PR24

NORTHUMBRIAN WATER living water | ESSEX&SUFFOLK WATER living water

REVISED DRAFT WATER RESOURCES MANAGEMENT PLAN 2024

EXECUTIVE SUMMARY

August 2023

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ESSEX & SUFFOLK 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.

East Anglia is one of the driest parts of the country and has been classified by the Environment Agency as a Serious Water Stressed Area. 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. We recognise that we must provide resilient supplies and look after the environment for our current customers, and that we must do the same for future generations.

In the early 1990s we identified that we would not have sufficient water supplies to meet long term forecast demand and so we started a twin track approach to reduce customer demand and increase supplies.

Reducing demand

We are proud that overall leakage from our network and from our customers' homes is at one of the lowest levels in the water industry. However, we continue to aim to improve, and our preferred plan is to reduce leakage by a further 40% from 2017/18 levels by 2050.

When customers pay for the amount of water they use it is the fairest way of charging them and we have widely promoted the benefits of this. The majority of our customers, nearly 70%, now have a water meter and are charged for how much water they use. Given that the majority of our customers are metered and that our supply area is a serious water stressed area, we now plan to compulsory meter all our customers which means that all customers will pay for the amount of water they use by 2030 in Suffolk and 2035 in Essex.

We are planning for all household and non-household meters to be smart meters by 2035, similar to the ones used for electricity and gas. They will allow our customers to make more informed choices about how they use water. They will also help to identify when they might have a leaking pipe or toilet and will help us support customers who use high levels of water 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 efficiency strategies will help us meet national targets for reducing customer water demand including reducing per capita consumption (PCC) to 122litres/head/day by 2038 and 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, we are forecasting that our strategy will enable us to reduce business water demand by 9% by 2038.

Increasing supplies

We were the first water company to build a Water Reuse scheme in 2000. The scheme intercepts effluent from a water recycling centre that would otherwise be discharged to the sea and treats it to a very high quality so that it can be discharged into a river instead. This increases flows in the river to support and protect our downstream abstraction as well as the river environment.

We also started a major project in the 1990s to improve our Abberton Reservoir in Essex. We carried out extensive environmental assessments and eventually invested £150m to increase its storage capacity by 60% or 15 billion litres. In doing so, we created one the best wetland sites for birds in the country, a great early example of biodiversity net gain. Construction works were completed in 2013 with the reservoir filling to its new top level in 2014.

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 using more energy and chemicals to treat the water before we can distribute it to our customers.

We have always monitored the impacts of taking water from rivers and groundwater and taken timely action to make sure the environment is not damaged as a result. A great early example of this came in the 1990s when we closed down one of our groundwater abstractions that was having a negative impact on Redgrave and Lopham Fen in Suffolk. However, as our understanding of the environment improves, so does our understanding of how much water it needs. We have just completed a comprehensive series of abstraction sustainability investigations. We have agreed with the Environment Agency that where the amount of water our abstraction licences permits us to abstract each year is not sustainable, we will reduce our licences and our plans are made on this basis.

Our revised draft WRMP24

Reducing some of our water abstractions, the effects of climate change and new demand from households and businesses mean that we will not have enough water. Consequently, we need to act now and develop new supply schemes to make sure our customers are not affected. These are presented in our preferred plan in this dWRMP24 and for Suffolk include new strategic pipelines to allow us to move water around our supply areas more efficiently, a new Water Reuse scheme and a new winter storage reservoir. In South Essex, we to plan to construct a new groundwater treatment works.

The following Table provides a summary of our Best Value Plan and confirms the changes made between our draft WRMP24 (which we consulted on) and our subsequent revised draft WRMP24.

Table: Best Value Plan summary

WRMP24 Best Value Plan Component		Draft WRMP24 Preferred Final Plan	Revised draft WRMP24 Preferred Final Plan	Difference
Demand Reduction	Leakage Reduction	40% reduction by 2050	40% reduction by 2050	No
	Compulsory Metering	All household and non-household properties to be compulsory metered by 2035	All household and non-household properties to be compulsory metered by 2035	Given the moratorium in our Hartismere water resource zone, we have committed to compulsory meter all Suffolk customers by 2030/31
	Smart Metering	All household and non-household properties to have smart meters by 2035	All household and non-household properties to have smart meters by 2035	No
	Water Efficiency Programme	Water efficiency programme to support meeting national household water consumption targets	Water efficiency programme to support meeting national household water consumption and business demand reduction targets	Inclusion of new programme to reduce business demand in line with the national non-household demand reduction target
Essex Supply Schemes	Linford WTW and Borehole(s)	Yes - 7Ml/d Scheme	Yes - 10Ml/d scheme	The revised draft WRMP24 includes a 10Ml/d rather than 7Ml/d scheme
	Abberton Raw Water Pumping Station & Langford Clarifiers	Not included	Included	Scheme to allow DO gain from the Abberton to Langford Pipeline
	Langford Nitrate Removal Scheme	Not included	Included	New scheme to reduce unplanned outage due to elevated raw water nitrate concentrations
	Langford Ultraviolet (UV) Scheme	Not included	Included	New scheme to reduce unplanned outage due to cryptosporidium in raw water
	Langham Nitrate Removal Scheme	Not included	Included	New scheme to reduce unplanned outage due to elevated raw water nitrate concentrations
Suffolk Supply Schemes	Suffolk Strategic Pipelines including: - Barsham to Saxmundham Pipeline - Holton to Eye Pipeline	Included	Included	This scheme should now be delivered in 2028/29 instead of 2030/31 as was forecast in our draft WRMP24
	Lowestoft Reuse	Included	Included	This scheme could be delivered by 2030/31 instead of 2032/33 as was forecast in our draft WRMP24. However, our preferred final plan delivery date remains 2032/33

	North Suffolk reservoir	Included	Included	No
	Barsham Nitrate Reduction Scheme	Not included	Included	New scheme to reduce unplanned outage due to elevated raw water nitrate concentrations
	Bungay wells to Broome WTW and Broome to Barsham WTW transfers	Included (part)	Included	Although partly included in our draft WRMP24, this scheme now extends the main from Broome to Barsham WTWs

Our revised draft WRMP24 preferred final plan will allow us to meet national targets for leakage and demand reduction including:

- **Leakage:** Although our ESW target is to reduce leakage by 40% by 2050, at a group, we will be reducing Northumbrian Water Group (NWG) leakage by 50% by 2050.
- **Per capita consumption:** 122litres/head/day by 2038 and 110litres/head/day by 2050
- **Non-household demand reduction:** 9% reduction by 2038

Consultation

We would 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 look forward to sharing our final WRMP24 once it has been approved by Defra.

Heidi Mottram

Chief Executive Officer

CONSULTATION

We developed 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 Wednesday 21 December 2022 and Wednesday 29 March 2023. Our dWRMP24 was available for review on our website **here**.

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

- Our projection 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 40% by 2049/50; smart metering; and water efficiency programmes; and
  - Our supply side options including a new Water Reuse scheme, Winter storage reservoir and strategic pipelines in Suffolk and anew groundwater treatment works in Essex.

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 East (WRE) 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. WRE's regional Plan has informed our draft WRMP24 and was consulted on at the same time as our draft Plan.

We have prepared a consultation Statement of Response which is availble **here** and 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

We prepare a Water Resources Management Plan (WRMP) every five years which sets out how we intend to achieve a secure, resilient, and sustainable supply of water for our customers while protecting and enhancing the environment, both now and in the long term.

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

Our dWRMP24 forecasts supply and demand for all four of our water resource zones from 2025 to 2100:

- **Essex Supply Area**
    - Essex
- **Suffolk Supply Area[1]:**
    - Northern Central
    - Blyth
    - Hartismere

What is a water resource zone?

A WRZ is the largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers will experience the same risk of supply failure from a resource shortfall

We have compared our baseline supply and demand forecasts to esblish whether a WRZ has a supply surplus or a supply deficit. Where there is a supply deficit, we have developed a Best Value Plan for the next 25 years. This includes options to:

- reduce leakage and customer demand; and
- increase water available for use through new supply schemes.

[1] While we refer to our “Suffolk supply area”, our Northern Central water resource zone extends into Norfolk where we have surface and groundwater sources within the Broads National Park and where we supply customers in Great Yarmouth and the surrounding villages.

Figure 1: Suffolk supply area

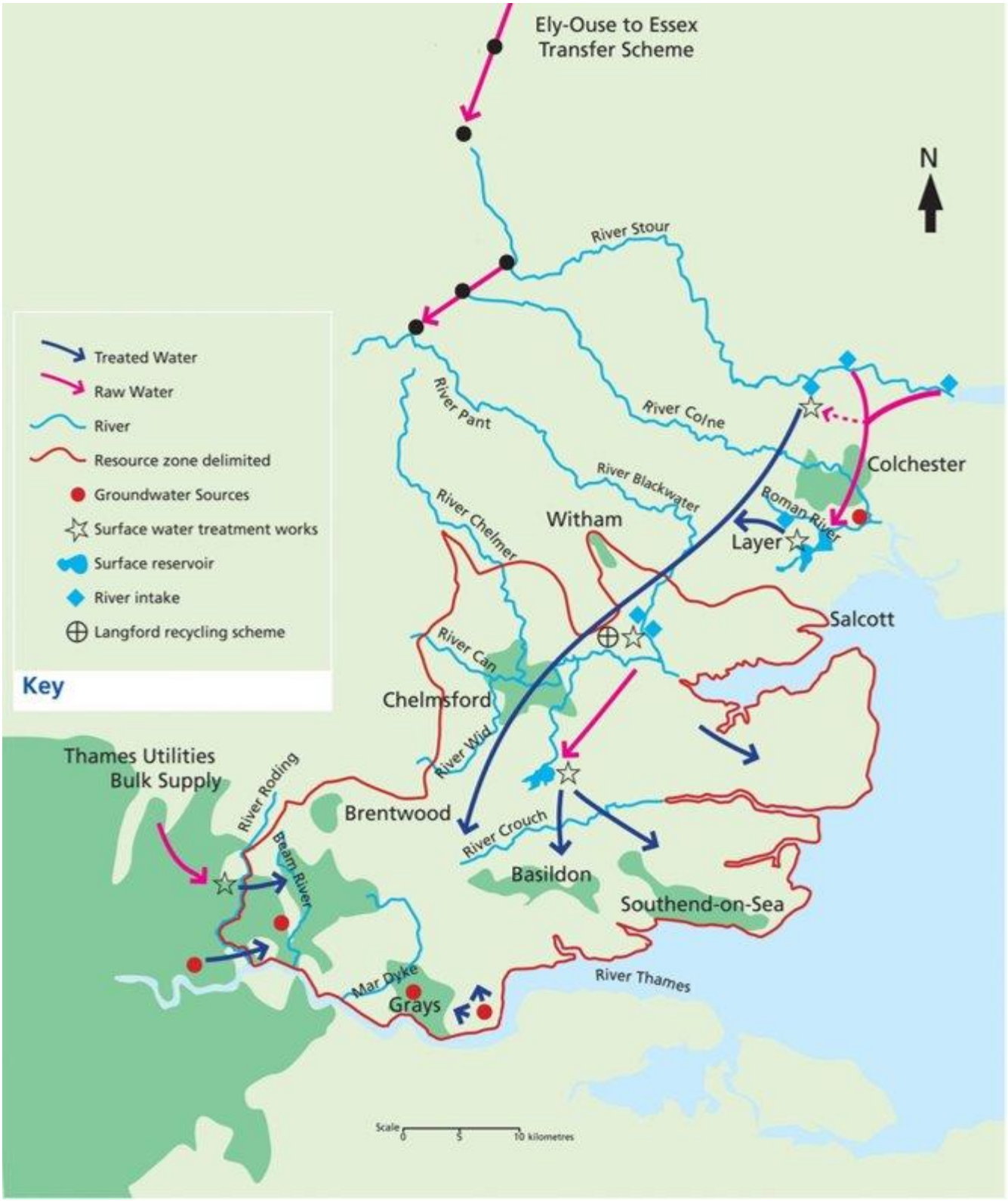


Figure 2: Essex supply area

1.1.2 OUR CURRENT PLAN (WRMP19)

Our current Water Resources Management Plan 2019 (WRMP19) is the starting point for our new revised dWRMP24. Our WRMP19 preferred plan only requires demand management options to maintain a supply surplus in each of our WRZs. This includes:

- Measures to reduce leakage from our network and from our customers' homes by 17.5% from 2019/20 levels by 2025.
- A water efficiency programme to support reducing per capita consumption (PPC) to 118/litres/head/day by 2040.
- An optant meter programme and a whole area metering (WAM) programme in part of our Essex supply area where all properties are fitted with a meter. This gives our customers the choice as to whether they want to be billed on their actual water use.

1.1.3 OUR WRMP24

Based on our revised dWRMP24 baseline supply and demand forecasts, which use the latest planning assumptions and take account of WRMP19 customer demand reduction programmes up to March 2025, we are forecasting a supply deficit in all our water resource zones when providing a 1 in 200 and 1 in 500 year level of drought resilience.

What does 1 in 200 and 1 in 500 year drought resilience mean?

Our drought plan includes drought actions which are required to ensure we can maintain a supply, even in the most extreme droughts. Our drought actions range from Level 1 actions (e.g. Appeal for Restraint) to Level 4 actions (e.g. Rota cuts where, for example, water may be turned off for 6 hours every six hours). Our WRMP19 currently plan so that Level 4 drought actions are not needed more than once every 200 years on average. However, by 2040, we are required to plan to improve this to no more than once every 500 years on average.

The causes of the supply deficits are:

- **Sustainability reductions:** these are changes applied to an abstraction licence where an investigation has concluded that an abstraction is not sustainable (i.e., it could have an adverse impact on the environment). In such cases, the amount of water we can abstract from the environment is reduced to a level agreed with the Environment Agency.
- **Non-household demand:** our latest non-household demand forecast includes, among others, new demand from meat processing facilities, hydrogen production, and new nuclear power stations at Sizewell in Suffolk and Bradwell in Essex.
- **Climate change:** we have used the latest UK Climate Projections 2018 (UKCP18) which predict a more significant impact on summer river flows than the previous UKCP09 projections.
- **1 in 500 supply resilience:** we are required to plan for 1 in 500 year supply resilience from 2040.

- **New methods:** as required by the latest Water Resources Planning Guideline, 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 revised dWRMP24 along with the change in supply and demand.

Table 1: Summary of changes in planning assumptions

ASPECT		WRMP19	WRE PLAN	WRMP24	SUPPLY / DEMAND CHANGE (ML/D) in 2025/26	SUPPLY / DEMAND CHANGE (ML/D) in 2049/50
Demand	Impact of Pandemic on consumption	x	✓	✓	+11.5	+15.8
	New non-household water demands	x	✓	✓		
Supply	AMP7 WINEP Sustainability Reductions (2030)	x	✓	✓	-3.49	-18.62
	Environmental Destination Sustainability Reductions (Enhanced scenario by 2040)	x	✓	✓	0	-39.72
Climate Change	UKCP Projections	UKCP09	UKCP18	UKCP18	-19.18	-34.64

We are required to produce a Best Value Plan with all WRZs having a supply surplus across the statutory 25 year planning period. Consequently, a supply deficit is forecast, we have considered a twin track approach including options to:

- reduce the amount of water our customers require (demand-side options); and
- increase the amount of water available to us (supply-side options).

In producing our Best Value 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). These include requirements to:

- Improve supply resilience from 1 in 200 years to 1 in 500 years for Level 4 drought plan restrictions (stand pipes and rota cuts) by 2040.
- Reduce household per capita consumption (PPC) to 110l/head/day by 2050 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 2017/18 levels by 2050.
- Install smart meters as a standard.
- Consider compulsory metering.
- Adapt to climate change.
- Rectify overreliance on unsustainable water sources.

2. DEVELOPING OUR PLAN

2.1 WATER RESOURCES MANAGEMENT PLAN PROCESS

Figure 3 shows the process we have followed in preparing our dWRMP24.

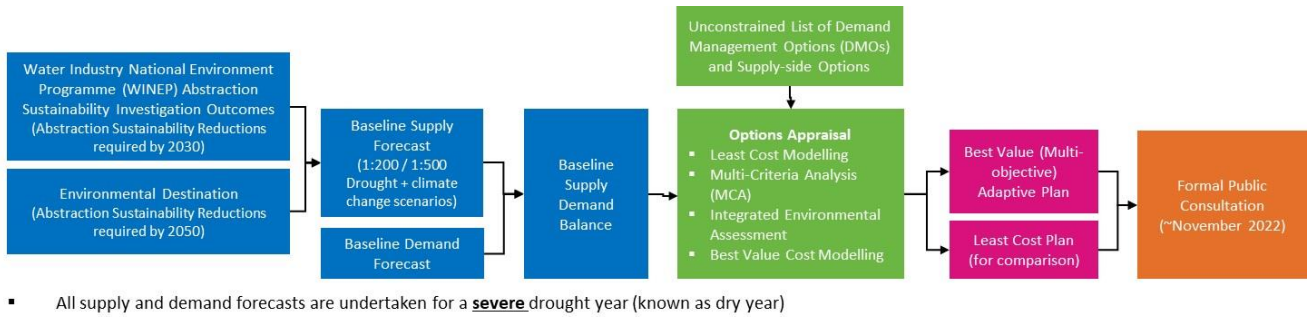


Figure 3: Water Resources Management Plan process overview

We have:

- Developed our plan in line with the Water Resources Planning Guidelines (WRPG) taking account of, our Drought Plan, Local Authority Plans, the Government's 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 confirmed the types of methodologies we should use for our demand and supply forecasts.
- Prepared baseline supply forecasts of what water resources are available over the planning period. These have allowed for sustainability reductions of the abstraction licence annual licensed quantities both in the short term (by 2030) and in the longer term (known as Environmental Destination). These are required to make sure sufficient water is left in the environment so that it is resilient to the effects of climate change.
- Prepared baseline demand forecasts of 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 2100).
- Where a supply deficit is forecast, we have identified an unconstrained list of demand management and supply-side options to reduce demand and increase supplies, which have then been reduced to a list of feasible options.
- Using the feasible options list and an agreed decision-making process, we have prepared a:
    - Least Cost Plan;
    - Best Value Plan (a preferred final plan following the Water Resources Planning Guideline);
    - Core Plan (includes only no / low regret options); and
    - Best Environment and Society Plan.

Our Best Value Plan, which considers wider environmental and social metrics, remains the same as our least cost plan which only considers option costs. The low regrets investment in Asset Management Plan 8 (AMP8) and early AMP9 is considered our Core Plan.

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

Our preferred final plan is an adaptive plan. This means it has:

- A central pathway and preferred programme of demand management and supply schemes representing the most likely future (based on the uncertainties); and
- Longer term alternative pathways and programmes should our demand and /or supply forecasts out-turn differently and risk a supply deficit.

For example, there are uncertainties around:

- How water company and Government measures will reduce customer demand, known as per capita consumption (PCC), over time.
- The size of longer term abstraction licence sustainability investigations (known as Environmental Destination) that will be needed to ensure sufficient water is left in the environment so that it is resilient to future climate change.

Consequently, we have undertaken sensitivity testing of our preferred final plan using among others, the following Ofwat Common Reference Scenarios:

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

In undertaking this assessment, we have only considered one change at a time. For example, for the low climate change scenario, we have used low climate change assumptions in our supply forecast while central planning assumpsions are used for all other components of the supply demand balance forecasts. Each scenario may result in a different supply demand balance which may require different supply schemes to restore a supply surplus.

We have used the results of the sensitivity testing to show which schemes are picked the most and to demonstrate the schemes selected for delivery during AMP8 in our preferred final plan are low regrets.

2.2 NATIONAL AND REGIONAL PLANNING

2.2.1 OVERVIEW

The Environment Agency published the Water Resources National Framework (WRNF) in March 2020. It identified 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 East (WRE) (www.wre.org.uk/) which has used the WRNF expectations to shape its approach to regional planning.

WRE has developed and consulted on a regional plan which supports the Government's 25-year Environment Plan and 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.

WRE's regional Best Value Plan is illustrated in Figure 4 and is published on its website (www.wre.org.uk). It was open to consultation at the same time as the water company dWRMP24s.

WRE 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 South East (WRSE) and Water Resources North (WReN). National reconciliation workshops have been held throughout 2021 and 2022 to ensure iterative appraisal of solutions and alignment of plans.

Regional plans and strategic options have been developed in parallel with our revised dWRMP24 and the other water company revised dWRMP24s, including modelling between companies and at regional level.

2.2.2 WRE BASELINE AND FINAL PLAN SUPPLY DEMAND BALANCE

Baseline supply demand balance forecasts covering the planning period 2025 to 2100 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 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 WRE for use in regional modelling. For consistency, the same baseline forecasts have been used for both the regional and water company plans.

2.2.3 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 WRE, we have adopted this planning assumption and have developed demand management options to achive these targets accordingly.

2.2.4 LEAKAGE

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

The national water industry target is to reduce leakage by 50% from 2017/18 levels by 2050. This is a target for the industry as a whole and not for individual water companies.

Our current leakage performance is near industry leading and so we do not believe that it is fair on our customers to reduce leakage by a further 50%. This is because we have already exhausted the cheaper leakage reduction options and so would need to replace a significant proportion of our distribution network. This would place a larger cost burden on our customers. We also do not believe that it is technically feasible for us to reduce leakage by 50% by 2050 in some parts of our supply area as leakage would need to be reduced to a level never achieved in the UK or Europe. We are therefore planning to reduce leakage by 40% by 2049/50.

2.2.5 ENVIRONMENTAL DESTINATION

The Government's 25 Year Environment Plan aims to improve the environment for the next generation with specific targets for sustainable abstraction. Some abstraction licences have annual licensed quantities which are already considered unsustainable and so will be reduced through the application of sustainability reductions by 2030. Other licences may pose a risk to protected sites in the Norfolk Broads and are likely to have significant sustainability reduction applied by 2026 to 2027. Other licences are considered unsustainable in the longer term due to climate change (2040 to 2050) and may need to have sustainability reductions applied then; this is known as Environmental Destination (ED).

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

WRE has carried out further analysis and assessed what the Environmental Destination sustainability reduction should be at each water company abstraction licence level. Along with other WRE water companies, we have then applied the Business As Usual Plus sustainability reductions to our baseline supply forecasts. We have also carried out sensitivity analysis to see how the other scenarios impact our final Best Value Plan.

2.2.6 INTRA AND INTER-REGIONAL WATER TRANSFER OPTIONS

Overview

We have a baseline supply deficit in both our Suffolk and Essex supply areas from 2025 and so we have not been considered as a donor water company. The same applies to our neighbours Anglian Water and Thames Water.

The opportunity for inter-regional transfers has been assessed by the regional groups. It was agreed at national reconciliation workshops that these would not provide best value for WRE, however we have considered intra- and inter-regional transfers with both Thames Water and Anglian Water.

Thames Water

Following the enlargement of Abberton reservoir in our Essex WRZ, we agreed to export 20Ml/d of raw water to Thames Water for the period 2015 to 2035. Given we are forecasting a baseline headroom deficit in our Essex WRZ, we have asked Thames Water whether the agreement can be terminated early but as Thames Water won't have alternative supplies in place before 2035, this won't be possible.

Anglian Water

We have considered the following supply options to facilitate regional transfers of water with Anglian Water:

- North Essex to Central Suffolk Transfer, including a "put and take" arrangement where one company transfers water into one part of the system and then takes the same amount out in another location. This option was discounted as a feasible option primarily because we, and Anglian Water, face considerable uncertainty with regards to the Habitats Regulations sustainability reductions that will restrict our abstractions within the Broads SAC which are not yet confirmed. This uncertainty makes it impossible to commit to new long-term water trade agreements. Therefore, we have discounted any new inter-company transfers in the planning horizon. However, as new resource options become available, we will reassess potential opportunities in the future, and continue to work closely with Anglian Water directly and through Water Resources East. There were further secondary operational reasons for discounting this option.
- The Lowestoft Water Reuse scheme is included in our preferred plan and in the regional plan but not in Anglian Water's plan as better value options have been chosen instead.
- The Caister Water Reuse scheme is not included in our Best Value Plan but is selected in the Habitats Regulation Adaptive Programme in 2032 and is in response to the loss of our Ormesby Broad abstraction licence. This will be reviewed in 2024 following Environment Agency investigations. This option is not in Anglian Water's plan as better value options have been chosen instead.

- We considered a Colchester Reuse scheme but discounted it from our feasible options list having agreed with Anglian Water that it provides better value for it and because of potential adverse environmental effects from discharging the water into our Abberton reservoir.
- We have considered various desalination options along the Essex, Suffolk and Norfolk coast although none have been selected for inclusion in our Best Value Plan. However, a desalination scheme on Canvey Island in Essex is selected in the Best for Environment and Society Plan which assumes significant sustainability reductions are applied to our Essex water resource zone abstraction licences. The actual size of the reductions will be confirmed via AMP8 WINEP Environmental Destination Investigations.
- Anglian Water and Cambridge Water are developing a new Fens Reservoir and we considered an option to transfer water to our Northern Central WRZ. However, this has been discounted because Anglian Water and Cambridge Water have included the full amount of water available in their preferred final plans. Even if the scheme had not been discounted, the North Suffolk reservoir (which is included in our preferred plan) provides better value being local to demand with lower pumping and carbon costs. Nevertheless, we will continue to explore options for increasing the deployable output of the Fens Reservoir in a way that could benefit ESW.

2.2.7 WRE BEST VALUE PLAN

Figure 4 below illustrates WRE's Best Value Plan.

Figure 4: WRE Regional Best Value Plan

2.3 ENGAGEMENT

We recognised the importance of engaging with stakeholders and customers throughout our planning process. In compiling our WRMP24, 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.

We have also 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.

A significant amount of engagement regarding supply, demand and environmental ambition has been undertaken at a regional level through Water Resources East and its Stakeholder Steering Group. Representatives include those from Energy UK, National Farmers Union, environmental groups, Broads Authority, the Environment Agency, and water companies.

We have engaged with 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.

We have engaged directly with non-household retailers, businesses and specifically with large users to inform our non-household demand forecast.

We have worked closely with our regulators to develop our 2025-30 Water Industry National Environment Programme (WINEP) including 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. As part of our agreed AMP8 WINEP we have included an ambitious programme of river enhancement and restoration schemes, which will complement the planned sustainability reductions to our abstraction licences. As our AMP8 WINEP has not yet received final approval from all our regulators, we are not able to include further detail in our revised dWRMP24 at this stage. Our AMP8 WINEP will be included in full within our PR24 Business Plan.

3. OUR BASELINE SUPPLY FORECAST

3.1 APPROACH

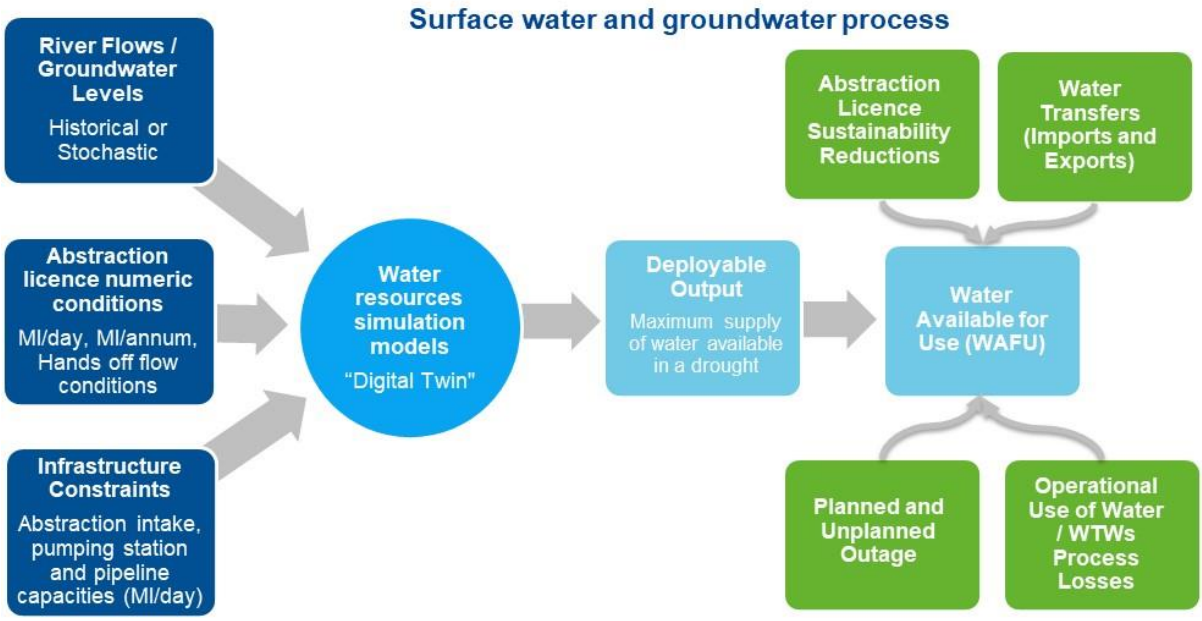


Figure 5: Supply forecast process overview

We have prepared a baseline supply forecast following the Water Resources Planning Guideline for each of our WRZs (see Figure 5). This confirms the amount of Water Available For Use (WAFU) in Ml/d in each WRZ across the planning period.

WAFU is the deployable output of each source (or group of sources) totalled for the WRZ less:

- Future changes to deployable output from sustainability changes, including long-term Environmental Destination, a changing climate and any other changes you expect;
- Existing transfers and schemes where planning permission is already in place;
- An allowance for short term losses of supply and source vulnerability, known as outage; and
- Any operational use of water or loss of water through the abstraction-treatment process.

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 Essex and Northern Central WRZs. For our Blyth and Hartismere groundwater zones, we have used the Environment Agency's regional groundwater models (NEAC, East Suffolk).

3.2 SCENARIOS

We have prepared supply forecasts for the following scenarios:

- Drought resilience
    - 1 in 200 years
    - 1 in 500-year
- Climate change
    - Low: RCP2.5
    - Central (most likely): RCP6;
    - High: RCP8.5 scenarios;
- Environmental Destination abstraction sustainability reductions:
    - Low: Business as Usual (BAU)
    - Central (most likely): Business As Usual Plus (BAU+). This scenario also includes all of our AMP7 sustainability reductions taking effect in 2030; and
    - High: Enhanced

Our baseline and final plan supply demand balance calculations are based on the above central (most likely) planning assumptions. However, the low and high scenarios have been used for sensitivity testing.

3.3 RESULTS

Our supply demand calculations are shown in section 5. The supply forecast part of the calculations has been particularly affected by the following factors.

Abstraction Licence Sustainability Reductions

There are three types of sustinability reductions that have been considered in our WRMP24 baseline supply forecasts:

- **AMP7 WINEP Sustainability Reductions:** The majority of our Suffolk abstraction licences will be subject to sustainability reductions as confirmed through our AMP7 WINEP investigations. This means that the annual licensed quantities stated in our abstraction licences will be reduced ("capped") in 2030 to ensure that there is not a deterioration in the environment. This is because the current, full annual licensed quantities, if used, would be unsustainable and in many cases, would cause river flows to fall below target levels. The sustainability reductions are statutory and are included in our AMP8 WINEP for delivery by 2030.
- **Environmental Destination sustainability reductions:** Longer term sustainability reductions, known as Environmental Destination, are required in the 2040s. However, they are currently uncertain and will be confirmed

by AMP8 WINEP investigations and allowed for in our PR29 WRMP. These sustainability reductions have been allowed for in our WRMP24 baseline supply forecast but do not drive any investment in AMP8.

- **Habitats Regulations sustainability reductions:** The EA has asked us to allow for further sustainability reductions (post submission of our draft WRMP24) against our Norfolk Broad abstraction licences. These are driven by the Habitats Regulations and will also be statutory.

All sustainability reductions have a significant impact on source / system deployable output. This is particually the case for the Environmental Destination (ED) sustainability reductions under the BAU+ scenario from 2040 onwards. For example, there is a working assumption that the full deployable output of our Lound and Ormesby Broads sources will be lost. However, for the Environmental Destination sustainability reductions, we consider that there is a low level of certainty that this is the most likely outcome and so all of our abstractions with ED sustainability reductions have been included for investigation in our AMP8 WINEP under the ED driver. The investigations will increase confidence in the sustainability reductions to be applied to our WRMP29 supply forecast.

Climate Change (UKCP18)

This is the first time we have used the UKCP18 Climate Projections and our assessments confirm that the most likely impact of climate change on deployable output of our surface water sources is significantly greater than was shown using the previous UKCP09 projections. For example, a reduction of 19Ml/d is seen in 2025/26 across our ESW WRZs. However, our groundwater deployable output assessments for the Blyth and Hartismere WRZs show that in all our Chalk and Crag groundwater sources are resilient to the effects of climate change as winter rainfall and groundwater recharge is unlikely to change.

4. OUR BASELINE DEMAND FORECAST

4.1 APPROACH

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 6.

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.

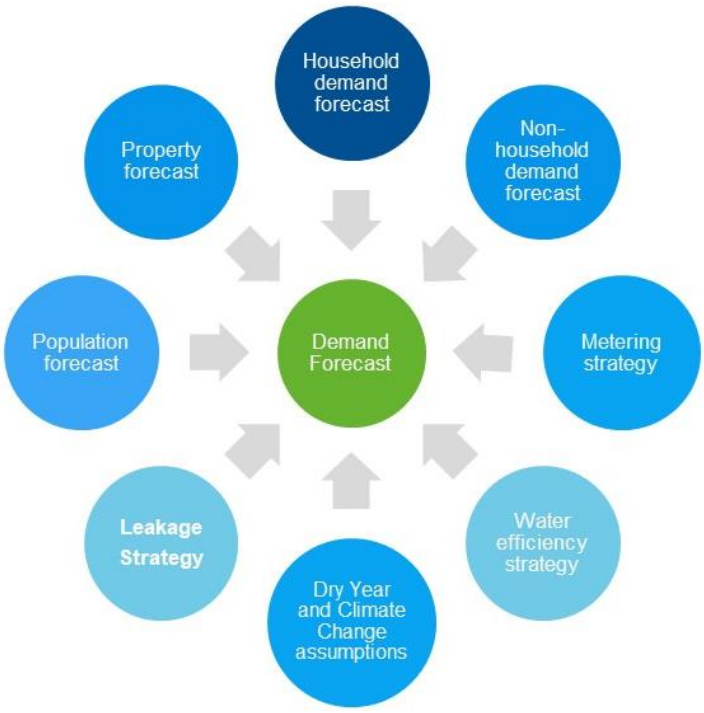


Figure 6: Inputs into the Baseline Demand Forecast

Our demand forecast includes assessments for household and non-household water use, meter 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.

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.
- Population and property growth forecast using Local Authority (LA) Housing Planned growth.

4.2 RESULTS

Our demand forecasts predict a total population growth of 21% by 2049/50, which includes a 22% increase in Essex population and a 13% increase in Suffolk population. The average annual number of new homes is forecast at 6,890 in Essex and 963 in Suffolk.

The per capita consumption (PCC) is forecast to reduce by 7% over the next 25 years as a result of optant metering and the Government-led intervention on water labelling.

Our non-household demand is forecast to increase by 32% by 2049/50, which includes an 18% increase in Essex and a 71% increase in Suffolk.

The overall result of the baseline demand forecast on normal year Distribution Input (DI) is that DI is forecast to increase from 463.23 Ml/d (base year) to 495.15 Ml/d in 2049/50. Essex is forecast to see an increase in demand of 18.04 Ml/d higher than today in 2049/50 and Suffolk demand is forecast to be 13.54 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 which predict the quantity of water that will be available both as an average across the year and also 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)).
- 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.

Our WRMP24 is based on a 25 year planning period. This is because:

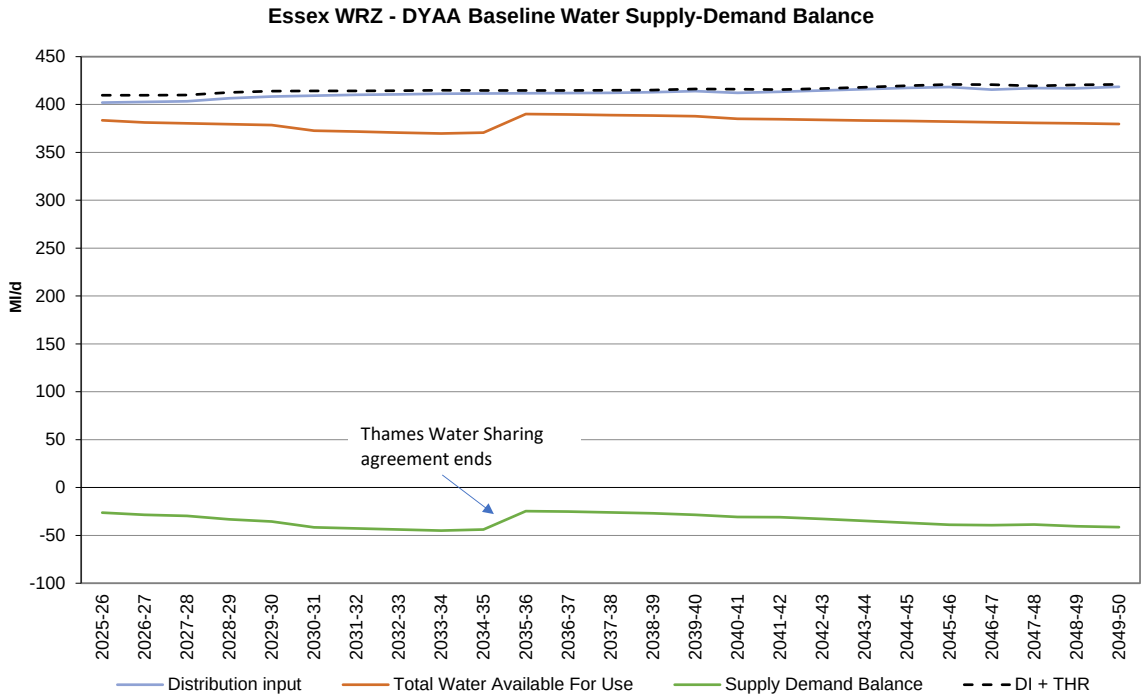
- our preferred final plan supply schemes are primarily being driven by sustainability reductions by both 2030 (AMP7 WINEP outcomes) and 2040 in relation to Environmental Destination (ED).
- new non-household demand in AMP8. The vast majority of new non-household demand is forecast to start in AMP8 and AMP9 with no step changes in NHH demand forecast beyond that.
- In terms of sustainability reductions, our central preferred plan uses the Business As Usual Plus (BAU+) Environmental Destination sustainability reductions scenario which, subject to AMP8 WINEP ED Investigations, we plan to implement in 2040. There is significant uncertainty as to the size of the ED sustainability reductions although they will be confirmed through both our AMP8 WINEP ED investigations and those undertaken by WRE. Consequently, even if further sustainability reductions were required post-2050, the level of certainty would be extremely low.

5.2 BASELINE SUPPLY DEMAND BALANCE GRAPHS

5.2.1 OVERVIEW

Figure 7, 8, 9 and 10 presents 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 supply deficits in our Essex and Hartismere WRZs from the start of the planning period and supply deficits in our Blyth and Northern Central WRZs from 2030 and 2040 respectively.

5.2.2 ESSEX WRZ

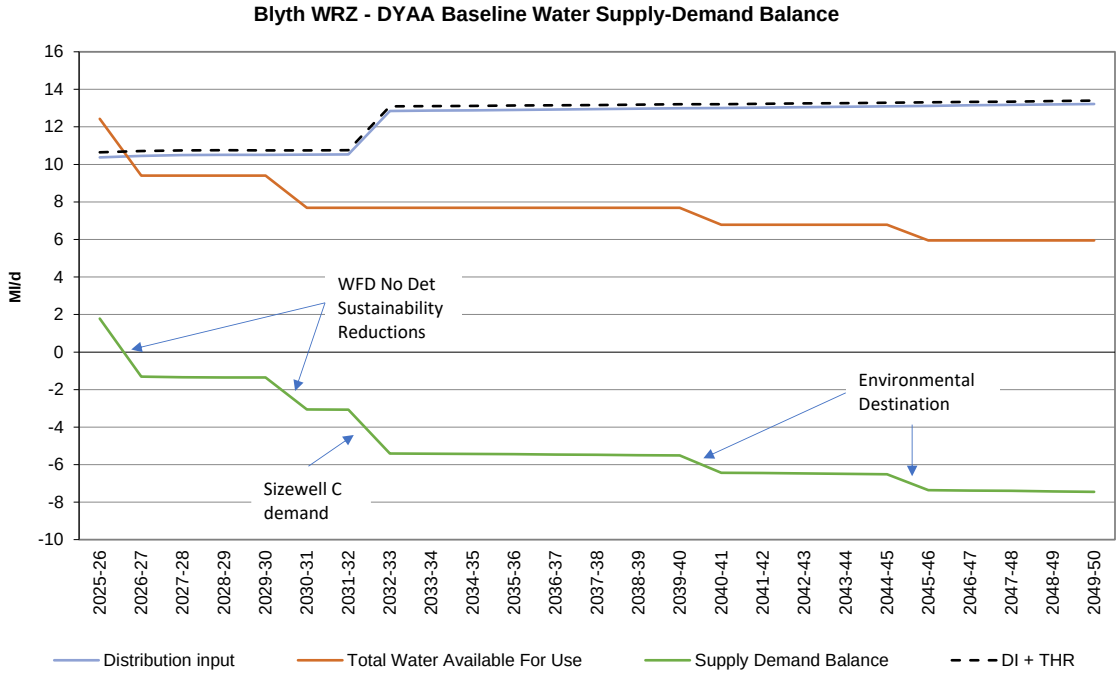


ESSEX WATER RESOURCE ZONE	END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP11	END OF AMP12
	2029/30	2034/35	2039/40	2044/45	2049/50
Supply Demand Balance	-35.51	-43.87	-28.42	-36.81	-41.24

Figure 7: Baseline Supply Demand Balance graphs (1:500 scenario)

The main causes of the baseline Essex supply deficits are climate change, household and non-household growth, abstraction licence sustainability reductions, a move to 1 in 500 year resilience from 2040 and the use of stochastic analysis.

5.2.3 BLYTH WRZ

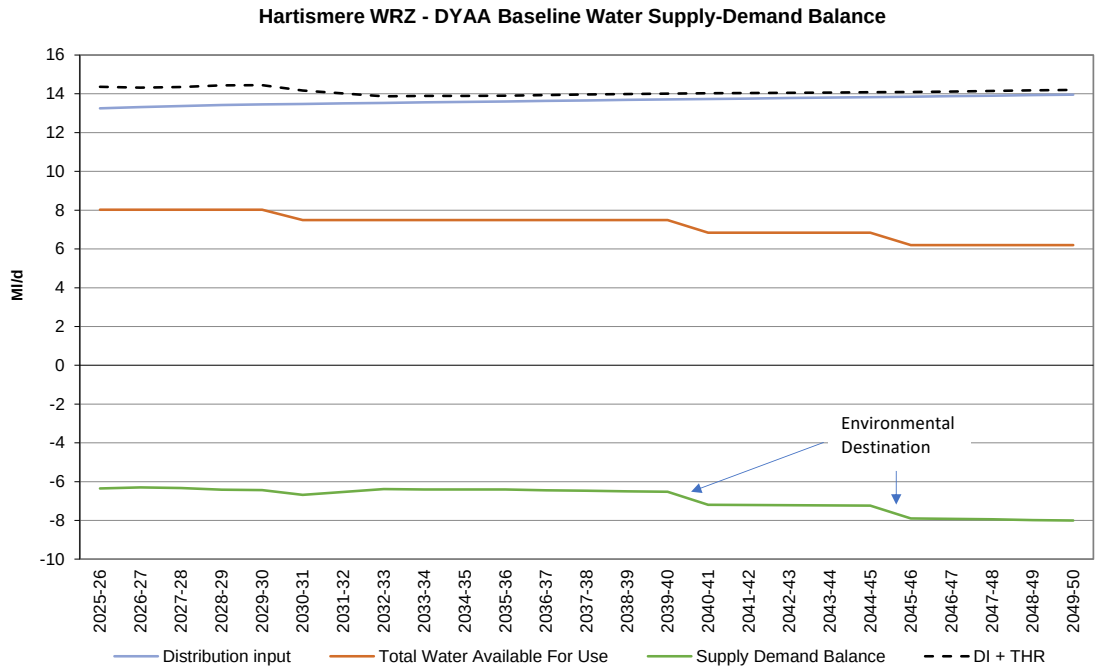


BLYTH WRZ	END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP11	END OF AMP12
	2029/30	2034/35	2039/40	2044/45	2049/50
Supply Demand Balance	-1.35	-5.43	-5.51	-6.51	-7.45

Figure 8: Baseline Supply Demand Balance graphs (1:500 scenario)

The main causes of the baseline Blyth supply deficits are non-household growth, abstraction licence sustainability reductions and a move to 1 in 500 year resilience from 2040.

5.2.4 HARTISMERE WRZ

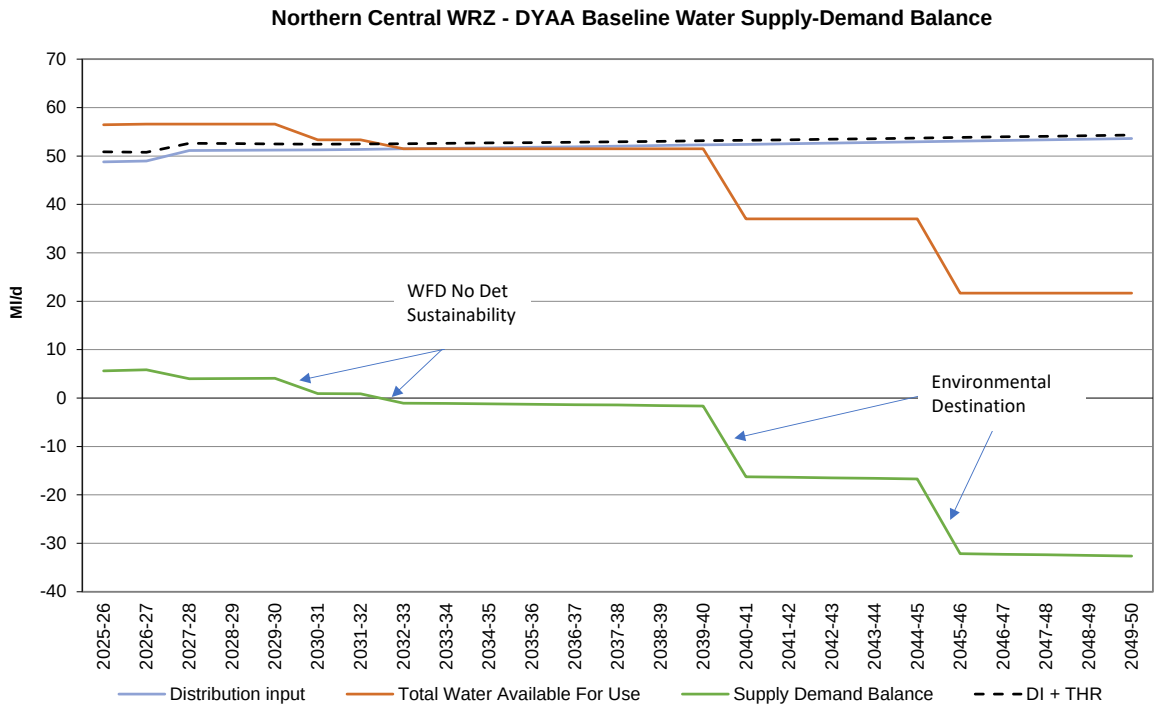


HARTISMERE WRZ	END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP11	END OF AMP12
	2029/30	2034/35	2039/40	2044/45	2049/50
Supply Demand Balance	-6.43	-6.40	-6.52	-7.24	-8.01

Figure 9: Baseline Supply Demand Balance graphs (1:500 scenario)

The main causes of the baseline Hartismere supply deficits are non-household growth, abstraction licence sustainability reductions (WINEP) and a move to 1 in 500 year resilience from 2040.

5.2.5 NORTHERN CENTRAL WRZ



NORTHERN CENTRAL WRZ	END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP11	END OF AMP12
	2029/30	2034/35	2039/40	2044/45	2049/50
Supply Demand Balance	4.08	-1.20	-1.66	-16.72	-32.63

Figure 10: Baseline Supply Demand Balance graphs (1:500 scenario)

The main causes of the baseline Northern Central supply deficits are climate change, household and non-household growth, abstraction licence sustainability reductions (WINEP, WFD No Deterioration, Habitats Regulations and Environmental Destination) and a move to 1 in 500 year resilience from 2040.

6. IDENTIFYING OPTIONS TO ADDRESS DEFICITS

6.1 OVERVIEW

As shown in section 5.2 we have forecasted baseline supply deficits in our Essex and Suffolk WRZs which will require new demand management and supply schemes. Working with WRE and our neighbouring water companies, we have identified feasible options to:

- Resolve supply deficits in each of our WRZs.
- Address Government expectations.
- Ensure the efficient use of water.

In doing so, we have considered:

- Supplies to other sectors, most notably the energy and meat processing sectors.
- Intra and inter-regional transfers to Anglian Water and Thames Water to address our own supply deficits and to supply regional and national need.

6.2 APPROACH

Figure 11 illustrates the process we have followed in order to idenify feasible options which could be included in ur Best Value Plan to provide a supply surplus across the full planning period.

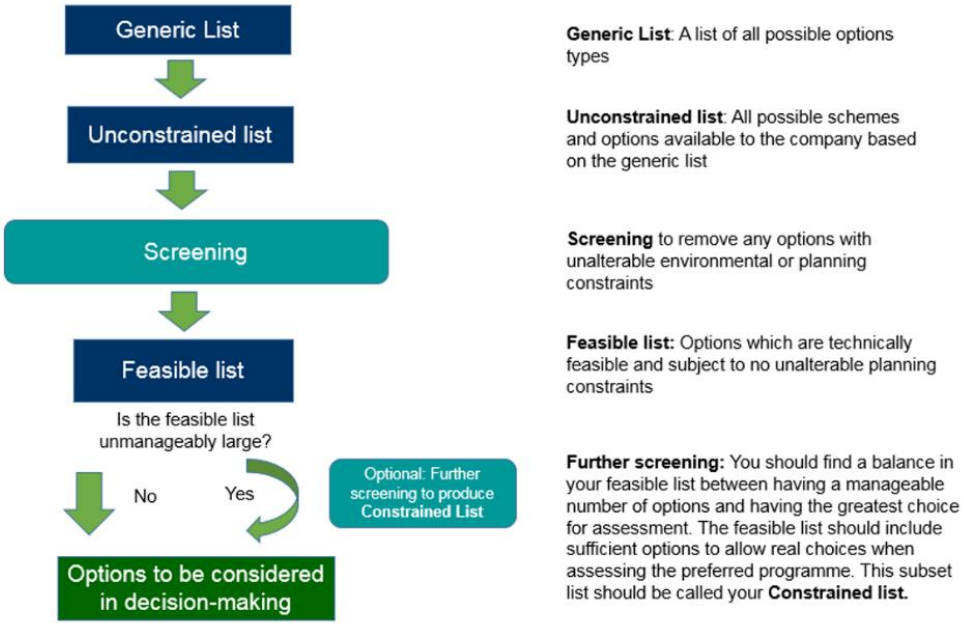


Figure 11: Options Appraisal process overview

We have reviewed all possible options that could contribute to deficit reduction and included them where they have been found to be technically feasible. This list was then screened to remove options with unalterable constraints that

make them unsuitable. Options on the resulting feasible list have been further assessed to feed into programme appraisal and optimisation of a Best Value Plan.

Table 2 confirms the total number of options that have been assessed and of those, the number that have been rejected because they were not considered feasible, and the number that have proceeded to the least cost and best value process.

Table 2: Summary of options

Option Type	**Option Description**	Total Number of Options **Assessed**
Aquifer Storage and Recovery (ASR)	At times of water surplus, this option pumps at least partially treated raw water from rivers into the Chalk aquifer where it is stored until it is re-abstracted for use, for example, during the summer.	20
New Water Reuse Options	Treated effluent from coastal water recycling centres that would otherwise be discharged to sea is diverted to a water reuse plant where further treatment would take place using Reverse Osmosis (RO) technology. The resulting output from the Reuse plant would then be transferred by pipeline and discharge into a river upstream of our normal abstraction intake to augment river flows.	11
Existing Water Reuse Enhancements	Upgrade of our existing Langford Effluent Recycling Plant to increase its capacity.	1
New Reservoirs	Construction of winter storage reservoirs to store water abstracted from rivers during high flows for use in the summer.	3
Desalination	Water abstracted from the sea (full sea water desalination) or from an Estuary (Brackish water desalination) is treated using Reverse Osmosis (RO) membranes to remove minerals (salts). The output would then be used to augment water supplies.	14
Water Transfer	Moving water, via pipelines, pipelines or existing river channels, from an area with a water surplus to an area with a water shortage.	64
Groundwater Sources	The extraction of water from underground water bearing rocks. This uses a submersible pump and rising main installed in a well or borehole, the latter being a narrow, deeper version of a well.	3
Nitrate Treatment	Rivers contain nitrates from agriculture and sewerage effluent. When river nitrate concentrations are significantly above the 50mg/l drinking water standard and it is not possible to dilute the nitrates down using another source of water with lower nitrate concentrations, a water treatment works output might need to be reduced creating unplanned outage. A nitrate treatment plant removes the nitrates to ensure final treated water complies with the 50mg/l drinking water standard and therefore reduces unplanned outage.	6

Option Type	Option Description	Total Number of Options **Assessed**
Pump Options	Increasing the capacity of, for example, a raw water pumping station by increasing the size of pumps or the number of pumps.	2
Upgrade Options	New water treatment works processes to allow a works to treat water from a new / difference source and / or to address a deteriorating trend in raw water quality.	2
UV Treatment	Ultraviolet (UV) treatment to manage cryptosporidium and other bacteria.	1
Total Number		**127**

At the macro level, there is a limited number of feasible supply option types which reflects the significant challenge in East Anglia which is a serious Water Stressed Area, and which has the highest number of water dependant Sites of Special Scientific Interest in the country.

Consequently, there is no groundwater available for abstraction licensing and all our Norfolk and Suffolk groundwater licences are subject to sustainability reductions either at renewal for time limited licenses else by 2030. Surface water is available but only at high flows which means new surface water abstractions must be developed with winter storage reservoirs. Aquifer Storage and Recharge (ASR) was discounted as a feasible for the Chalk and given they have similar groundwater sustainability challenges to us, there are no opportunities for importing water from neighbouring Anglian Water.

Our option appraisal methodology is summarised in Figure 12 and has been developed to align with the options appraisal process as set out in the WRPG.

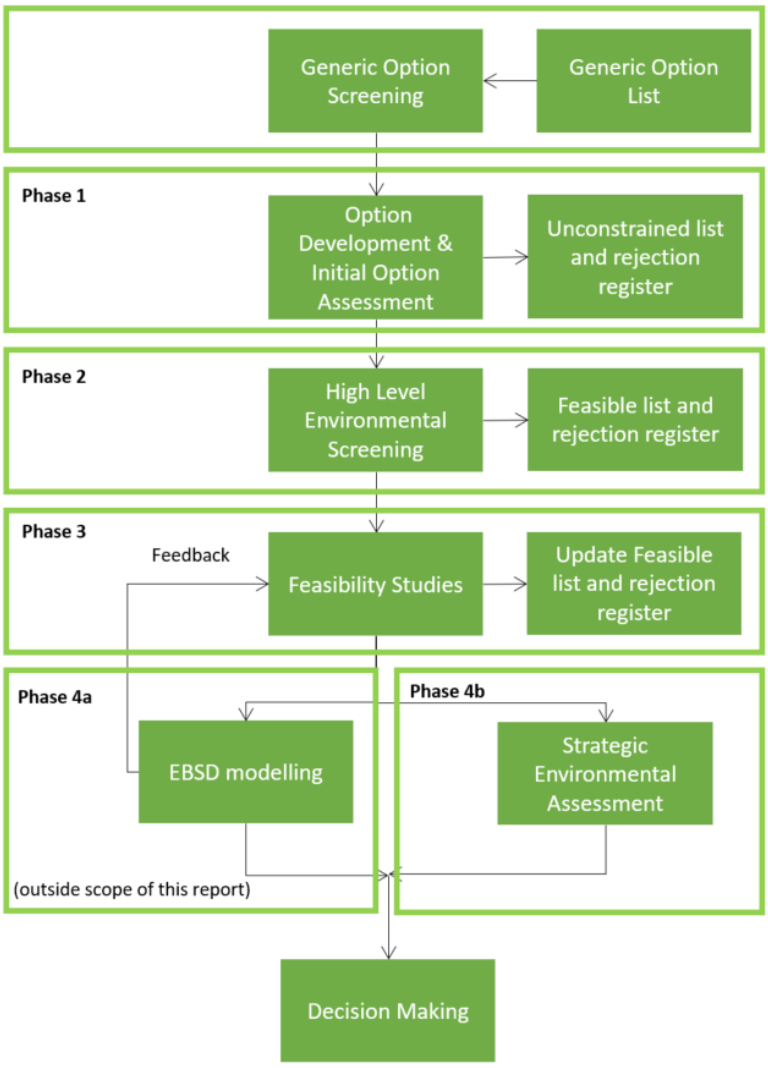


Figure 12: Options Appraisal process overview

6.3 DEMAND MANAGEMENT OPTIONS

The demand management options which will both meet and exceed government expectations with regards to leakage reduction, per capita consumption (PCC), business demand and smart metering are summarised in Table 3.

Table 3: Feasible Demand Management Options

ASPECT	SUPPLY GAIN / DEMAND SAVING (ML/D) ON FULL IMPLEMENTATION

Leakage	Low: 30% Reduction compared to 2017/18 levels by 2050	6.9
	Medium: 40% Reduction compared to 2017/18 levels by 2050	13.7
	High: 50% Reduction compared to 2017/18 levels by 2050	20.3
Metering	Option 1: Optant and Reactive Replacement Scheme	10.4
	Option 2: Optant and Reactive with Proactive Replacement Scheme and Whole Area Metering	35.0
	Option 3: Optant and Reactive with accelerated Proactive Replacement Scheme and Whole Area Metering	46.4
	Option 4: Optant and Reactive with accelerated Proactive Replacement Scheme	46.4
	Option 5: Compulsory metering and Proactive Replacement Scheme fully smart by 2035	55.6
	Option 6: Compulsory metering and Proactive Replacement fully smart by 2030	62.0
Water Efficiency	Low: Reduces PCC by 0.49 l/hd/d	20.8
	Medium: Reduces PCC by 0.97 l/hd/d	34.9
	High: Reduces PCC by 1.08 l/hd/d	37.0
	Enhanced: additional actvity achieved through smart meter installs	7.2
	Non-Household activity level results in 9% saving on consumption (excluding growth)	6.8

6.4 WATER SUPPLY OPTIONS

Of all the options considered, we have developed 41 water supply options for inclusion within our decision-making process for developing our Best Value Plan. These options are summarised in Table 4.

Table 4: Feasible Supply Options

OPTION TYPE	SUPPLY GAIN (ML/D)
New groundwater abstraction	6.6
New Water Treatment Works	10
Aquifer Storage & Recharge	2.4
North Suffolk Winter Storage Reservoir	16.2, 18.5, 19.9
Water Reuse	3.5, 6.5, 10, 11, 15, 31.5, 35, 38, 40.5
Desalination	25, 31.5, 35, 38, 41.5, 50, 65, 100, 145, 190
Strategic Transfer Pipelines	3.5 to 44

7. OUR BEST VALUE PLAN

7.1 OVERVIEW

The aim of this dWRMP24 is to present a long-term Best Value Plan to ensure a secure supply of drinking water for customers and to protect and enhance the environment.

We have forecast baseline supply deficits in our Essex and Suffolk supply areas and so using an agreed decision-making process, we have developed a Best Value Plan to restore a supply surplus across the planning period.

7.2 OUR DECISION MAKING APPROACH

We have used an Economics of Balancing Supply and Demand (EBSD) optimiser model to develop a least cost plan for our revised draft WRMP24. The EBSD model considers the supply-demand balance for each water resource zone at annual timesteps and selects options to address deficits based on a least cost per Ml/d and the earliest available date of supply for relevant options.

This tool does not consider other monetised criteria such as carbon or other societal and environmental impacts and benefits. As such the model results represent a least-cost plan with no optimisation.

Best Value Planning determines whether the inclusion of further monetised and non-monetised criteria would identify a plan that delivers the best value, defined by the Water Resources Planning Guideline (WRPG) as 'one that considers factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and overall society'.

The objectives of this revised 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 2050.
- 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 levels by 2050.
- Reduce customer demand to 110l/head/day by 2050.
- 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 East'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.

Table 5 summarises the decision making criteria (metrics) we have used to assess whether plans and options deliver best value.

Table 5: WRMP24 decision making metrics

BEST VALUE CRITERIA DESCRIPTION	DESCRIPTION	UNITS
Cost of the plan	Total cost (TOTEX) of the programme	£
PWS Drought resilience	Number of years over the planning period the PWS drought resilience to 1 in 500 is achieved	Years
Biodiversity Net Gain (BNG)	Additional Biodiversity Habitat Units required to achieve Biodiversity Net Gain	Habitats Units (total restoration)
Natural Capital (NC)	Monetised (£NPV) impact of the option on natural capital e.g. changes to land use.	£
Leakage reduction	The volume of leakage reduction achieved over the planning period (Ml/d)	Ml/d
PCC reduction	The volume of PCC reduction achieved over the planning period (litres/head/day).	l/h/d
Business demand reduction	The volume of business consumption reduction acheieved over the plannig period (Ml/d) excluding growth.	Ml/d
Flood risk management (non-drought resilience)	Qualitative assessment based on SEA objective to reduce and manage flood risk	Score
Multi-abstractor benefit	Qualitative assessment based on SEA objectives to maintain or improve the quality of waterbodies and to avoid adverse impacts on surface and groundwater levels and flows	Score
Carbon	Capital/embedded and operational total tCO2e of programme	tCO2e , £
Customer preferred option type	Options to be ranked based on customer preference survey data	% Preference
Human and social well-being	SEA objectives associated with human and social well-being	Score.

Option deliverability	Options scored for deliverability / cost confidence	% Optimism Bias
The impact on designated sites	SEA objectives associated with impact upon statutory environmental designated sites	Score

Figure 13: illustrates the steps undertaken to develop and determine the Best Value Plan. This has been developed to align with the WRPG and other supplementary guidance.

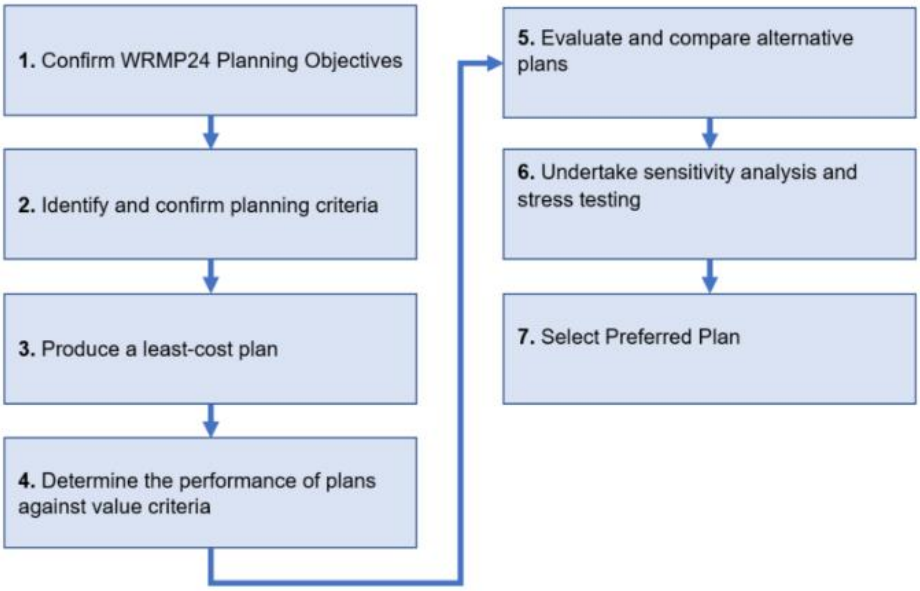


Figure 13: Overview of Best Value Planning approach

7.3 PREFERRED DEMAND MANAGEMENT OPTIONS

7.3.1 OVERVIEW

Table 6 confirms the Demand Management Options in our Best Value Plan along with the total cost for AMP8. These schemes are required to meet Government expectation for leakage, metering and PCC.

Table 6: Preferred Demand Management Options

ASPECT		AMP8 SUPPLY GAIN / DEMAND SAVING (ML/D)	AMP8 TOTAL COST (£M)
Leakage	Active leakage control with permanent hydrophones and water mains replacement achieving a 40% reduction in leakage by 2049/50	8.19	28.14
Metering	Replacement of existing meters with smart meters and Compulsory Smart Metering of all unmeasured customers by 2030 in Suffolk and 2035 in Essex	4.36	127.49
Water Efficiency	Using activities which result in a 0.97 litres per person per day saving and an increase digital engagement as well as activity alongside the installation of smart meters. Non-Household activity level results in a 9% saving on consumption.	15.81	9.69
Total		**28.36**	**165.32**

7.3.2 LEAKAGE

We are proud that overall leakage from our network and from our customers' homes is at one of the lowest levels in the water industry. Our preferred plan for leakage reduction is to reduce leakage by 40% from 2017/18 levels by 2050 and not 50%. This is because the 50% reduction is a target for the industry as a whole and not for individual water companies. Our current leakage performance is near industry leading and we have already exhausted the cheaper leakage reduction options. To achieve a further 50% reduction we would need to replace significant proportion of our distribution network, placing an unfair cost burden on our customers. We also do not believe that it is technically feasible for us to reduce leakage by 50% by 2050 in some parts of our supply area as leakage would need to be reduced to a level never achieved in the UK or Europe. We are, however,commited to a 50% reduction companywide (40% reduction by 2050 in ESW and a 55% reduction by 2050 in Northumbrian Water), 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.

7.3.3 METERING

When customers pay for the amount of water they use it is the fairest way of charging them and we have widely promoted the benefits of this. The majority of our customers, nearly 70%, now have a water meter and are charged for how much water they use. Given that the majority of our customers are metered and that our supply area is a serious water stressed area, we now plan to compulsory meter all our customers which means that all customers will pay for the amount of water they use by 2030 in Suffolk and 2035 in Essex.

We are planning for all household and non-household meters to be smart meters by 2035, similar to the ones used for electricity and gas. 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 usage customers to become more water efficient. Given the moratorium on new non-household demand in our Hartismere water resource zone, we are fast tracking our smart metering programme in Suffolk and have already started delivering the AMP8 programme.

7.3.4 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:

- £4.56 million of base funded household water efficiency activity which, along with our smart metering programme and government interventions (e.g. mandatory water labelling and the updating of Building regulations), will reduce PCC to 110 l/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
- £3.55 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.

7.3.5 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 £1.58 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

7.4 SUPPLY OPTIONS

Our baseline supply demand balance forecasts have been updated to reflect the demand savings from our preferred demand management options. However, there are still significant residual supply deficits and so our Best Value Plan necessarily also includes new supply options.

Using the feasible options and the decision making process described in Sections 6 and 7.2 respectively, we have prepared a Least Cost Plan and a Best Value Plan to to restore a supply surplus across the full planning period. The least cost plan schemes have been slected based only on their operational and capital costs while the best value plan schemes have been selected taking account of wider environmental and social metrics. However, for our WRMP24, the least cost and best value planning processes select the same schemes for both the Least Cost Plan and the Best Value Plan which is illustrated in Figure 14.

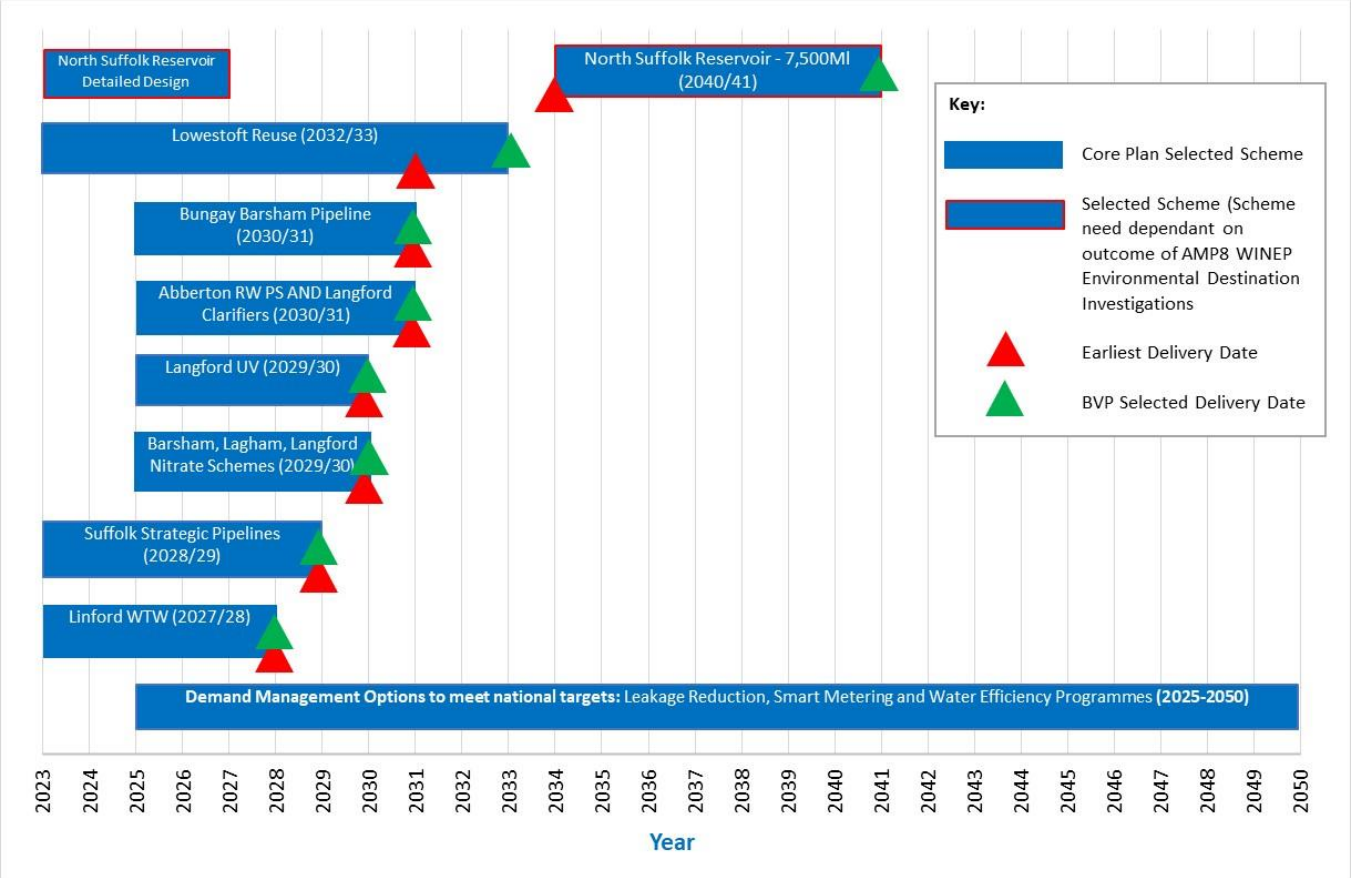


Figure 14: Best Value Plan

Our Best Value Plan has been prepared following the Water Resources Planning Guideline (WRPG) and delivers our WRMP24 objectives which are to:

- Achieve a secure, resilient and sustainable supply of water for our customers, moving to a 1 in 500 level of resilience by 2050.

- 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 levels by 2050.
- Reduce customer demand to 110l/head/day by 2050.
- Reduce business demand by 9% by 2037/38 (excluding growth).
- Ensure all our meters are smart meters by 2035.

Our Best Value Plan currently includes the Lowestoft Reuse scheme in 2032 because of all schemes, it can be delivered the quickest although we believe that the North Suffolk reservoir is a more sustainable option. This is because the Reuse scheme has higher energy and carbon costs, a brine discharge to sea and limited scope for onsite Biodiversity Net Gain. Conversely, the reservoir has greater opportunities to build in onsite Biodiversity Net Gain with the reservoir itself providing valuable water habitat. It also has lower energy and carbon costs and provides an opportunity for it to be developed as a multisector resource.

Nevertheless, based on our current programme, the reservoir will not be ready until 2033/34 and so if we progressed the North Suffolk Reservoir instead of Lowestoft Reuse, the moratorium in our Hartismere Water Resource Zone on supplying non-domestic demand for manufacturing and processing would be extended by one year.

Consequently, we will undertake further detailed design starting in Autumn 2023 to establish whether the scheme can be delivered more quickly. If it can and we conclude that it should be delivered instead of Lowestoft Reuse, we will move to the North Suffolk Reservoir adaptive programme (see Section 8.3).

Table 7 summarises the cost of our proposed Best Value Plan.

Table 7: Cost of proposed Best Value Plan

AMP	Cost Type		Cost £ Millions
AMP8	CAPEX		228.8
	OPEX		7.6
		TOTEX	236.5
AMP9	CAPEX		90.1
	OPEX		21.8
		TOTEX	111.9
AMP10	CAPEX		0
	OPEX		20.3
		TOTEX	20.3
AMP11	CAPEX		221.9
	OPEX		23.1
		TOTEX	245.0
AMP12	CAPEX		0.0

AMP	Cost Type		Cost £ Millions
	OPEX		29.3
		TOTEX	29.3
	CAPEX		540.9
Total	OPEX		102.1
		TOTEX	643.0

7.5 PLANNED LEVELS OF SERVICE

During long or very intense droughts we may need to place some restrictions on our customer's water usage to make sure we are always able to maintain reliable supplies should a period of dry weather turn into an extreme drought. Restrictions on Water Use are categorised into four levels as summarised in Table 8.

Table 8: Water Use Restrictions Level of Service

LEVEL OF SERVICE	WATER USE RESTRICTION DESCRIPTION
Level 1: Appeal for restraint	Ask customers to use water wisely. For example, watering plants at night and not watering the lawn because grass is resilient to drought.
Level 2: Temporary Use Ban	Applies mainly to the domestic use of water and stops the use of a hosepipe or sprinkler for any garden watering or cleaning.
Level 3: Drought Order Ban	Bans what has been applicable to the domestic customer under the Temporary Use Ban, to non-domestic or commercial customers. These bans have economic consequences for businesses and must be used as sparingly as possible.
Level 4: Reduced supply at customer tap	A temporary reduction or nil supply of water at the customer tap: • Reduced pressure / flow at the customer tap; • Rota cuts (e.g., 12 hours normal supply, 12 hours no supply); or, • Standpipes where supplies to customer's taps are turned off leaving customers to fill containers from an in pavement standpipe tap.

Planned levels of service set out the most likely frequency of restrictions on customer water use during a drought. Our current and proposed revised dWRMP24 Planned Levels of Service for our Essex and Suffolk customers are summarised in Table 9a and 9b.

Table 9a: Current and Proposed Levels of Service for the Essex supply area

ESSEX SUPPLY AREA LEVEL OF SERVICE	CURRENT (WRMP19)		PROPOSED (WRMP24)	
	FREQUENCY OF RESTRICTION	ANNUAL CHANCE OF RESTRICTION	FREQUENCY OF RESTRICTION	ANNUAL CHANCE OF RESTRICTION
Level 1: Appeal for restraint	1 in 10 years	10% probability in any one year	1 in 10 years	10% probability in any one year
Level 2: Temporary Use Ban	1 in 20 years	5% probability in any one year	1 in 20 years	5% probability in any one year
Level 3: Drought Order Ban	1 in 50 years	2% probability in any one year	1 in 50 years	2% probability in any one year
Level **4:** Reduced supply at customer tap	1 in 200 years	0.2% probability in any one year	**2025/26 to 2030/31:** 1 in 200 years **2031/32 onwards:** 1 in 500 years	**2025/26 to 2030/31:** 0.5% probability in any one year **2032/33 onwards:** 0.2% probability in any one year

Table 9b: Current and Proposed Levels of Service for the Suffolk supply area

SUFFOLK SUPPLY AREA LEVEL OF SERVICE	CURRENT (WRMP19)		PROPOSED (WRMP24)	
	FREQUENCY OF RESTRICTION	ANNUAL CHANCE OF RESTRICTION	FREQUENCY OF RESTRICTION	ANNUAL CHANCE OF RESTRICTION
Level 1: Appeal for restraint	1 in 10 years	10% probability in any one year	1 in 5 years	20% probability in any one year
Level 2: Temporary Use Ban	1 in 20 years	5% probability in any one year	1 in 10 years	10% probability in any one year
Level 3: Drought Order Ban	1 in 50 years	2% probability in any one year	1 in 50 years	2% probability in any one year
Level **4:** Reduced supply at customer tap	1 in 200 years	0.2% probability in any one year	**2025/26 to 2032/33:** 1 in 200 years **2033/34 onwards:** 1 in 500 years	**2025/26 to 2032/33:** 0.5% probability in any one year **2033/34 onwards:** 0.2% probability in any one year

In our draft WRMP24, we proposed to temporarily change our levels of service for Level 1 and 2 drought actions in both Essex and Suffolk because of the small supply surplus in AMP8. However, with the additional new supply schemes included in our revised plan, we are now able to maintain our current (WRMP19) planned levels of service in our Essex supply area. Our system deployable output assessments, for the Essex WRZ, are based on our current levels of service. We will provide a 1 in 500-year level of service for our Level 4 drought action from 2031/32.

In Suffolk, however, we propose to keep the draft WRMP24 planned levels of service for our Suffolk supply area, as set out in Table 10. This is because our WINEP investigations have concluded that in some cases our abstractions are at risk of causing deterioration or not allowing waterbodies to meet their Water Framework Directive objectives, and so we must keep abstraction at or below recent actual levels until 2030 when some of our new supply schemes are available. Our revised draft WRMP24 levels of service for Suffolk means that we will introduce Level 1 Appeals for Restraint and

Level 2 Temporary Use Bans marginally earlier, and therefore potentially more frequently. The associated demand savings will therefore help us minimise abstraction.

Once demand savings are delivered through our preferred demand management options and supply increases are delivered through our WRMP24 supply schemes, then our Level 1 and 2 Planned Levels of Service will return to the current WRMP19 levels. We expect that to be in 2034, once Lowestoft reuse is operational.

7.6 OUR PLAN AND CUSTOMER SUPPORT

We have undertaken a number of customer research projects to understand customers' preferences regarding types of demand management and supply option. We have used this information to help inform the development of our Best Value Plan. Table 10 presents a comparison of the options chosen in our Best Value Plan against the views of our customers.

Table 10: Customer views of Best Value Plan options

Option Type	Option Name / Target	Customer view	Preferred Final Plan Considerations
Demand Management	40% reduction in Leakage by 2050	Leakage reduction tends to come out as a high or mid priority when ESW customers are asked what is important to them.	The national target is to reduce leakage by 50% by 2050. While we will reduce leakage by 40% by 2050 in our ESW supply area, we will be reducing leakage by 55% by 2050 in our Northumbrian Water region. At a group level, this means we will reduce leakage by 50% by 2050. Customers support leakage reduction.
Demand Management	Compulsory Metering by 2030 in Suffolk and 2035 in Essex to support a reduction in PCC to 110/litres/head/day by 2050	When metering is presented as part of an overall water efficiency package (e.g., as in our pre-acceptability (2023) research) it is considered a high priority, however when we test it in isolation (e.g., as in our WRMP company and regional research) support is lower.	We consider it a necessary component of our preferred final plan to reduce household consumption and meet national PCC targets. Additionally, from an environmental perspective given our region is a serious water stressed area and many of our existing groundwater abstractions, if fully utilised, would be unsustainable.
Demand Management	Fully smart metered by 2035 to support a reduction in PCC to 110/litres/head/day by 2050	When metering is presented as part of an overall water efficiency package (e.g., as in our pre-acceptability (2023) research) it is considered a high priority. However, when we test it in isolation (e.g., as in our WRMP options research) support drops.	We consider it a necessary component of our preferred final plan. Smart metering provides the largest demand savings and without it, we would not be able to meet the national PCC targets. Additionally, from an environmental perspective, it will help reduce demand and therefore abstraction which is also important given our region is a serious water stressed area and many of our existing groundwater abstractions, if fully utilised, would be unsustainable.

Option Type	Option Name / Target	Customer view	Preferred Final Plan Considerations
Demand Management	Household and Non-household water efficiency programme to support a reduction in PCC to 110/l/hd/d by 2050 and a reduction in business demand of 9% by 2038	Our customer research suggests that PCC is a mid-low priority relative to other measures.	Although water efficiency programmes are a mid to low priority for our customers, they are important in reducing both household and business water demand and are required in order to meet national targets
Supply	New Linford [Groundwater] WTW and Borehole(s)	Customers prefer more traditional source of water such as groundwater, river abstractions and winter storage reservoirs	Selected in least cost and best value plan and supported by customers.
Supply	Barsham, Langham and Langford Nitrate Removal Schemes	Participants found this option difficult to understand and it received lower levels of support than other options presented. However, 61% of participants supported nitrate removal at any level ('definite' or 'possible' support). There were significantly higher levels of support from non-household participants (75%).	Selected in least cost and best value plan. The majority of customers still supported this scheme even though it was considered a lower priority. We consider it an important scheme in our final plan because it can be delivered relatively quickly and will reduce the amount of unplanned water quality outage. This will mean that we can at least partially lift the mains water non-domestic use moratorium in the Hartismere water resource zones earlier than otherwise would have been the case.
Supply	Abberton RWPS and Langford Clarifier	No evidence	Selected in least cost and best value plans to resolve near term supply deficits.
Supply	Suffolk Strategic Pipelines	No evidence	Selected in least cost and best value plans to resolve near term supply deficits.
Supply	Lowestoft Water Reuse	Participants are open to water recycling, and it receives relatively high levels of support. Reassurances would be required about the quality of recycled water and the impact of water recycling on the environment.	Selected in least cost and best value plans to resolve near term supply deficits. Supported by customers.
Supply	North Suffolk [Winter Storage] Reservoir	Winter storage reservoirs have high support because of their minimal impact on the environment and the long-term benefits they bring to communities	Selected in least cost and best value plans to resolve near term supply deficits. Supported by customers.

The results of all three areas of research are presented in our Customer Research Report which can be downloaded here.

8. TESTING OUR PLAN

8.1 OVERVIEW

We have carried out sensitivity analysis of our central (most likely) supply and demand balance forecasts to establish:

- whether our final preferred plan is sensitive to changes to any of the supply and demand forecast components, and if so, how this affects the selected schemes within the preferred final plan to address supply deficits;
- which of our preferred final plan schemes are selected in the final plans for other scenarios in order to demonstrate that our preferred final plan schemes selected for delivery during AMP8 are low regrets;
- if increasing the planning period to 50 years and 75 years to determine if this influences the range of options being selected as the EBSD model seeks to minimise TOTEX cost.
- to identify the need for adaptive programme (see Section 8,2) to address potential supply deficits where supply demand forecasts outturn differently to central (most likely) forecasts.

Our Best Value Plan uses central (most likely) forecasts for supply and demand. However, for the sensitivity testing, among others, we have used Ofwat's common reference scenarios with high and low parameters for climate change, demand, technology and Environmental Destination (see Table 10). These have been used to develop alternative plans across three time horizons (2050,2075 and 2100).

In undertaking this assessment, we have only considered one change at a time. For example, for the low climate change scenario, we have used low climate change assumptions in our supply forecast while central planning assumpsions are used for all other components of the supply demand balance forecasts. Each scenario may result in a different supply demand balance which may require different supply schemes to restore a supply surplus.

Table 11 summarises the assumption used for each of the scenarios tested.

Table 11: Scenario Testing Assumptions

Least Cost Planning Scenarios	Scenario reference	Supply Forecast	Demand forecast scenario name	DMOs			Water Efficiency (NHH)	Growth	Government led interventions incl Y/N	Climate Change scenario		Environmental Destination scenario	Sustainability Reductions start	New NHH Demand profile
				Leakage	Metering	Water Efficiency (HH)				Supply Forecast	DI Component			
Central Plan	CntrlPln	Central plan	WRMP24 Final Preferred Plan	Medium	Option 5 (high - compulsory)	Medium Enhanced	9%	Local Authority	Y	RCP8.5 scaled to RCP6	Scenario Forecast	BAU+	When expected to be applied	New NHH delayed to 2031/32 in Hartismere
OFWAT Climate change	CC_Low	Low CC	WRMP24 Final Preferred Plan	Medium	Option 5 (high - compulsory)	Medium Enhanced	9%	Local Authority	Y	RCP2.6	Most Likely / Minimum	BAU+		
	CC_High	High CC	WRMP24 Final Preferred Plan	Medium	Option 5 (high - compulsory)	Medium Enhanced	9%	Local Authority	Y	RCP8.5	Least Likely / Maximum	BAU+		
OFWAT Technology	Tech_Slow	Central plan	Ofwat Scenario 1	Low 30%	Option 1 (Low impact)	Low	2%	Local Authority	N	RCP8.5 scaled to RCP6	Scenario Forecast	BAU+		
	Tech_Fast	Central plan	Ofwat Scenario 8 enhanced WE	High 50%	Option 5 (high - compulsory)	High Enhanced	9%	ONS	Y	RCP8.5 scaled to RCP6	Scenario Forecast	BAU+		
OFWAT Demand	Demand_Low	Central plan	WRMP24 Final -Low demand, L Growth, HWE enhanced, H Met, H Leak	High 50%	Option 5 (high - compulsory)	High Enhanced	9%	ONS	Y	RCP8.5 scaled to RCP6	Scenario Forecast	BAU+		
	Demand_High	Central plan	WRMP24 Final -High demand, H Growth, LWE, L Met, L Leak	Low 30%	Option 1 (Low impact)	Low	2%	Housing Need	Y	RCP8.5 scaled to RCP6	Scenario Forecast	BAU+		
OFWAT Abstraction Reductions	ED_Low	Low ED	WRMP24 Final Preferred Plan	Medium	Option 5 (high - compulsory)	Medium Enhanced	9%	Local Authority	Y	RCP8.5 scaled to RCP6	Scenario Forecast	BAU		
	ED_High	High ED	WRMP24 Final Preferred Plan	Medium	Option 5 (high - compulsory)	Medium Enhanced	9%	Local Authority	Y	RCP8.5 scaled to RCP6	Scenario Forecast	Enhanced		
PCC	PCC_Low	Central plan	WRMP24 Final - High WE (Opt 5/2) enhanced WE	Medium	Option 5 (high - compulsory)	High Enhanced	9%	Local Authority	Y	RCP8.5 scaled to RCP6	Scenario Forecast	BAU+		
	PCC_High	Central plan	WRMP24 Final - Low WE (Opt 5/2)	Medium	Option 5 (high - compulsory)	Low	2%	Local Authority	Y	RCP8.5 scaled to RCP6	Scenario Forecast	BAU+		
Best Environment	Best_Env	High ED	WRMP24 Final - Leakage ESW 50 NW 55%	50%	Option 5 (high - compulsory)	Medium Enhanced	9%	Local Authority	Y	RCP8.5 scaled to RCP6	Scenario Forecast	Enhanced		
North Suffolk Reservoir	NSR_2033	Central plan	WRMP24 Final Preferred Plan	Medium	Option 5 (high - compulsory)	Medium Enhanced	9%	Local Authority	Y	RCP8.5 scaled to RCP6	Scenario Forecast	BAU+		
Habs Regs SR	HabsRegs	HabsRegs	WRMP24 Final Preferred Plan	Medium	Option 5 (high - compulsory)	Medium Enhanced	9%	Local Authority	Y	RCP8.5 scaled to RCP6	Scenario Forecast	BAU+	Reg19/64 Derogation until 2031/32	

The results of the assessment are summarised in Table 12.

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Table 12: Results of Sensitivity Testing

Planning horizon: 2050				Benign Scenarios					Central Preferred Plan, Least cost & BVP*	Adverse Scenarios				Alternative Plan	Adaptive Programmes		
					OFWAT Common Reference Scenarios					OFWAT Common Reference Scenarios							
WRZ	Option name	ESW Option Reference	Gain in WAFU (Ml/d)	Low PCC	Low Demand	Fast Technology	Low Climate Change	Low Abstraction Reductions (Low ED)		High Climate Change	High Demand	Slow Technology	High Abstraction Reductions (High ED)*	Best Environment	High PCC	North Suffolk Reservoir	Habs Regs SR
Essex	Langford_UV	ESWUVC001	0.2	✓				✓	✓	✓	✓	✓	✓		✓	✓	✓
	Langham_Nitrate_Scheme	ESWNIT006	0.9	✓				✓	✓	✓	✓	✓	✓		✓	✓	✓
	Langford_Nitrate_Scheme	ESWNIT005	2.8	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
	AbbertonRWPS_and_Langford_Clarifier	ESWUVC01	8.0	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Linford_New_WTW_10	ESW-ABS-003	10.0	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Southend_Water_Reuse_PhaseA_and_Transfer	ESWEFR001A	20.5							✓	✓	✓			✓		
	Southend_Water_Reuse_and_Transfer	ESWEFR001	40.5										✓	✓			
	Canvey_Island_Desalination_190_and_Transfer	ESWDES001D	190.0										✓	✓			
Blyth	Barsham_WTW_Saxmundham_Tower_A15	ESWTRA001A15	15.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hartismere	HoltonWTW_EyeAirfield	ESWTRA019	8.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Northern Central	Bungay_to_BarshamWTW_pipeline	ESWTRA023	1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Barsham_Nitrate_Scheme	ESWNIT001	2.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Corton_Desal_Infiltration_Gallery_and_Transfer	ESWDES008IGB	5.6				✓			✓							
	Corton_Desal_Beach_Well_and_Transfer	ESWDES008BWA	10.1								✓		✓	✓	✓		
	Lowestoft_Water_Reuse_for_Ellingham_Mill_and_Transfer_Holton	ESWEFR002B	11.0				✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
	CaliforniaCaister_Desal_IG_and_Transfer_Caister_Tower	ESWDES004BWY	14.0	✓	✓	✓						✓					
	North_Suffolk_Winter_Storage_3500_and_Transfer	ESWRES002A	16.2													✓	✓
	Caister_Water_Reuse_and_Ormesby_Transfer	03b0478B	16.4	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
	North_Suffolk_Winter_Storage_7500_and_Transfer	ESWRES002C	19.9						✓								

* Following our best value assessment, our Least Cost Plan remains our Best Value Plan. Green ticks indicate options included in the OFWAT Core Plan.

The table above illustrate that there is significant alignment between the options selected in our Best Value Plan and those selected in the other scenarios. This provides confidence that the proposed investment in AMP8 (our core plan) is low regret.

The cost of each of the adaptive programmes is summarised in Table 13.

Table 13: Programmes Cost for each sensitivity scenario (£000s)

Supply Option costs Planning horizon: 2050		Benign scenarios					Central Least Cost Plan*	Adverse scenarios				Alternative Plan	Adaptive Programmes		
EBSD Model Results (£000)		Low PCC	OFWAT Scenarios					OFWAT Scenarios				Best Environment	High PCC	North Suffolk Reservoir	Habs Regs SR***
			Low Demand	Fast Technology	Low Abstraction Reductions (Low ED)	Low Climate Change		High Climate Change	Slow Technology	High Demand	High Abstraction Reductions (High ED)				
AMP8	CAPEX	228,861	122,958	157,157	228,861	185,416	228,861	228,861	228,861	228,861	228,861	122,958	228,861	228,861	228,861
	OPEX	7,570	617	1,399	7,571	5,721	7,571	7,574	7,570	7,568	7,571	661	7,581	7,571	8,203
	TOTEX	236,431	123,575	158,556	236,432	191,137	236,432	236,435	236,431	236,429	236,432	123,619	236,442	236,432	237,064
AMP9	CAPEX	99,601	8,214	8,214	90,139	90,139	90,139	197,615	197,615	197,615	90,139	115,685	197,615	207,939	157,866
	OPEX	30,583	4,023	4,716	21,805	17,857	21,805	50,701	56,498	49,185	21,805	15,304	47,211	13,960	43,541
	TOTEX	130,184	12,237	12,930	111,944	107,996	111,944	248,316	254,113	246,800	111,944	130,989	244,826	221,899	201,407
AMP10	CAPEX	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OPEX	36,832	3,675	4,393	20,337	20,350	20,337	48,859	49,835	49,336	20,337	19,457	49,293	6,562	43,164
	TOTEX	36,832	3,675	4,393	20,337	20,350	20,337	48,859	49,835	49,336	20,337	19,457	49,293	6,562	43,164
AMP11	CAPEX	0	67,727	67,727	0	83,166	221,912	83,166	67,727	67,727	965,011	965,011	67,727	0	191,072
	OPEX	40,783	26,015	26,730	21,747	37,339	23,085	66,298	72,203	71,677	488,750	486,364	71,658	9,882	45,756
	TOTEX	40,783	93,742	94,457	21,747	120,505	244,997	149,464	139,930	139,404	1,453,761	1,451,375	139,385	9,882	236,828
AMP12	CAPEX	67,727	82,734	82,734	67,727	67,727	0	67,727	82,734	99,994	252,868	261,521	99,994	67,727	0
	OPEX	63,862	59,227	59,937	43,278	61,350	29,315	90,376	105,803	98,030	621,056	606,378	97,984	32,555	49,317
	TOTEX	131,589	141,961	142,671	111,005	129,077	29,315	158,103	188,537	198,024	873,924	867,899	197,978	100,282	49,317
Total	CAPEX	396,189	281,633	315,832	386,727	426,448	540,912	577,369	576,937	594,197	1,536,879	1,465,175	594,197	504,527	577,799
	OPEX	179,630	93,557	97,175	114,738	142,619	102,114	263,809	291,909	275,797	1,159,520	1,128,164	273,727	70,530	189,979
	TOTEX	575,819	375,190	413,007	501,465	569,067	643,026	841,177	868,846	869,993	2,696,399	2,593,339	867,924	575,057	767,778
% TOTEX of Central Plan		89.5%	58.3%	64.2%	78.0%	88.5%	100.0%	130.8%	135.1%	135.3%	419.3%	403.3%	135.0%	89.4%	119.4%

*Bold outline identifies OFWAT Core Plan costs.
**Demand in this scenario is higher than Central Plan, and higher than the largest North Suffolk Reservoir can meet. So a reuse and desal scheme are slected instead of the reservoir, at a lower total Capex, which although results in a higher plan opex under the 30% leakage reduction scenario compared to Cnetral plan, the overall totex is lower to 2050.
***A REG19/64 Derogation is required to meet unresolved deficit in this scenario.

8.2 ADAPTIVE PLANNING

8.2.1 OVERVIEW

The sensitivity testing we have undertaken (see Section 8.1 above) has identified that our central supply demand balance forecast and preferred final plan are sensitive to:

- **Customer demand (per capita consumption or PCC):** If customer demand was to outturn at or above our high PCC scenario.
- **Environmental Destination Abstraction Licence Sustainability Reductions:** If AMP8 WINEP investigations confirm that high (Enhanced) sustainability reductions are required instead of the central (Business As Usual Plus) scenario.
- **Habitats Regulations sustainability reductions:** If the Environment Agency's investigations in 2023/24 confirm that further abstraction licence sustainability reductions need to be applied to our Norfolk Broads abstraction licences.
- **The lead in time for delivering the North Suffolk Reservoir:** If the detailed engineering design stage (commencing Autumn 2023) confirms that the Norfolk Suffolk reservoir can be delivered one year earlier than currently is the case, then we would look to deliver it rather than Lowestoft Reuse, the latter of which is less preferred from an environmental perspective.

The above uncertainties can be managed by having an adaptive plan.

As illustrated in Figure 15, our Best Value Plan is an adaptive plan and comprises:

- A central pathway and preferred programme representing the most likely future in terms of customer demand and available water supplies; and
- Adaptive pathways and programmes for:
    - North Suffolk Reservoir;
    - High PCC;
    - High Environmental Destination and
    - Habitat Regulations

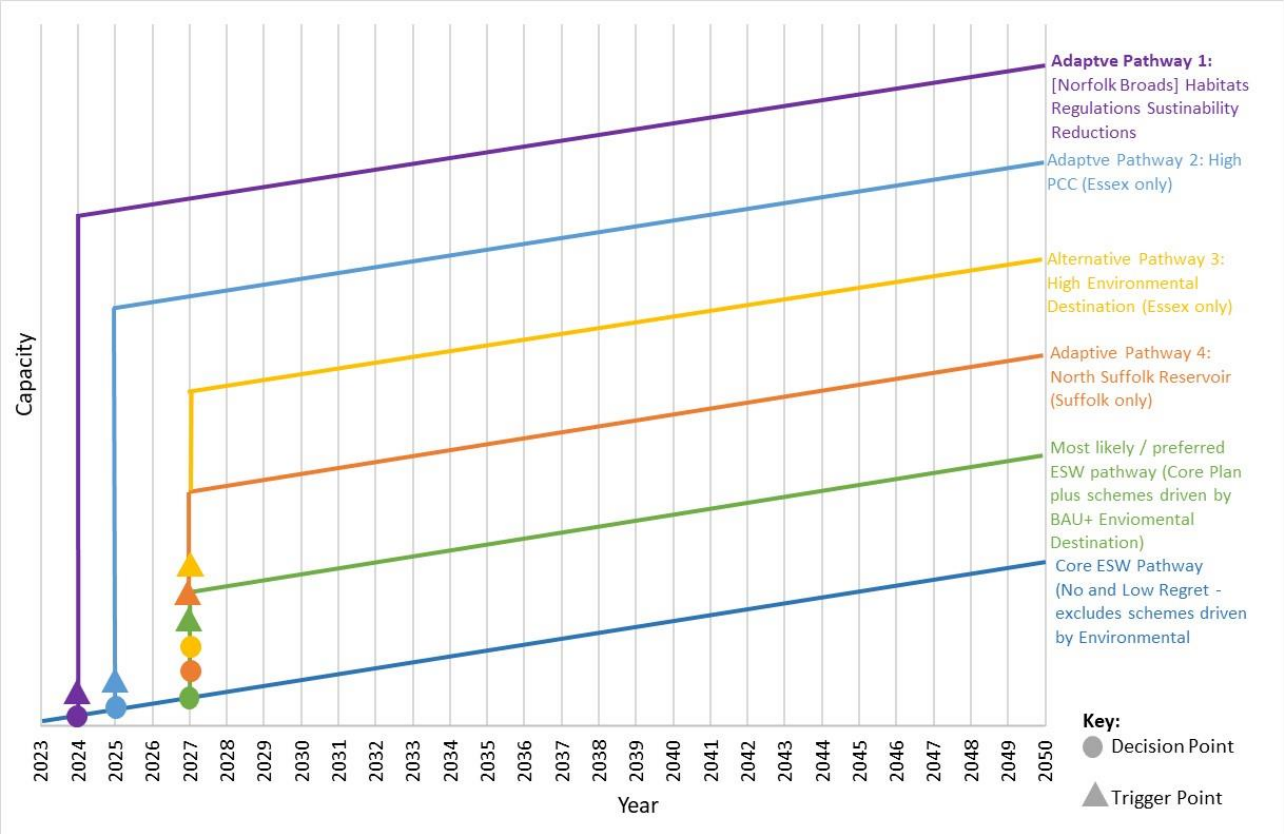

Figure 15: ESW Best Value Plan Adaptive programmes

A description of each of the adaptive programmes is provided below.

8.2.2 NORTH SUFFOLK RESERVOIR ADAPTIVE PROGRAMME

Our final plan includes the Lowestoft Water Reuse scheme. It is primarily chosen because it can be delivered more quickly than North Suffolk Reservoir and so minimises the duration of the moratorium on new non-domestic water supplies in our Hartismere water resource zone. However, our preference would be to deliver the North Suffolk Reservoir instead of Lowestoft Reuse because we consider it a more sustainable option. Lowestoft Reuse has high

operational energy and carbon costs and produces a brine discharge while the North Suffolk Reservoir has lower energy and carbon costs and has significant potential to build in environmental gain.

Subject to review of our progress with delivery of our AMP7 enhancement programme, Ofwat has allowed PR24 transition expenditure funding to undertake detailed engineering design for the North Suffolk Reservoir. This next phase of the project will commence in Autumn 2023 and will develop the scheme so that it is "shovel ready" by 2026/27. If at that point it is concluded that North Suffolk Reservoir provides better value than Lowestoft Reuse (i.e. it can be delivered as quickly as Lowestoft Reuse so as not to lengthen the Hartismere water resource zone moratorium), then we would immediately move to the North Suffolk Reservoir adaptive pathway and programme. Currently, North Suffolk reservoir takes one more year to develop than Lowestoft Reuse.

8.2.3 HIGH PCC ADAPTIVE PROGRAMME

Our central (most likely) demand forecast assumes a downward trajectory over the next 25 years with a PCC of 110l/head/day being achieved by 2050. As well as our own water efficiency and smart metering strategies, this depends on changes to building regulations to adopt the 110l/head/day PCC target and the timely implementation by Government of mandatory water labelling. However, there is uncertainty as to whether PCC will reduce as forecast. Consequently, our Best Value Plan includes an adaptive programme should PCC outturn higher (i.e., High scenario) than our central forecast.

The need to move to the High PCC adaptive programme will be monitored and reported as part of the WRMP Annual Review process which we will submit to regulators every June. This will include monitoring water resource zone PCC; abstraction; and non-household demand, particularly that of large users.

For the Essex WRZ, the High PCC scenario is sensitive to the date of providing 1 in 500 year drought resilience in the Essex WRZ. If we provide 1 in 500 year drought resileince in 2031/32 (as is the case in our central plan, this requires us to develop the Southend Reuse scheme. However, this is not required when we defer 1 in 500 year drought resilience to 2035/36 when a 20Ml/d raw water export to Thames Water ends, thus boosting our supplies by the same amount. Consequently, if PCC outturns in line the high forecast, then we will move the date which we supply 1 in 500 year resilience from 2032/33 to 2035/35.

For the Suffolk WRZ, the option selection under the High PCC scenario is different in the Northern Central WRZ, with Corton Desalination and Caister Water Reuse being selected in favour of the North Suffolk Reservoir to enable Environmental Destination sustainability reductions to be made in 2040/41 and 2045/46 respectively. This is because the North Suffolk Reservoir alone cannot meet demand under this scenario, and therefore an additional option is required. The resulting set of options selected has a higher OPEX, but due to the lower total CAPEX, represents the lowest TOTEX plan. No additional options are required for Blyth and Hartismere WRZs as the new Suffolk Strategic Pipelines in our core plan have sufficient capacity to meet demand under this scenario.

For the Essex WRZ, we have set a:

- Review date of 2027/28 which will depend on the outcome of the draft WRMP29 and consider 2026/27 outturn PCC; and
- Change date of 2028/29 once the WRMP29 has been approved.

For the Suffolk WRZs, the lead time for the schemes needed to enable Environmental Destination Sustainability Reductions to be applied in 2040/41 and 2045/46 does not start until 2030/31 and 2036/37 respectively. Consequently, we have set the:

- Review point date to be 2027/28 following completion of AMP8 WINEP Environment Destination investigations and to tie in with the PR29 process; and
- Change point date of 2028/29 once the WRMP29 has been approved.

8.2.4 ENVIRONMENTAL DESTINATION

Our baseline supply forecast assumes further abstraction sustainability reductions will be required in 2040 and 2045. However, given the uncertainty regarding the size of the reductions, they will not be confirmed until after AMP8 WINEP investigations have concluded in 2026/27.

Our Best Value Plan includes an adaptive programme should WINEP investigations conclude that higher abstraction licence sustainability reductions (i.e. Enhanced scenario) than our central forecast are required. This would result in the loss of approximately 70% of our Essex deployable output and would require both Southend Water Reuse scheme and a 190 Ml/d Canvey Island desalination plant at a capital cost approaching £1.5b. No additional options are required for Blyth and Hartismere WRZs because the new potable water transfers under our preferred best value plan have sufficient capacity to meet demand under this scenario.

8.2.5 HABITATS REGULATIONS ADAPTIVE PROGRAMME

The likely need for additional sustainability reductions to meet the requirements of the Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations), was advised to us in a letter from the Environment Agency in November 2022. Unfortunately, this was too late for their inclusion within our dWRMP24. The reductions will apply to nine groundwater and surface water sources in the Norfolk Broads Special Area of Conservation and must be made by 2026/27.

However, the size of the likely sustainability reductions is still not known as the Environment Agency's ongoing investigations to determine this will not conclude until 2024. However, we have worked with the Environment Agency to agree likely licence reduction values for this revised draft WRMP24.

Given the uncertainty, we are including the sustinability reductions in the baseline supply forecast for the Habitats Regulations Adaptive Programme.

We propose a 2024/25 Review and Change point to move to this adaptve programme following completion of the Environment Agency's investigations.

As illustrated in Figure 16, in addition to our core plan, the adaptive programme also includes construction of Caister Water Reuse in AMP8 for delivery by 2032/33 and delivery of North Suffolk Reservoir by 2040/41.

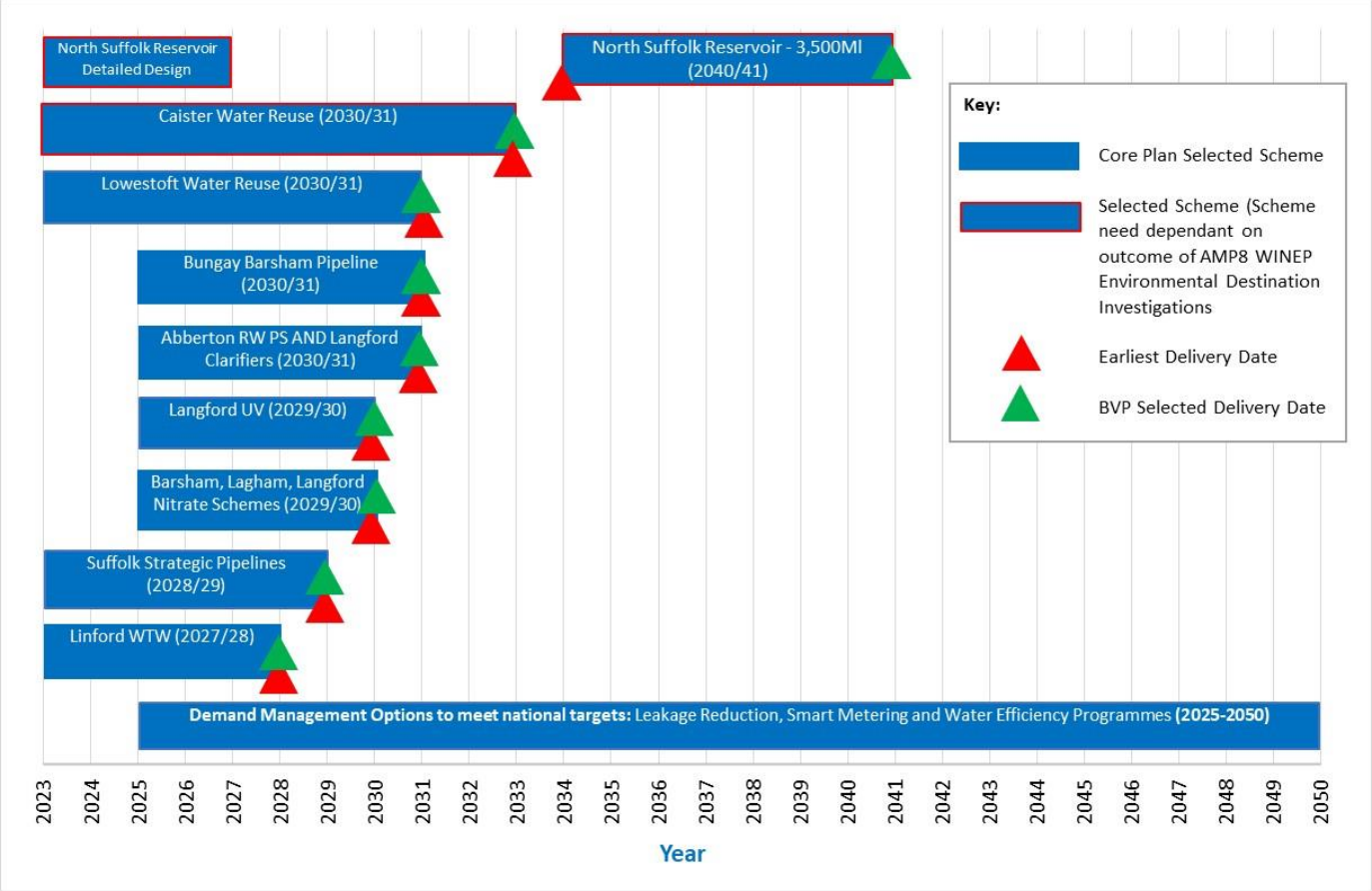

Figure 16: Habitats Regulation Adaptive programme

If we move to the Habitat Regulations Adaptive Programme in 2024/25, then, subject to detailed engineering design over the next three years, we would still prefer to deliver North Suffolk Reservoir instead of Lowestoft Reuse. However, this may be more challenging because under the Habitats Regulations adaptive programme, Lowestoft Reuse is required by 2030/31 while the delivery date for the North Suffolk Reservoir is 2033/34. Consequently, this would mean extending the Hartismere non-domestic mains water moratorium and defering at least some of the Habitats Regulations sustinability reductions by a further three years until 2033/34.

9. ALTERNATIVE PLANS

9.1 OVERVIEW

In addition to our Best Value Plan, we have presented a Least Cost Plan, Core Plan and Best Environment and Society Plan.

All of the plans solve supply deficits that have been calculated using an agreed set of baseline planning assumptions. A core planning assumption for the baseline supply forecast is that all AMP7 abstraction licence sustainability reductions will be made from 2030 and that phase 1 and phase 2 Environmental Destination sustainability reductions will be made from 2040 and 2045 respectively. However, in the Hartismere water resource zone, part of our abstraction licences are time limited and the Envirnment Agency is minded to apply the sustinability reductions on renewal of the time limited aspects of the licence. However, this would cause a supply deficit and so we have applied to the Environment Agency to defer the sustinability reductions, under Regulation 19 of the Water Framework Directive, until 2028/29 once the Suffolk Strategic Pipelines are in supply.

Figure 17 illustrates both our Best Value and Core Plan.

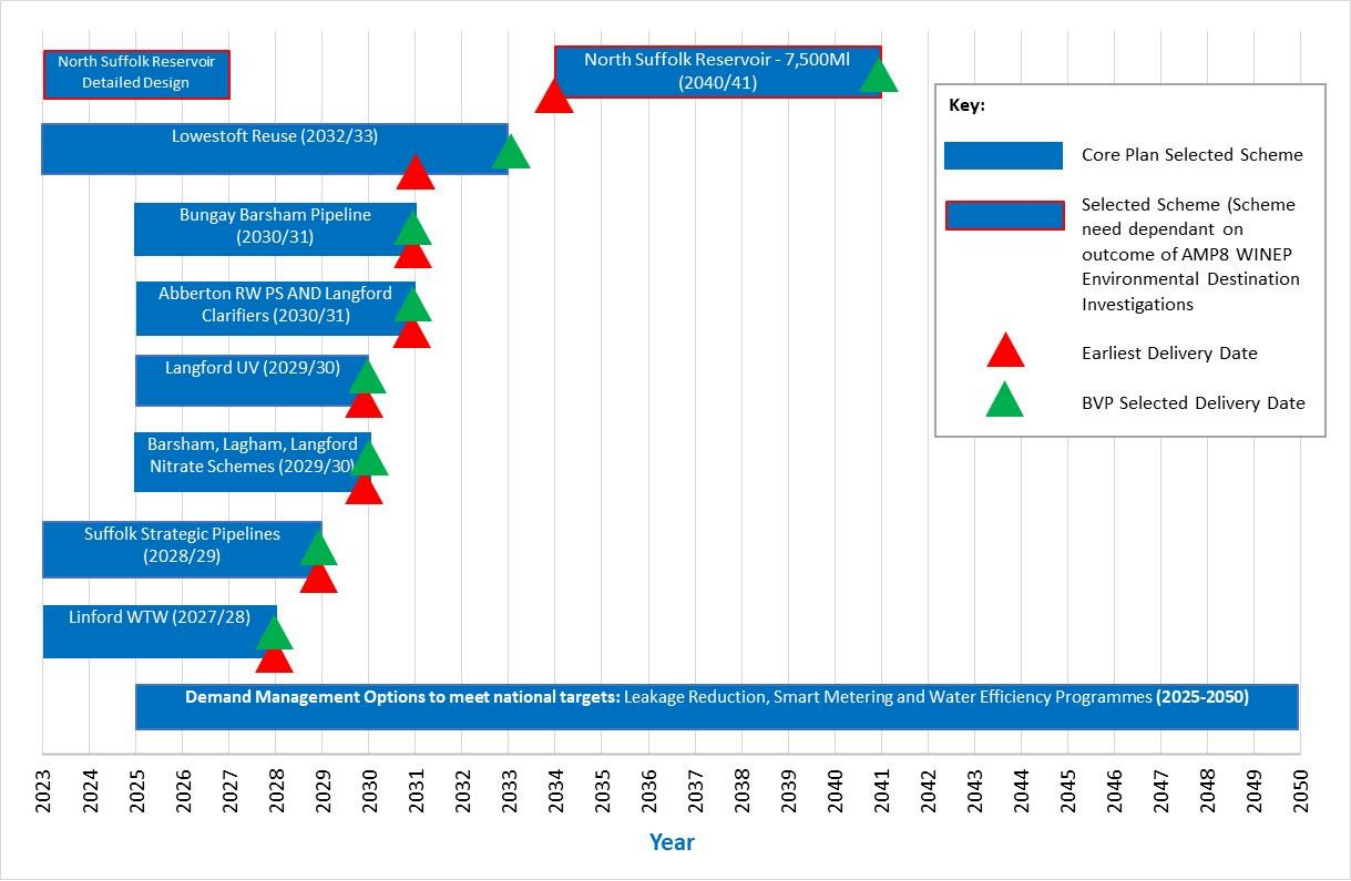

Figure 17: Our Best Value and Core Plan

The core plan represents no or low regret options that are required to maintain a supply surplus in all years of the planning period and to meet government expectations on demand management. The core plan includes all of the Best Value Plan options with delivery dates between 2025-35 but does not include those Best Value Plan options that are driven by Environmental Destination abstraction reductions in the 2040s. This is because there is a low level of certainty regarding the size of the sustainability reductions which will remain until AMP8 WINEP investigation conclude in 2026/27.

9.2 LEAST COST PLAN

The Least Cost Plan is determined using only economic cost information and as its name suggests, is the plan with the lowest cost to maintain and / or restore a supply surplus in all years of the planning period. The Least Cost Plan does not consider other monetised criteria such as carbon or other societal and environmental impacts and benefits.

9.3 BEST ENVIRONMENT AND SOCIETY PLAN

Figure 18 illustrates our Best Environment and Society Plan. It presents a plan with the lowest level of abstraction from existing sources (i.e. high (Enhanced) Environmental Destination scenario), as well as the lowest level of leakage and PCC.

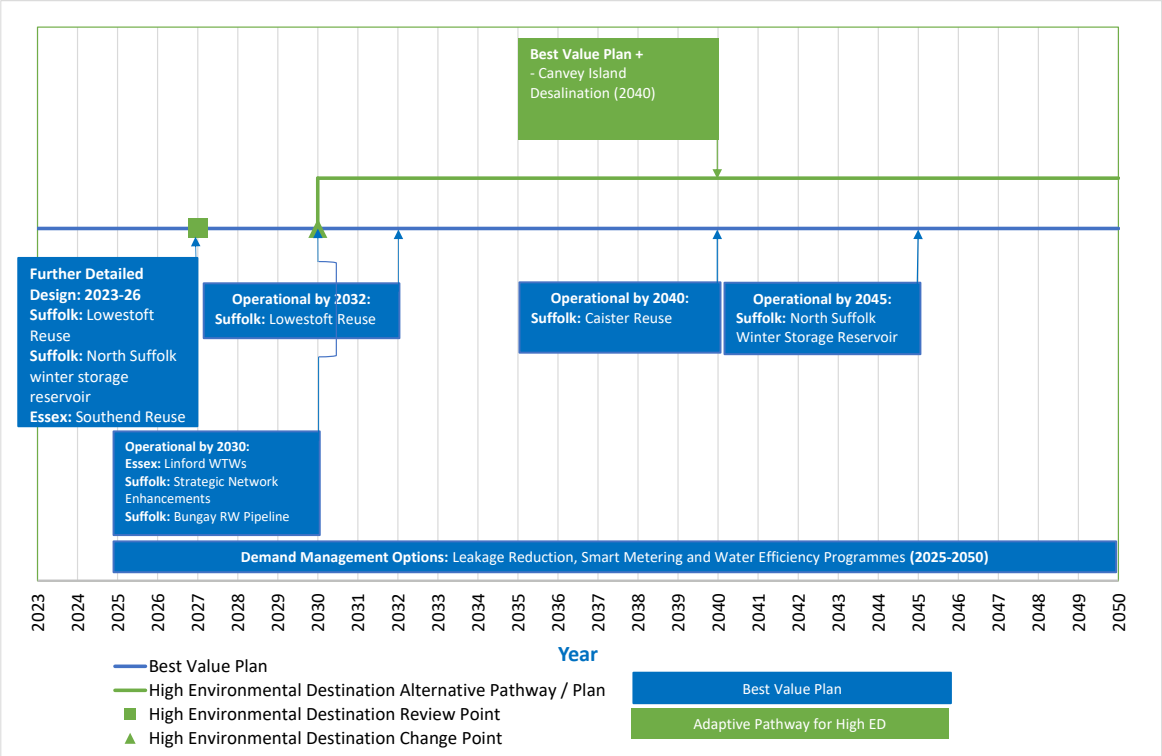

Figure 18: Best Environment and Society Plan

While there would be marginal savings by reducing leakage by 50% by 2050, the high Environmental Destination scenario abstraction licence sustainability reductions results in a loss of over 70% of our deployable output. This means that in addition to all our Best Value Schemes, the Southend Reuse scheme and a 190Ml/d desalination plant are also required in Essex. We do not believe this would be a good outcome for the environment or our customers as the desalination scheme:

- Has the highest carbon and operational costs given the process has the highest electricity demands (kwh/Ml/d of water produced).
- Produces a large brine effluent that would need to be discharged to sea.
- Has a significant capital cost approaching £1b.

We have included all our surface water abstractions in our AMP8 WINEP for investigation under the Environmental Destination driver. This will provide a better understanding of the freshwater requirements of rivers and estuaries and will determine what licence changes (licence reductions or Hands Off Flow conditions) will be required to inform our PR29 WRMP.

10. ENVIRONMENT AND SOCIETY

10.1 OVERVIEW

Our Best Value 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.

Protecting the environment is at the heart of our business. We share the same ambitions for healthy thriving watercourses as our customers, and making sure that rivers, aquifers and coasts are in the best possible environmental health is behind everything we do.

Our revised dWRMP24 has allowed for both short term (arising from our AMP7 WINEP, Water Frameworkt Directive and Habitats Regulations obligations) and long term (Environmental Destination) reductions to our abstraction licence annual quantities, known as sustainability reductions. It also summarises how we are developing our AMP8 WINEP including schemes to support wider outcomes of the 25 Year Environment Plan.

In developing our Best Value Plan, we have used an Integrated Environmental Assessment.

10.2 INTEGRATED ENVIRONMENTAL ASSESSMENT

10.2.1 APPROACH

We have undertaken an Integrated Environmental Assessment (IEA) which comprises various assessments including Strategic Environmental Assessment (SEA), Habitats Regulations Assessments (HRA), Water Framework Directive Assessments (WFD), Biodiversity Net Gain (BNG) assessments, Natural Capital (NC) assessments and Invasive Non-Native Species (INNS) assessments. We have used these to aid our decision-making on mitigation requirements, 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. We have incorporated feedback from the consultation on our draft Environment Report into the report for our revised dWRMP24.

10.2.2 RESULTS

The IEA carried out for this revised dWRMP24 has identified the likely effects of the WRMP at an option level, at a plan level, and in conjunction with other plans, programmes and projects. As well as our Best Value Plan we have also developed a Least Cost Plan. These two plans are identical and therefore the SEA results of the two plans are identical. If we need to follow one of the adaptive programmes built into our BVP, these require the inclusion of different supply side options, therefore performance against the various SEA topics varies from the BVP main pathway, for both the construction and operational phases.

10.3 WATER INDUSTRY NATIONAL ENVIRONMENT PROGRAMME (WINEP)

As part of our five-year planning process we agree with our regulators 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.

WINEP (2020 to 2025)

In the current planning period, we have:

- Carried out a number of investigations to better understand the effect of our abstractions on the environment;
- Installed screens on our river abstraction intakes to make sure eels do not become entrapped;
- Built fish passes on structures (for example, weirs) that we own which currently prevent fish from moving naturally up and down rivers;
- Increased the amount of priority habitat that we own and manage;
- Provided grants to partner organisations, charities and local groups to create and restore priority habitat and to tackle invasive non-native species in our region;
- Engaged with farmers 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 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 Blackwater catchment;
- Carried out monitoring and risk assessments for Invasive Non-native Species (INNS), installed washdown facilities at reservoirs with public access and ensured we follow appropriate biosecurity measures in all our operations.

WINEP (2025 to 2030)

We have worked closely with our regulators and stakeholders to identify what needs to be included in the WINEP for delivery in 2025 to 2030. We have been challenged by our regulators to aim for even more ambitious environmental outcomes 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 carried out in 2020-25, 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 can 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.

As our AMP8 WINEP has not yet received final approval from all regulators, we are not able to include further detail in our revised dWRMP24 at this stage. Our AMP8 WINEP will be included in full within our PR24 Business Plan.