in

technology). This would mean a spike in metering investment in this AMP and a need to re-increase resource and capacity across the end-to-end value chain to be able to deal with this hump; and

- **Supply Demand Blance Flexibility**: A linear profile provides greater flexibility if other demand management options under-perform or if non-household growth is higher than expected.

Given the baseline supply deficits forecast in our Kielder water resource zone and uncertainties in reducing PCC, we will continue to plan to deliver our leakage and metering programmes against a linear delivery profile. However, we commit to reviewing our demand management strategies during the development of our WRMP29 in 2027 and will optimise our smart metering programme at that point.

8. ENVIRONMENT AND SOCIETY

8.1 OVERVIEW

This draft Water Resources Management Plan sets out how we intend to achieve a secure supply of water for our customers during extreme droughts, whilst also protecting and enhancing the environment.

We want the best outcome for the environment, in particular when our customers are in support of this and we can deliver these improvements in a way that is affordable for customers. We recognise that we have an important role to play in making sure our water environments are healthy and rich with biodiversity. A key part of that is making sure we only take from rivers and aquifers what they can afford to give – we call this sustainable abstraction – and that we change our operations if factors such as climate change and population growth mean our abstractions become unsustainable in the future.

We also think about the wider environment when making our plans, for example by adopting low carbon options where possible and embracing nature-based solutions where feasible. Where we need to build new assets we are committed to achieving a net gain for biodiversity as part of each scheme.

8.2 INTEGRATED ENVIRONMENTAL ASSESSMENT

8.2.1 Overview

Although we are not porposing any new supply side options in our WRMP24 preferred final plan, we have carried out various environmental assessments, including Strategic Environmental Assessment (SEA) of our Demand Management Options and of the 140Ml/d raw water export from the River Tees to Yorkshire Water and our plan as a whole. We have used these to aid our decision-making on options development and the selection of preferred options within our dWRMP24, with the aim of developing a WRMP that meets legislative requirements and provides environmental net gain.

The draft SEA Environmental Report was issued for public consultation alongside our dWRMP24 in late 2022. Comments received on the Environmental Report were recorded in a log and have been addressed in the final SEA Environmental Report. No significant alterations to the NW WRMP24 were required as a result of the consultation feedback on the Environmental Report.

The Environmental Report is provided in the accompanying document ‘Northumbrian Water – Water Resources Management Plan 2024 - Environmental Report’ (Mott Macdonald July 2023) and reviews the feasible options for our WRMP24, to identify any potential positive or negative environmental effects.

The outcomes of the SEA are summarised below.

8.2.2 Summary of SEA of Tees to York Transfer Option

Construction

- During the construction phase, there are considered to be a number of major and moderate, and therefore significant, residual negative effects posed by the Yorkshire Water option (DV7a(vi)) to biodiversity, soil, air quality, landscape, historic environment, and population and human health SEA objectives. These are as a result of the proposed pipeline's close proximity to designated sites, its required temporary land take within a large quantity of greenfield, best and most versatile agricultural land, and a small quantity of Agricultural Land Classification Grade 2 (land of medium to high value), its anticipated temporary adverse effects on local air quality in surrounding urban areas and its potential to cause nuisance from noise, dust and vibration as a result of construction and vehicle movements, its proximity to AONB, scheduled monuments and numerous listed buildings in which there is potential for temporary adverse construction effects on the setting of these designations coming from construction activities and vehicle movements, its temporary disruption to a range of recreational facilities, and its significant use of materials. Any other residual negative effects are considered to be minor, and therefore not significant.
- During construction, there are not anticipated to be any significant residual positive effects to SEA objectives. There is also anticipated to be no minor positive effects.

Operation

- During the operational phase, there are considered to be major, and therefore significant, residual negative effects posed by the Yorkshire Water option (DV7a(vi)) to climatic factors and material assets SEA objectives. These are as a result of the proposed pipelines significant use of materials and the large quantity of embodied carbon emissions associated with this, as well as from carbon emissions associated with anticipated HGV movements and construction activities, and from electricity requirements required for pumping during operation. Any other residual negative effects are considered to be minor, and therefore not significant.
- During operation, there are anticipated to be major and moderate, and therefore significant, residual positive effects to biodiversity, climatic factors, and population and human health SEA objectives. These are as a result of potential beneficial opportunities for areas of habitat affected by construction through compensatory planting and habitat enhancement, in particular grassland and woodland habitat local to the scheme, the proposed pipeline helping to secure a supply-demand balance over the next 25 years, thus helping to maintain essential public water supplies and therefore help maintain public health and well-being, as well as improved resilience to the threats of climate change. No minor positive effects are anticipated.

Summary

Yorkshire Water note the adverse effects associated with this scheme. They will work collaboratively with WReN and Northumbrian water and are committed to a full assessment of all options including the Tees transfer and developing other suitable options which will be fully assessed, including cumulative SEA assessments for all options.

8.2.3 Summary of Northumbrian Water Demand Management Options SEA

Construction

- During the construction phase, there are considered to be no significant residual negative effects to SEA objectives as a result of all three demand management option scenarios. Any residual negative effects during the construction phase are considered to be minor, and therefore not significant. The DMO-Preferred option scenario (the preferred option included in the Best Value Plan), and the DMO-High option scenario were assessed as having minor negative effects to objectives in all SEA topics, with the DMO-Low option scenario having minor negative effects to objectives in all SEA topic apart from water.
- During construction, none of the demand management option scenarios were considered to have significant residual positive effects to SEA objectives. Additionally, no minor positive effects were anticipated.

Operation

- During the operational phase, none of the demand management option scenarios were considered to have significant residual negative effects to SEA objectives. Additionally, no minor negative effects were anticipated.
- During operation, there are anticipated to be significant residual positive effects to water and population and human health SEA objectives as a result of all three demand management option scenarios, with DMO-Preferred and DMO-High also having significant residual positive effects to climatic factors objectives. Positive effects are generally associated with improved water efficiency and leakage works, resulting in lower water demand, and therefore less extraction of water from natural environments for human consumption. This could, for example, increase resilience of water supplies and natural systems to droughts, help to enhance or maintain surface water quality, flows and quantity, as well as providing other significant positive effects. Through improved water efficiency, and leakage reduction of 55% by 2050, the DMO-Preferred scenario is anticipated to yield an annual water saving of 52,246.1 Ml for the year 2074/75 (143.14 Ml/d average). The DMO-High scenario (improved water efficiency and 50% leakage reduction by 2050) is anticipated to yield an annual water saving of 63,919.1 Ml for the year 2074/75 (183.34 Ml/d average). The DMO-Low scenario (improved water efficiency and 30% leakage reduction by 2050) is anticipated to yield an annual water saving of 30,324.2 Ml for the year 2074/75 (83.08 Ml/d average).

8.3 WATER INDUSTRY NATIONAL ENVIRONMENT PROGRAMME (WINEP)

8.3.1 Water Industry National Environment Programme (WINEP)

As part of our five-year planning process we agree a list of actions we will take to further improve the environment. This is known as the Water Industry National Environment Programme (WINEP). The WINEP is designed to protect the environment around the rivers and aquifers we abstract from, the reservoirs we use to store water, the environments we discharge to, and our land holdings.

8.3.2 AMP7 WINEP (2020 to 2025)

In the current planning period, known as AMP7, we have carried out a number of investigations to better understand the effect of our operations on the environment and to make changes where needed. The locations and scope of these investigations were agreed with our environmental regulator the Environment Agency, and the resulting changes to our operations have the Environment Agency's approval. We have agreed to:

- Reduce abstraction from some of our groundwater sources in the Berwick & Fowberry Water Resource Zone to make sure our abstractions do not exceed aquifer recharge rates. We have incorporated these reductions in licensed quantity into our WRMP24 baseline supply forecast.
- Change the timing and volumes of releases of water from several of our reservoirs to reflect a more natural flow, with higher winter flows and lower summer flows, as well as 'spate' releases to ensure river conditions which allow migratory fish to move up and downstream at keys times of their annual life cycles.
- Install screens on our river abstraction intakes to ensure eels do not become entrapped.
- Build fish passes or easements on structures (e.g. Weirs) that we own which prevent fish from moving naturally up and down rivers.
- Address the impacts that reservoirs have on the natural 'form' of rivers, for example by adding gravel to rivers which are depleted of natural sediment by the presence of a dam wall.

We continue to work closely with land managers and farmers to improve the quality of water at our abstractions as better quality water requires less treatment, therefore using less energy and chemicals. In AMP7 we have focused particularly on reducing pesticides, nitrates and cryptosporidium in our raw water, as well as addressing the problem of colour in water from degraded peatland. In AMP7 we have:

- Engaged with farmers through events and one-to-one visits and offered grants to support them to make changes to their farm infrastructure or change their farming practices to minimise the loss of nitrates and pesticides from their land.
- Supported the Pennine Peat Life Programme to regenerate degraded peatlands which supply the upland reservoirs in the Tees catchment.
- Supported partner organisations to deliver projects which take a holistic approach to improving river habitat, increasing biodiversity, and addressing the impacts of climate change, focusing on the South Tyne catchment.

Invasive Non-native Species (INNS) are a threat locally and nationally. We are working with regulators and stakeholders to reduce the risk of spreading INNS by monitoring for them, carrying out risk assessment for existing and proposed new operations, installing washdown facilities at reservoirs with public access, and ensuring we follow appropriate biosecurity measures in all our operations.

8.3.3 AMP8 WINEP (2025 to 2030)

We have worked closely with our regulators and stakeholders and have now finalised all the enviornmental improvement schemes in our part of the WINEP for delivery in 2025 to 2030. We were set a challenge by our regulators to aim for even more ambitious environmental outcomes for AMP8, and we have been 'thinking big' around how we can deliver more for our water environments and for our customers. Some of our proposals build on investigations we have undertaken in AMP7, while others build on our success in supporting partners to deliver holistic environmental projects.

From a water resources perspective our overall aim is to create resilience in rivers and aquifers so they are able to support healthy habitats and diverse and abundant wildlife in the face of climate pressures, as well as providing for our own water supply needs. We are working closely with other environmental organisations to identify the opportunities to develop bigger and better projects which will deliver multiple benefits for the environment. By aligning our aims and ambitions with those of others we will be able to deliver far more than we could alone, and working in this way means our spending can be used to lever additional funding to deliver more for our environment and for people.