
love every drop
anglianwater
WRMP24 Technical Document
Sustainable abstraction and environment
September 2024
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Sustainable Abstraction

1 WRMP24 Introduction

1.1 About our company

Anglian Water is the largest water and wastewater company in England and Wales geographically, covering 20% of the land area.

We operate in the East of England, the driest region in the UK, receiving two-thirds of the national average rainfall each year; that's approximately 600mm.

Our region has over 3,300km of rivers and is home to the UK's only wetland national park, the Norfolk Broads.

Between 2011 and 2021, our region experienced the highest population increase in England. Despite this, we are still putting less water into our network than we did in 1989.

1.2 Planning for the long term

Our company Purpose is "to bring environmental and social prosperity to the region we serve through our commitment to Love Every Drop". This purpose is at the heart of our business, having been enshrined in our Articles of Association in 2019.

Central to delivering this purpose is planning for the long term; one of the strategic planning frameworks we use to achieve this is the Water Resources Management Plan (WRMP), which details how we will ensure resilient water supplies to our customers over the next 25 years.

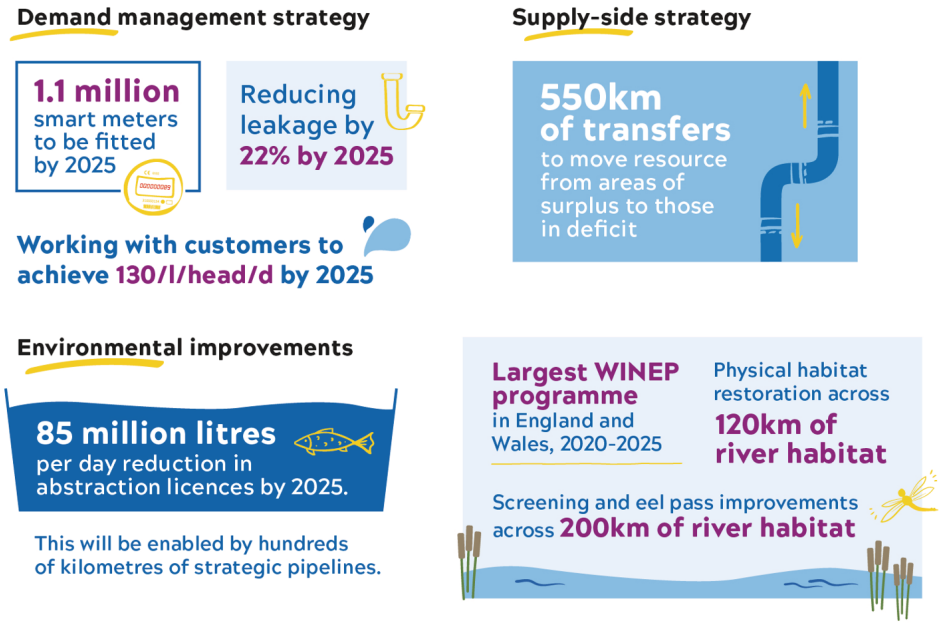
A WRMP looks for low regret investments[1] for our region, giving flexibility to adapt to future challenges and opportunities such as technological advances, climate change, demand variations, and abstraction reductions.

1.3 Water resources management plan

We produce a WRMP every five years. It is a statutory document that sets out how a sustainable and secure supply of clean drinking water will be maintained for our customers. Crucially it takes a long-term view over 25 years, allowing us to plan an affordable, sustainable pathway that provides benefit to our customers, society and the environment.

Our previous WRMP, WRMP19, had an ambitious twin track strategy, combining an industry leading smart meter roll out and leakage ambition with a strategic pipeline across our region, bringing water from areas of surplus to areas of deficit. An overview of the WRMP19 strategy can be seen in Figure 1 below.

Figure 1 Our WRMP19 strategy



This WRMP focusses on the period 2025 to 2050, and is known as WRMP24. We have developed it by following the Water Resources Planning Guideline (WRPG)[2], as well as other relevant guidance, in order to meet our statutory requirements. This has ensured our WRMP24:

1 Investments that are likely to deliver outcomes efficiently under a wide range of plausible scenarios
2 https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline

- Provides a sustainable and secure supply of clean drinking water for our customers.
- Demonstrates a long-term vision for reducing the amount of water taken from the environment, and shows how we will protect and improve it.
- Is affordable.
- Maintains flexibility by being able to respond to new challenges.
- Complies with its legal duties.
- Incorporates national and regional planning; and
- Provides best value for the region and its customers.

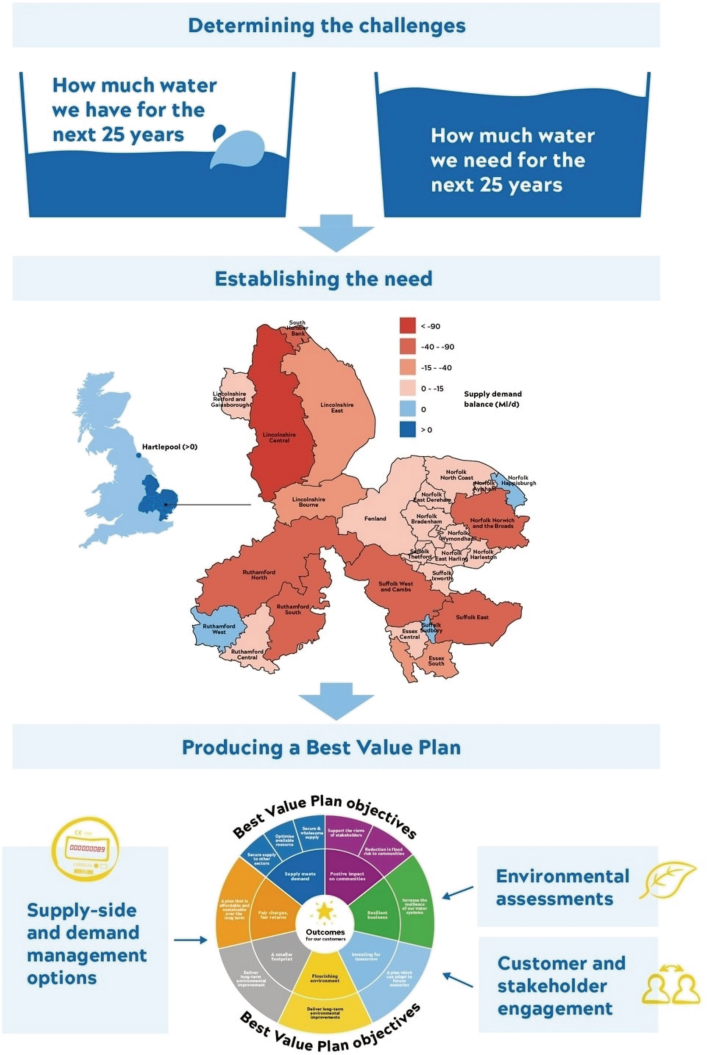
1.4 Developing our WRMP

Our WRMP24 has been progressed following the processes detailed in the WRPG, as shown in Figure 2.

We start by determining the extent of the challenges we face between 2025 and 2050. We achieve this by developing forecasts to establish the amount of water available to use (supply forecast) and the amount of water needed (demand forecast) in our region. When these forecasts are combined, a baseline supply-demand balance is created. This tells us whether we have a surplus of water or a deficit, establishing our water needs for the planning period.

An appraisal for both demand management options and supply-side options is undertaken, starting with an unconstrained list of possible options which progresses through various assessments until a final constrained list is determined.

Figure 2 A high level overview of our WRMP24 planning process



Demand management options aim to reduce the amount of water being used by our customers and lost in our water network. Examples of these options include smart metering and the promotion of water efficiency measures, such as reducing shower times. Supply-side options are also developed; these provide additional water to supply to customers. Examples of these options include new raw water storage reservoirs or water reuse treatment works.

We environmentally assess both demand management and supply-side options so we can understand their potential environmental impacts and what could be put in place to mitigate these impacts; in some cases we exclude options from further consideration.

The next step is for the water savings associated with the chosen demand management options to be added into our baseline supply-demand balance to determine if our region's water needs are met. If the demand management option savings do not solve the need, supply-side options are added into the modelling process. This is undertaken in our Economics of Balancing Supply and Demand (EBSD) model which conducts numerous modelling runs, creating a range of plans that meet our objectives. These plans are also environmentally assessed.

We develop a best value plan from these different model runs and environmental assessments, encompassing the views of our customers and stakeholders who have been consulted throughout the plan's development.

1.5 Best value plan

To ensure we develop the right solution for our region's water needs, we have focused on 'best value'. To us, best value is looking beyond cost and seeking to deliver a benefit to customers and society, as well as the environment, whilst listening and acting on the views of our customers and stakeholders.

These views, from our customers and stakeholders, have helped build our best value framework, shown in Figure 3 which has been used as the basis for our decision making.

Figure 3 Our best value planning objectives

1.6 Our WRMP24

Our best value plan, has been produced following a public consultation on our draft WRMP24. This consultation ran from December 2022 to March 2023. Taking into account consultation feedback and our revised forecasts, we:

- Increased our leakage ambition from 24% to 38%.

- Included projected non-household demand for the South Humber Bank, in north Lincolnshire.
- Developed non-household demand management options.
- Recognised further opportunities to utilise the existing resource we have; and
- Removed abstractions from the supply forecast that are likely to be closed due to Habitats Regulations.

1.7 Strategic context of the WRMP24

Our WRMP24 aligns with our Purpose, as well as internal and external strategic plans and initiatives. We have worked collaboratively with internal and external stakeholders, regulators and other water abstractors to achieve this.

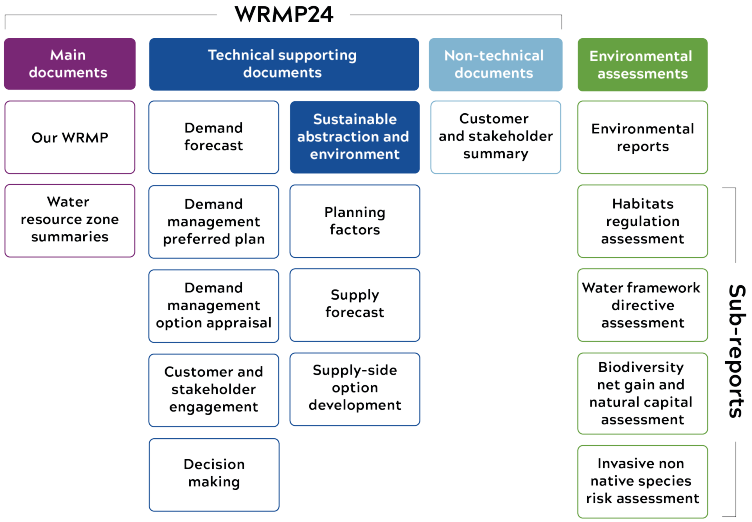
These interactions are highlighted throughout our WRMP24, showing the importance of collaborative planning. For instance, Regional Plans led by Water Resources East (WRE) and Water Resources North (WReN) have been significant in shaping our investment priorities and requirements, with WRE demonstrating the value of the strategic regional options (SROs) at the regional, multi-sectoral level.

Our WRMP24 has helped to shape our company investment strategy for the Price Review (PR24), as well as our Long Term Delivery Strategy. We have also maintained close links with the Drainage Wastewater Management Plan and our Drought Plan.

1.8 Guide to our WRMP24 submission

Our submission comprises a non-technical customer and stakeholder summary, our main report and nine technical supporting documents, as shown in Figure 4 below. These technical documents are supported by a suite of independent environmental assessments.

Figure 4 Our WRMP24 reports



This is the Sustainable abstraction and environment technical supporting document.

2 Executive Summary

At Anglian Water, our Articles of Association require us to deliver long-term value to our customers and the wider community by proactively seeking positive outcomes for the environment and society. This is summarised in a simple statement, which represents our core purpose:

"Our Purpose is to bring environmental and social prosperity to the region we serve through our commitment to Love Every Drop."

We recognise that all of our abstractions must be environmentally sustainable. Sustainable abstraction will continue to be addressed as part of the Water Industry National Environment Programme (WINEP) in Asset Management Period Seven (AMP7) which takes place between 2020 and 2025. In our region, we have a significant part to play with the largest WINEP plan of any water company, totalling at £800 million across schemes such as sustainable abstraction (licence changes), river restoration, river support and improving water quality. In addition to this, we are continuing to work with the Environment Agency to determine our approach to capping licences under the Water Framework Directive (WFD) 'no-deterioration', ensuring the environment is protected from risk in the growth of demand for water.

In AMP7, we are also delivering a series of further investigations and appraisal for options to be implemented in AMP8. In AMP6, the Environment Agency identified several waterbodies to investigate due to the potential risk from abstraction pressures on flow, such as the Stiffkey, Waveney and East Suffolk chalk and crag (River Gipping), North Essex chalk (River Colne and River Pant) and the River Brett. These investigations are ongoing.

Although a breadth of investigations and implementation schemes have been conducted, many waterbodies still attribute flow impacts on WFD classifying elements as a Reasons for Not Achieving Good status. Previous investigations have focused on changes to abstraction to improve flow rather than strategic solutions, the concept of environmental destination aims to improve and adjust this focus on long-term sustainable solutions. The National Framework for Water Resources was published in March 2020, which introduced environmental destination and the aim to define a long-term vision for the environment. The most notable part of this publication was the aim to reduce the impact of abstraction on environmental flows and restoring, protecting and enhancing waterbodies.

As a water company and the largest abstractor in the region, we have worked closely with other regional companies and abstractors, and environmental regulators, under the auspices of Water Resources East (WRE) to define a set of regional specific and locally verified environmental destination scenarios. These are included in our WRMP.

Having a set of environmental destination scenarios in water resources plans will enable water companies, regulators and stakeholders to understand the types of interventions required to achieve varying degrees of sustainable abstractions. Whilst useful for long-term water resources planning, the levels of environmental destination, their deliverability and benefits remain highly uncertain. As a result, further investigations, to be commenced later this year and into the early years of AMP8 (2025-2030) are required to determine with more certainty the needs of the environment and the associated changes in abstraction. The benefits of these changes will then be weighed against the costs - economic and environmental - of solutions required to replace this water.

Our WRMP includes a multitude of opportunities to deliver net-gain for the environment and to help deliver the goals set out by the 25-Year Environmental Plan 2018 , Environment Act 2021, Environmental Improvement Plan 2023 and the Plan for Water 2023.This is reinforced by our most recent commitment to Get River Positive by 2030. Most notably, our WINEP programme and work on environmental destination aims to realise these outcomes for the environment and mobilise investment to deliver them. In addition to these, our WRMP contains a series of further opportunities to help deliver environmental net gain.

3 Introduction

3.1 Our commitment to the Environment

At Anglian Water, our Articles of Association require us to deliver long-term value to our customers and the wider community by proactively seeking positive outcomes for the environment and society. This is summarised in a simple statement, which represents our core purpose:

"Our Purpose is to bring environmental and social prosperity to the region we serve through our commitment to Love Every Drop."

Water is vital to health and wellbeing, to the economic prosperity of the East of England, and to maintaining a thriving natural environment that we can all enjoy. Yet we face growing challenges to supply, from population growth in our region and the escalating climate emergency. To meet these challenges, we all have to play our part in balancing the needs of society, economy and the environment to enable a sustainable future.

To ensure that our business is sustainable in the long term, we are committed to protecting and enhancing the natural environment. This includes ensuring that our abstractions are sustainable and by doing so, we will continue to work closely with the Environment Agency, Natural England and many other key stakeholders such as Environmental Non-Governmental Organisations (eNGOs). In addition to this, it's important that we engage with our customers every AMP to produce a Business Plan that is reflective of their preferences and the issues that matter most to them. Price Review 2024 will inform our key priorities for our next Business Plan for AMP8.

3.2 Environmental Improvement in the Water Sector

We recognise that all of our abstractions must be environmentally sustainable. Historically, where abstractions had the potential to cause environmental problems or risk, we have addressed the issue through the National Environment Programmes (NEPs) in AMP3, AMP4, AMP5, and AMP6. Sustainable abstraction is continuing to be addressed in AMP7 (2020 - 2025) WINEP and beyond. Nationally, the AMP7 WINEP aims to deliver £5.2 billion of asset improvements, investigations, monitoring, and catchment interventions[3]. In our region, we have a significant part to play with the largest WINEP plan of any water company, totalling at £800 million across schemes such as sustainable abstraction, river restoration and improving water quality.

These programmes of work are primarily driven by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 and The Wildlife and Countryside Act 1981, to address the hydrological impacts upon waterbodies and water dependent ecosystems. In addition to this, the River Basin Management Plans are published by the Environment Agency and set out waterbody objectives that seek to improve the water environment. More recently in 2022, the latest draft River Basin Management Plans were updated by the Environment Agency[4] to establish a new baseline, whereby subsequent objectives are set out to 2027. The baseline informs necessary measures required to ensure waterbody status classifications do not deteriorate as a result of risks such as growth in the demand for more water. Lastly, we have a duty to ensure our abstractions are sustainable in relation to potential impacts upon fish and eels (The Eels (England and Wales) Regulations 2009), as well as addressing the risk of spreading invasive and non-native species (INNS).

3.3 The 25 Year Environment Plan, Environmental Act (2021) and Plan for Water

In 2018, the Department for Environment, Food & Rural Affairs (Defra) published the 25 Year Environmental Plan (YEP) [5], setting out Government action to achieve various outcomes such as delivering cleaner air and water in our cities and rural landscapes, providing richer habitats for wildlife and protecting threatened species. Most notably for the water environment, the 25 Year Environmental Plan sets a goal of 'improving at least three quarters of our waters to be close to their natural state as soon

3 Defra, Water industry national environment programme (WINEP) methodology, May 2022
4 Environment Agency, river basin management plans: 2022, December 2022.
5 Defra, 25 Year Environment Plan, January 2018.

as is practicable'. This includes reducing the impacts of harmful abstraction and reaching or exceeding objectives for specially protected waterbodies such as rivers, lakes, coastal and ground waters.

In addition to this the Environment Act[6] was passed into UK law in 2021. This new piece of ambitious legislation aims to protect and enhance our environment for future generations and will result in a set of legally binding environmental targets. These long-term targets will be enforced by the new and independent Office for Environmental Protection and will aim to deliver measurable improvements in both the water environment and for biodiversity more broadly. This includes halting the decline of species by 2030 and ensuring there is a statutory obligation to deliver biodiversity net gain (minimum 10%) for new developments. Furthermore, targets under the Environment Act also have the potential to address harmful abstraction and improve collaboration across abstractors. Defra consulted on environmental targets in summer 2022, and following this, legally binding targets were published in December 2022[7]. In addition to halting the decline in species by 2030, these targets have a focus on reduction in water pollution and improving household demand management measures to help restore waterbodies to their natural state. In succession of this, in January 2023, the Environmental Improvement Plan[8] was published, presenting how these targets will be delivered and updates since the publication of the 25 YEP in 2018. Interim targets included reducing per capita consumption by 9% by 2027 and 14% by 2032, leakage reductions by 20% by 2027 and 30% by 2032 and reducing damaging abstractions from rivers and groundwater. In addition, there is continued ambition to restore three quarters of our water bodies to good ecological status and a target of 75% of Sites of Special Scientific Interest (SSSIs) to be in favourable condition by 2042.

The Plan for Water [9]was published by the Government in April 2023 which encompasses steps already undertaken and future action required to deliver clean and plentiful water. This plan uses a catchment-based approach to improve management of our water system, deliver a clean water environment for people and nature and secure a plentiful supply of water. This includes increasing water supply, managing water demand, new funding and restoring water habitats.

We fully support the Government's ambition to protect and enhance the environment for generations to come and recognise that we have an important role to play in our region to ensure future targets are achieved and that key environmental outcomes materialise.

3.4 This document

This document outlines how we will meet our sustainable abstraction objectives in the WRMP24. It is critical that abstraction for public water supply is environmentally sustainable, in order to maintain an essential service which underpins public health. Our legal obligations in terms of sustainable abstraction must be carefully managed to ensure that the security of water supply is not compromised.

This document aims to describe how we are supporting and compliant with:

- Water Framework Directive River Basin Management Plan objectives
- Outcomes under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, including 'No Deterioration'
- The Habitats Directive 1992
- The Wildlife and Countryside Act 1981
- Eels (England and Wales) Regulations 2009
- European Invasive Alien Species Regulations 2014
- Invasive non-native species
- The 25 Year Environment Plan
- The Environment Act 2021
- The Environmental Improvement Plan, and
- The Plan for Water.

Other sections of this document set out our contribution to meeting wider objectives, for example:

- Outline how we have carried out and implemented our AMP7 WINEP requirements for Water Resources.
- Detail the outcomes of our WINEP investigations and options appraisal in AMP7 for Water Resources (for implementation in AMP8).

6 Defra, World-leading Environment Act becomes law, November 2021.
7 Defra, New legally binding environment targets set out, December 2022
8 Defra, Environmental Improvement Plan, January 2023
9 Defra, Plan for Water: our integrated plan for delivering clean and plentiful water, April 2023

- Give an overview of our approach to environmental destination - a long-term approach to sustainable abstraction.
- Highlight opportunities to deliver environmental net-gain through water resources planning.

4 WINEP Schemes - Implementation & Investigations

After a comprehensive set of WINEP investigations and options appraisal in AMP6, we agreed with the Environment Agency a series of schemes to be delivered in AMP7 for Water Resources. In addition to this, further investigations and option appraisal are being scoped in AMP7, with the intention of implementing schemes that are shown to be beneficial in AMP8. The different types of WINEP drivers that gave precedent to these implementations and investigations were:

- Water Framework Directive (WFD)
  - Flow
  - No-deterioration
  - Groundwater quality
  - Groundwater resource
  - Heavily modified waterbodies (HMWBs)
- Drinking water protected areas
- Habitats Directive
- Invasive non-native species
- Fish & Eel regulations.

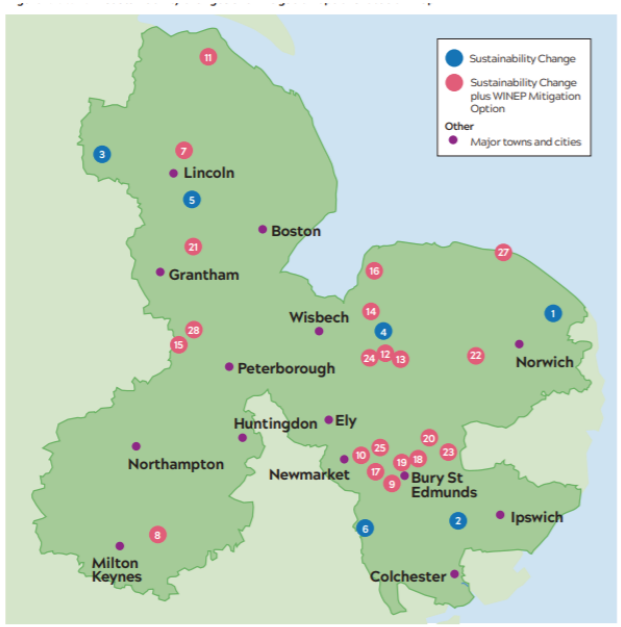
4.1 AMP7 Implementation schemes

The Price Review 2014 (PR14) NEP outlined 25 waterbodies and designated sites where current abstractions were considered to be causing, or had the potential of causing, environmental issues according to RBMP classifications and objectives, and where the Environment Agency had determined that implementing a catchment wide bundle of measures to reach those objectives was cost beneficial at a catchment scale.

In early AMP6 we carried out options appraisals to determine how to address these issues. These were completed according to the guidance set by the Environment Agency in order to ensure that we could include the outcome of the options appraisals in our WRMP.

We looked at options to reduce or mitigate the potential effects of abstraction on low flows, groundwater bodies, and water dependent terrestrial ecosystems. Options appraisals were completed, with options selected following detailed multi-criteria analysis, cost-benefit assessment, and discussion with the Environment Agency (see section 4.2 for more detail). These options, including any associated sustainability changes to licences, have been and are being implemented in AMP7.

Figure 5 WINEP schemes being implemented in AMP7



Key:
Sustainability changes: 1 Catfield Fen, 2 River Brett, 3 River Idle and River Poulter, 4 River Nar, 5 Witham Limestone, 6 Bumpstead Brook, Mitigation options: 7 Barlings Eau, 8 Broughton Brook, 9 Cavenham Stream, 10 Lee Brook, 11 Northern Chalk, 12 Old Carr Stream, 13 River Gadder, 14 River Gaywood, 15 River Gwash, 16 River Heacham, 17 Kennett-Lee, 18 River Lark, 19 River Linnet, 20 River Sapiston, 21 River Slea, 22 River Tiffey, 23 Stowlangtoft Stream, 24 Stringside Stream, 25 Tuddenham Stream, 26 West and East Glen, 27 West Runton Common.

4.1.1 River Restoration

River restoration aims to reinstate the natural physical processes and features of rivers and improve the overall quality of habitat and biodiversity. This can help to restore and build resilience to the river

ecosystem and can be achieved using a variety of techniques such as re-meandering, introducing riparian habitat and river bank protection or stabilisation.

We aim to implement the following sixteen river restoration schemes (as detailed in Table 1) by **December 2024:**

Table 1 River Restoration schemes to be implemented for WINEP AMP7

Catchment	River
Lark	River Linnet
	Cavenham Stream
	Tuddenham Stream
	Lee Brook
Little Ouse & Thet	Sapiston River
	Stowlangtoft stream
North West Norfolk	River Gaywood
	River Heacham
Ouzel & Milton Keynes	Broughton Brook
Wissey	Gadder
Welland	West Glen
	Main Glen
	Gwash (Adaptive Management)

It should be noted that since the draft WRMP24, through discussion with the EA, it has been agreed that the AMP7 WINEP obligation for Old Carr will be removed, the Stringside river obligation and Kennett Lee Brook river obligation will be moved to AMP8 WINEP and the East Glen obligation has been changed to the Main Glen river instead.

4.1.2 River Support schemes

A river support scheme provides groundwater (abstracted from a local aquifer via boreholes) directly into the receiving river, helping to supplement low flows at times of need. This can help support river flows when the groundwater table is below a certain point, supplementing the natural flow as it varies throughout the year. Typically, the highest flows can be seen in spring after months of autumn and winter rainfall causing the recharge of aquifers. Low flows can occur in autumn after the summer months have seen limited rainfall and higher rates of evaporation.

River support schemes can help alleviate the pressures of low flows on the ecology and can be a temporary or short-term measure until more long-term strategic solutions deal with the root cause of flow pressure (e.g. unsustainable abstraction).

We aim to implement the following ten river support schemes (as detailed below in Table 2) by **December 2024**:

Table 2 River Support schemes to be implemented for WINEP AMP7

Catchment	River
Lark	River Linnet
Little Ouse & Thet	Sapiston River
	Stowlangtoft Stream
Becks Northern	Laceby and Skitter Beck
Ouzel & Milton Keynes	Broughton Brook
Welland	East Glen
Witham	River Slea
	Barlings Eau
Yare	River Tiffey
Stour	River Brett

4.1.3 Habitats Directive investigation outcomes

In 2020, investigations carried out by the Environment Agency and Natural England concluded that our abstraction at Ludham (north-east Norfolk) was likely to be adversely impacting Catfield Fen, located in the Ant Broads and Marshes SSSI - designated as a SSSI and Special Area of Conservation (SAC). Catfield Fen is an ecologically diverse and rich low-lying wetland; an important habitat that supports an abundance of plant and animal species.

In March 2021, we completed work on a £9million scheme to maintain water supplies to 3,000 homes by connecting Ludham to sources in Norwich and enabling the closure of our borehole at Ludham. This cessation of

groundwater abstraction aims to support efforts to reduce the impact of unsustainable abstraction on our most important and sensitive protected sites.

Since the abstraction ceased, water levels have increased (as witnessed in observation boreholes in the area), allowing more alkaline nutrient-rich water into the fen.

In addition to this, further groundwater abstractions at East Ruston and Witton are also considered to be having an impact on SSSIs in the Ant Valley (Broad Fen and Smallburgh Fen). We closed these abstractions in October 2023. Discussions are ongoing with the Environment Agency as they continue further investigations into the Broadland SAC.

Furthermore, we are committed to working with other abstractors in the Ant Valley who face a similar challenge of reducing their groundwater abstraction. This includes supporting agricultural irrigators (such as the Broadland Agricultural Water Abstractors Group) with their development of a "masterplan" to create new sources of water for irrigation.

4.1.4 Raw Water Quality

In our region, we face significant challenges when addressing raw water quality and ensuring improvements are made both for the environment and the water we treat for our customers. Pollutants such as nitrates, phosphates and pesticides can end up in groundwater aquifers and watercourses as a result of activities such as private discharges (point source pollution) and agricultural practices (diffuse pollution). This can often cause harm to the aquatic environment such as eutrophication, as well as posing challenges to our reservoirs that receive direct input of river flows. For this reason, we work proactively with landowners in the catchments surrounding our reservoirs to reduce diffuse pollution and minimise the risk of supply outages, or the need for extensive treatment to achieve standards for drinking water.

This work is undertaken by our Catchment team whose responsibility is to reduce the risks of diffuse pollution to rivers and aquifers from which we abstract. The team's work is prioritised according to the most significant pollution risks, such as metaldehyde (prior to its ban), nitrate in high-risk aquifers and oilseed rape herbicides. The team engages with farmers, agronomists, and others, to encourage long-term behaviour change through providing advice, disseminating information, undertaking trials, and funding capital items and activities that deliver a water quality benefit.

Priorities are discussed and set in collaboration with others, such as water quality risk scientists and our Water Quality Policy and Strategy Manager. Strategic planning, tactical delivery, and performance are overseen by the Catchment Strategy Steering Group, which includes members from across Anglian Water.

Our Catchment team also works closely with our operational colleagues to ensure that abstraction is optimised to avoid periods of higher diffuse pollution (e.g. major rainfall after summer). One example of the pesticide challenge is metaldehyde, used widely for slug control in agriculture. Metaldehyde is extremely difficult to treat (being very stable in the environment), and therefore requires expensive, innovative treatment technology to reduce concentrations to sufficient levels to meet DWI requirements. The production of metaldehyde has now been banned (due to the perceived environmental impacts), but the principles of the catchment management approach can be applied to wider conversations with agriculture going forward.

Groundwater is a critical resource in our region which accounts for roughly half of our supply, as well as sustaining rivers and important habitats such as chalk streams and wetlands. Therefore, it is important that we proactively work to improve and protect groundwater resources. To deliver these improvements, it is necessary to take a catchment-based approach by collaboratively working in key partnerships with other abstractors and land managers to embed schemes and best practice. Solutions that prevent pollution from getting into raw water sources are more sustainable than relying on 'end of pipe' solutions, like water treatment, while delivering other benefits for the environment.

Table 3 Abstraction sources for farmer engagement and catchment planning on nitrates

Groundwater body	Abstraction source
North West Norfolk Chalk	Congham, Gayton, Marham, Fring 1, Fring 2, Gt Bircham and Hillington.
North Norfolk Chalk	Sedgeford, Wighton, Houghton St Giles and Glandford.

Groundwater body	Abstraction source
Broadland Rivers Chalk & Crag	Lyng Forge, Postwick and Trowse Newton.
Waveney and East Suffolk Chalk & Crag	Westerfield.
Cam and Ely Ouse Chalk	Eriswell, North Pickenham, Riddlesworth, Risby, Stanton, Twelve Acre Wood, Thetford 1, Beachamwell, Isleham, Lower Links, Moulton, Thetford 2 and Square Plantation.
Upper Bedford Ouse Woburn Sands	Birchmoor.
Witham Limestone	Aswarby, Sleaford and Dunston.
Idle & Torne Sandstone	Retford.
Grimsby Ancholme Louth Chalk	Barnoldby, Barrow, Barton, Goxhill, Habrough, Healing, Little London, Littlecoates, Thornton Curtis and Ulceby.

Our Catchment team does this by working extensively with key partners to implement schemes that improve water quality. We will continue to build these relationships and help implement best practices for nutrient management with the aim of addressing challenges such as nitrate leaching.

In AMP7, our Catchment team are undertaking a series of extensive engagements as a part of our WINEP commitments to address risk to Drinking Water Protected Areas for groundwater resources. This includes extensive farmer engagement in relation to nitrates, as shown in Table 3.

4.1.5 Eel screens and passes

When abstracting water from a surface waterbody, there is a risk that freshwater fish and eels can be drawn in, potentially harming them or affecting their natural efforts for migration. In addition to this, manmade barriers on watercourses such as intakes and weirs can affect migratory efforts.

Under our obligations under the Eels (England and Wales) Regulations 2009, we continue to implement eel screens and passes to mitigate the impacts of intakes and structural barriers.

In AMP7, we have completed implementation of all eel screens except for the screening for Duston Mill Intake and refurbishment of fish and eel pass at Cloves Bridge. The fish and eel pass / bypass on Bucklesham tilting gate will be completed in AMP8. The detail of the schemes is shown in Table 4.

Table 4 Fish and eel screen and passes implement for WINEP AMP7

	Surface water intake / barrier	River	Objective
Screens	Screening for Tinwell intake	River Welland	Screen the intake to prevent eel entrainment whilst also delivering protection for fish populations and the water environment.
	Screening for Duston Mill Intake	River Nene	
	Screening of Clapham intake	River Great Ouse	
	Screening of Bucklesham intake	Mill River	
Passes	Fish and eel pass / bypass on Bucklesham tilting gate	Mill River	Provide eel passage at obstruction - investigation launched following natural breach of the river.
	Refurbishment of fish and eel pass at Cloves Bridge	Great Eau	Improve the design and efficiency of the installed eel pass.

4.2 AMP7 Investigations

4.2.1 Flow investigations

In AMP7, we are delivering a series of further investigations and appraisal for options to be implemented in AMP8. The Environment Agency identified several waterbodies to investigate due to the potential risk from abstraction pressures on flow:

- Stiffkey
- Glaven
- Wensum
- Broadlands
- Waveney and East Suffolk chalk and crag (River Gipping)
- North Essex chalk (River Colne and River Pant)
- River Brett
- Skerne Magnesium Limestone (Hartlepool Water region)

Modelling and optioneering

Any adverse effects on river ecology could compromise the Water Framework Directive objectives for waterbodies to achieve 'Good Ecological Status' by 2027 and for there to be 'No deterioration' in Status. Sufficient flow is a supporting element to a waterbody achieving 'Good' WFD status. Whether flow is sufficient in a river is initially assessed by comparison of the flows against the Environmental Flow Indicator (EFI). The EFI indicates the proportion of natural flows that are required to support the environment in any given waterbody.

Groundwater modelling was initially undertaken to quantify abstraction impacts and flow deficits relative to the EFI. This informed the development of a long list of potential options, alongside a review of available data (e.g. previous Anglian Water and Environment Agency reports). In addition to this, site walkover surveys were undertaken to obtain local information (such as natural features and extent of channel modifications in reaches) and identify potential river restoration techniques focussed on restoring flow diversity.

Options typically fall into the following categories (or combinations of these):

- Capping of abstraction licence quantities
- Abstraction reduction
- Relocation of abstraction sources
- River support
- River restoration

Option appraisal approach

The potential long list was consulted on with the Environment Agency, with the final long list being subject to Multi-Criteria Assessment (MCA) to generate the options short list taken forward to Cost Benefit Analysis. The MCA process considers three main categories of criteria:

- **Feasibility and Risk** - If options are not technically feasible, will cause a deterioration or fail to deliver significant benefit, then they can be screened out immediately.
- **Performance against environmental outcomes** - This focuses on the specific aspect of the options' performance in terms of the drivers that prevent (or are at risk of preventing) the site achieving Good Ecological Status.
- **Wider socio-environmental considerations** - Effects on wider socio-environmental factors such as long-term carbon footprint, flooding (surface water and groundwater) and water quality in receiving waters and downstream water bodies are also scored.

The highest scoring options were carried through to a short list, agreed between Anglian Water and the Environment Agency. PR24 WINEP guidance[10] required that options identified to mitigate the effects of abstraction-related low flows (in order to improve ecological status) should be carried forward "where they are expected to be cost-beneficial".

Cost benefit analysis was carried out on all short-listed options, whereby capital, operational and maintenance costs were compared against environmental benefits using the Environment Agency's Water Appraisal Guidance (WAG, 2016) and the latest National Water Environment Benefit Survey unit values. Note that this is separate to the catchment wide cost benefit analysis carried out by the Environment Agency when setting the RBMP objectives. Once total costs and benefits of the options have been estimated in present terms, benefit-cost ratios were calculated.

10 Environment Agency, PR24 WINEP driver guidance- Water Resources (hydrological regime)

Preferred options

After the options appraisal process, a list of preferred options for each site was compiled and submitted to the Environment Agency by the deadline of May 2022. The reports include technical notes describing the Multi Criteria Analysis and Cost Benefit Analysis processes, and information and evidence for the selected options. The preferred options are shown in Table 5.

Table 5 Preferred options for WINEP AMP7 investigations

Investigation	Option type	Option description
River Stiffkey	River Support (using existing source)	Refine our groundwater source at Houghton St Giles to increase operation of river support. This will remain within licence limits.
River Gipping	River Restoration	An optimised combination of river restoration options on two reaches of the river. Reaches considered most effective in mitigating impacts from abstraction in this waterbody.
River Colne	River Support (using existing source) & River Restoration	River support from Great Yeldham (at current daily licenced quantity) and river restoration.
River Pant	River Support (using existing source)	Modification of Ely Ouse to Essex Transfer Scheme (EOETS) operation to provide additional support to the Pant when licence constraints allow in-combination with the use of aggregate group licensed headroom on top of recent actual abstraction quantities to provide additional flow support from AWS Hawkspur Green (3 Ml/d) when EOETS additional input is not available.
River Brett	River Support (using existing source)	River support from a combination of three licences - Lavenham (EA), Semer (Anglian Water) and Shelley (Affinity Water).
Skerne Magnesium Limestone (Hartlepool Water region)	n/a	The groundwater modelling results indicate that most of the water bodies in the Skerne are compliant with WFD low flow screening thresholds. It was agreed that a full options appraisal is not required for the Skerne catchment water bodies.

4.2.2 INNS investigations

The transfer of raw water from one location to another creates a high risk of transfer of INNS. In AMP7 we investigated the risk of potential pathways of introduction and spread of INNS via existing raw water transfers. The investigation involved a description of each raw water transfer, identification and prioritisation of the risks of spread or introduction of INNS resulting from the transfer operation(s) and a review of opportunities & measures to reduce risk within the water transfer.

In addition to the raw water transfer investigations, we carried out an investigation and risk assessment of the pathways of spread for all activities (including recreational activities) which could result in the transfer of invasive species. The investigation involved the identification of pathways by which invasive species may be spread, the risk of spread occurring, and the prioritisation of sites based on risk. Biosecurity plans were then produced for the high-risk sites which outlined measures to reduce the risk of invasive species spread.

4.2.3 Eel investigations

In AMP7 we investigated how to improve access and escapement of eels in three reservoirs: Alton Water, Ardleigh and Rutland Water.

A workshop identified several options, including installation of mechanical eel passes, trap and transport and changing operating regimes at the reservoirs. Subsequent discussions with the Environment Agency determined that the preferred option involves the use of conventional spillways as a route for access and egress of eels. Unlike Alton and Ardleigh Reservoirs, Rutland Water does not have a conventional channel-type spillway, instead having a vertical shaft spillway. Therefore, the primary focus of the investigation was on Alton Water and Ardleigh Reservoirs.

The investigation produced a high-level design and cost breakdown for an option to improve access and subsequent escapement from Alton and Ardleigh reservoirs. The solution is based on the use of the spill way channel as a connection route between the reservoir and the downstream watercourse. The investigation explored suitable substrates which could be used within the channel to facilitate the movement of eels. It also produced a cost summary of an alternative trap and transport option, both of which will be taken forward for consideration in PR24.

4.2.4 Groundwater investigations

In AMP7 we carried out three groundwater investigations at the following Water Recycling Centres (WRCs): Upper Sundon WRC (Upper Bedford Ouse Catchment), West Acre WRC (North West Norfolk Catchment) and Methwold WRC (Cam & Ely Ouse Catchment). All three sites discharge treated final effluent to groundwater and the investigation gathered data to better understand the risk to groundwater from the water recycling discharge.

To achieve the objectives of the investigation, a programme of groundwater and final effluent water quality sampling was carried out at each site over a period of 6 months. Concentrations of water quality parameters and presence of hazardous substances within each sample was assessed. In addition, the investigation reviewed the current effluent and groundwater sampling methodologies and provided recommendations for improvement. Groundwater levels were monitored, and a review of the current water recycling treatment process was carried out for each site.

5 Changes to abstraction licences

5.1 Sustainability reductions

In AMP6, groundwater modelling confirmed a number of our abstractions were impacting on WFD flow non-compliance.

Table 6 Sustainability reductions for Anglian Water in AMP7 for licences under the RSA programme

Licence	Solution
Bury / Rushbrooke	Significantly tighter Hands-Off Flow (HOF) on River Lark
Marham	Significantly tighter Hands-Off Flow (HOF) on River Nar - Cessation of Marham surface water abstraction at current location (possible relocation)- capped in AMP7 to average (3840 Ml/year average upfront permitted cap)
Elkesley	6 Ml/d reduction to Elkesley licence (redistributed to three other licences- Grove, Retford and Everton)- yearly cap 4719.45 Ml/yr.
Raydon	Anticipated cessation of Raydon abstraction
High Oak	Cap to average use (and river support provision)
Wixoe	Closure of Wixoe source (possible source relocation)
Northern Chalk (Barton, Barrow, Barnoldby, Little London, Healing, Little Coates, Weelsby, Tetney, Harbrough, Ulceby, Goxhill 1, Goxhill 2, Thornton and Fulstow)	Upfront permitted to max peak
Slea schemes (Kirby La Thorpe, Drove Lane and Clay Hill)	Adoption of an EA borehole with capping to come for Drove Lane and Clay Hill and already upfront permitted for Kirby La Thorpe

Under the Environment Agency's Restoring Sustainable Abstraction (RSA) programme, these abstractions will be reduced or closed. Launched in 2008, the RSA programme has been investigating abstraction licences that are known to be environmentally impactful and agreeing licence reductions with Water Companies as part of WINEP obligations. In Table 6 are details of the abstractions that will be impacted by RSA sustainability reductions in AMP7.

5.2 Habitats Directive

Under the Habitats Directive (see section 4.1.3), the following sources in Norfolk will be closed in AMP7 (as shown in Table 7 below):

Table 7 Abstraction closures AMP7 for licences under Habitats Directive

Licence	Solution
Ludham	Closure in 2021
East Ruston	Closure in 2023
Witton	Closure in 2023

For AMP8, following the outcome of the recent Judicial Review the Environment Agency must extend their investigation into the effects of abstraction on the Ant Broads and Marshes SSSI, to all other parts of The Broads SAC. This has put several licences at risk of requiring sustainability changes to meet the requirements of the Habitats Directive. The extended investigation is ongoing.

5.3 WFD 'No Deterioration'

The Water Framework Directive requires the prevention of deterioration of surface water and groundwater body status from the Environment Agency's 2022 River Basin Management Plan classifications. As such, we are obligated to ensure that deterioration of the environment does not occur because of public water supply abstraction (where it is technically feasible or does not incur disproportionate cost).

Through collaboration with the Environment Agency, a series of abstractions and the risk they pose to waterbodies were assessed over the course of AMP6 and AMP7 (to date), factoring in future predicted growth in demand. Investigations in AMP7 have typically focused on sources that have not been previously investigated, where environmental impacts are less well known.

In WRMP19, Anglian Water planned to cap all relevant groundwater licences to Maximum Peak (also referred to as Historic Max) in AMP7. This brought significant challenges for water resources planning and our ability to supply our customers, as nearly 60% of our groundwater abstraction licences are time-limited, with a high proportion of these renewed in December 2022 or currently being in the process of renewal. At WRMP24, we have accounted for the most recent guidance and evidence (as explained below) to help determine our approach to managing deterioration from our abstractions.

Licences and capping

Time-limited licence-a licence that has a specified expiry date. Unsustainable abstraction can be addressed at the point of expiry / licence renewal.

Permanent licence- a licence that does not have an expiry date. Unsustainable abstraction can be addressed through statutory processes.

Maximum Peak licence cap- capping abstraction to the maximum volume of water abstracted in any one year during a historical representative period of abstraction.

Recent Actual Average licence cap- capping abstraction to the total volume of water abstracted during the representative recent actual period divided by the number of years in that period.

In 2021, new supplementary guidance was published by the Environment Agency, highlighting actions required to prevent the risk of deterioration[11]. Detailing the methodology to assess risk, it states the actions that will need to be taken where abstractions are categorised by low, moderate and high risk (determined by the impact of recent actual, fully licenced and future predicted abstraction on environmental flows).

Most notably, groundwater abstractions categorised as moderate risk will be capped to Maximum Peak and abstractions categorised as high risk will be capped to Recent Actual Average. We expect a significant proportion of our abstractions to be categorised as moderate and high risk and this brings challenges on how caps to licences are realised whilst ensuring we maintain a secure supply of water to our customers.

We are in a unique position in comparison to the rest of the water industry as we have a very high proportion of time-limited licences, and capping to Recent Actual Average would result in potentially unresolvable deficits in our supply in AMP8 and AMP9 (due to a lack of short-term supply-side options).

Furthermore, additional challenges have arisen since WRMP19 in the form of increase in demand from COVID-19, delivery risks following political and economic impacts on supply chains and a better understanding of localised deficits and operational capacity of our supply system.

11 Environment Agency, Water resources planning guideline supplementary guidance - actions required to prevent deterioration, November 2021

Given these challenges, we will continue to work with the Environment Agency on the best means to deliver capping for preventing risk of deterioration. In WRMP24, we have modelled a series of scenarios to test if we can deliver caps to licences by different target dates (2022-2024, 2025, 2030 or 2036) whilst resolving deficits in our region.

The dates used for the licence reduction scenarios are linked to the delivery of solutions. The 2030 date is the earliest we could deliver any of the supply options and 2036 is the earliest the Strategic Resource Options would be available.

The following represents the different capping scenarios for groundwater abstractions. We have modelled all of these scenarios as part of our decision making (seeTable 8 below).

Part of the process of developing scenario 8 has been adjusting the initial most likely scenario to maximise best value planning objectives.

Table 8 Scenarios tested in WRMP24 for capping trajectories

	Year for capping to Maximum Peak		Year for capping to Recent Actual Average	
Licence Cap Scenario	Time-limited licences	All other Licences	Time-limited licence	All other licences (e.g. permanent)
1	-	-	2022-2024	2025
2	2022-2024	-	2025	2025
3	2022-2024	-	2025	2030
4	2022-2024	2025	2030	2036
5	2022-2024	2025	2036	2036
6	-	-	2022-2024	2030
7	2022-2024	2025	2030	2032
8	2022-2024	2025	2030	2030-2036

Scenarios 1, 2, 3 and 6 result in residual supply demand deficits as there are insufficient supply-side options available early in the planning period. Our WRMP24 must maintain the supply demand balance without any final planning deficits, therefore licence capping scenarios 1, 2, 3 and 6 have been excluded from further analysis as they are unfeasible.

We have selected scenario 8 to be included in our most likely scenario as this is more ambitious than scenario 5. Scenario 8, referred to as our preferred most likely scenario, was developed for our WRMP24, this built off scenario 4 (as used for the draft WRMP24) and includes:

- Draft final regional plan
- Feedback from Stakeholders, customers, regulators and within our business
- Alignment with neighbouring water company plans

Surface water abstractions do not pose a significant deterioration risk due to existing licence constraints such as Hands-Off Flow (HOF) and Minimum Residual Flow (MRF) conditions and hence no sustainability changes related to WFD No Deterioration are expected.

In addition, it is not accepted that the changes in the amount of water that can be abstracted between scenario 6 and the other feasible scenarios necessarily causes deterioration or presents a risk of that nor that the use of scenarios other than 6 automatically gives rise to the need for OPI. However even if OPI is required in order to amend or alter licences our policy decision modelling shows that OPI would be satisfied.

5.4 Impact on Supply Forecast

The impact of changes to licences (as a result of the drivers in previous sections) on deployable output is explained in more detail in the WRMP24 main document, and the WRMP24 Supply forecast technical supporting document. Supply-side options to maintain a supply-demand balance are set out in the WRMP24 Supply-side option development technical supporting document.

6 Environmental Destination

6.1 Introduction

Since the development of WRMP19 there has been a step-change in national ambition with regards to the environment, as illustrated by the 25-Year Environment Plan and the Government commitment to be the first generation to leave the environment in a better state than we found it[12]. More specifically to delivering sustainable abstraction, the Environment Agency produced its National Framework for Water Resources in 2020[13].

The National Framework articulates a vision for regional groups to come together to facilitate a multi-sector approach to water resources planning and to ensure resilient supplies of water and the needs of the environment under an uncertain future.

The East of England contains many important environmental and biodiversity sites, including SSSIs, Ramsar Sites and the only water-based National Park, The Broads. These include some of the most important wetland and river systems in Britain including some, like the River Wensum and the Broads, which are of international significance. The concept of environmental destination aims to define a long-term vision for the environment, most notably for reducing the impact of abstraction on environmental flows to facilitate restoring, protecting and enhancing waterbodies. Objectives in the National Framework include reducing reliance on low flows, evidencing where the largest abstraction recovery might be required and aiming to compare the costs and benefits of reducing abstraction and building the strategic solutions that enable this.

From previous planning periods to today, there have been a series of plans and mechanisms by which Anglian Water and the water industry has delivered significant changes to abstraction through large investment, such as:

- River Basin Management Plans - flows to support Good Ecological Status under the Water Framework Directive and for there to be 'No deterioration' in Status
- Water Abstraction Plan and Restoring Sustainable Abstraction programme
- Water Industry National Environment Programme

Although a breadth of investigations and implementation schemes have been conducted, many waterbodies still attribute flow impacts on WFD classifying elements as a Reasons for Not Achieving Good status. Previous investigations have focused on changes to abstraction to improve flow rather than strategic solutions (leaving more water in the environment often requires a new source to maintain supply), non-cost beneficial outcomes, little account for climate change risk and an absence of a long-term destination.

By defining a long-term approach to sustainable abstraction, WRMPs and Regional Plans have for this round of plans used a top-down approach to inform adaptive plans that aim to achieve sustainable abstraction in our region and facilitate key discussions on deliverability and affordability.

In October 2020, the Environment Agency shared guidance on environmental destination[14] for regional groups and water companies, it highlighted that regional groups are responsible for proposing the shared long-term environmental destination for water resources to 2050 and included the following recommendations:

- Use the scenarios from the National Framework as a start and review them in order to explore different levels of environmental protection.
- Use scenarios to identify catchments that are at risk of not meeting environmental objectives in the future due to abstraction pressure.
- Engage with stakeholders, including water companies, other abstractors, regulators and environmental NGOs to identify abstraction pressures.
- Develop a proposal for the long-term environmental destination to be included in regional plans.
- Test proposed long-term destination with regulators and agree abstraction changes that will need to be included in plans.

12 Defra, 25 Year Environment Plan, January 2018.
13 Environment Agency, Meeting our future water needs: a national framework for water resources, March 2020.
14 Environment Agency, Long-term water resources environmental destination, October 2020.

We are a member of Water Resources East (WRE), the regional group that represents the East of England and facilitates the regional planning process by bringing together water companies, agriculture, other major abstractors and interested stakeholders. WRE is tasked with producing a multi-sector plan for water resources by co-creating it in collaboration with over 200 members.

As a water company and largest abstractor in the region, we have ensured that our plan aligns with the regional plan and have accounted for the environmental destination. Regional planning at WRE - led by the Environment Task and Finish group - have facilitated analyses on scenarios for the environmental destination, taking a multi-sector approach to analysing sustainable abstraction.

6.2 Scenarios

As part of the National Framework, the Environment Agency initially communicated a series of environmental destination scenarios[15] that showed how much abstraction would need to reduce by in order to return water to sensitive environments. Across lower and upper scenarios with different objectives, it estimated for all sectors across the entire East of England, abstraction would need to reduce by between 269 Ml/d and 567 Ml/d.

WRE's Environment Task and Finish group has undertaken further work on scenarios to refine the objectives so that they align with the national regulatory view of environmental destination, as well as locally verify abstractions and waterbodies to ensure the needs of the environment is accounted for as accurately as possible within the limitations of the methodology adopted for this round of plans.

The methodology used by WRE has been to model environmental destination scenarios using the Environment Agency's Waterbody Abstraction Tool to estimate the future deficits in each waterbody by 2050, whilst considering the impact of climate change[16]. In summary, the following steps are taken for each scenario:

- Establish the licence baseline as a starting point (groundwater often capped to Maximum Peak or Recent Actual Average, as well as other reductions in AMP7 e.g. WINEP)
- Establish the required environmental flows in waterbodies to support a healthy ecology (based on the Environmental Flow Indicator)
- Determine the impact of fully licenced abstraction on flows
- Derive the necessary licence changes to achieve sustainable abstraction in each scenario
- Apportion reductions proportionately across sectors (each sector accounting for their fair share)

The scenarios produced through the WRE Environment Task & Finish group have apportioned reductions proportionately across sectors, with both water companies and agricultural abstractions accounting for most of the deficit in our region. The scenarios represented in our WRMP are:

15 Environment Agency, Long-term water resources environmental destination - Appendix 4: Longer term environmental water needs, March 2020
16 Refer to WRE's Regional Plan for more information on the technical methodology for environmental destination.

Table 9 Environmental Destination scenarios used in WRMP

Business as usual (BAU)	Business as usual plus (BAU+)	Enhanced
Achieving flows to support 'Good Ecological Status' under the Water Framework Directive (WFD)	Achieving flows to support 'Good Ecological Status' under the Water Framework Directive (WFD)	Achieving flows to support 'Good Ecological Status' under the Water Framework Directive (WFD)
Excluding uneconomic waterbodies*	Excluding uneconomic waterbodies*	Including uneconomic waterbodies*
	Further protections for European Protected Sites (riverine & GWDTE)	Further protections for European Protected Sites (riverine & GWDTE)
		Further protections for chalk streams, sensitive headwaters and SSSIs.

**These waterbodies are assessed by the Environment Agency's Abstraction Plan by 2027 as uneconomic to recover.*

It should be noted that the BAU+ scenario meets the requirements of the guidance from the Environment Agency regarding the 'most likely' scenario used for our WRMP[17]. The BAU and Enhanced scenarios are consistent with the requirements of Ofwat's Common Reference Scenarios for Environmental Destination.

17 Ofwat, PR24 and beyond: Final guidance on long-term delivery strategies, April 2022

6.3 Licence impacts

In order to determine the extent of licence impacts, licence data from the Environment Agency's Waterbody Abstraction Tool has been used to derive the sustainability reductions needed to remove the deficit from the EFI at Q95 (believed to be the most harmful to aquatic ecology) by 2050 in all waterbodies across the WRE region.

The results of this, for Anglian Water, are shown in Table 10.

Table 10 Licence impacts of Environmental Destination scenarios for Anglian Water

	BAU	BAU+	Enhanced
Deployable Output of licence reductions (Ml/d) - Anglian Water	-180	-241	-368
Returns to environment in an average year (Ml/d) - Anglian Water **(Indicative - based on Future Predicted Abstraction)**	-90	-157	-287

Approximately 90% of our Environmental Destination abstraction reductions are groundwater, which is considered to be the main cause of deterioration to flow in our region. Many of our surface water abstractions do not pose a significant risk to environmental flows due to existing licence constraints such as Hands-Off Flow and Minimum Residual Flow. Figure 6 shows that key hotspots in our region are on the eastern side of our supply in the Norfolk catchments, Cam and Ely Ouse, Essex and East Suffolk, as well as some sensitivity in Lincolnshire. The impact of changes to licences on deployable output (as a result of environmental destination) is explained in more detail in the WRMP24 main document, and the WRMP24 Supply forecast technical supporting document.

Figure 6 Key hotspots by operational catchment for Environmental Destination (BAU+ scenario) for Anglian Water

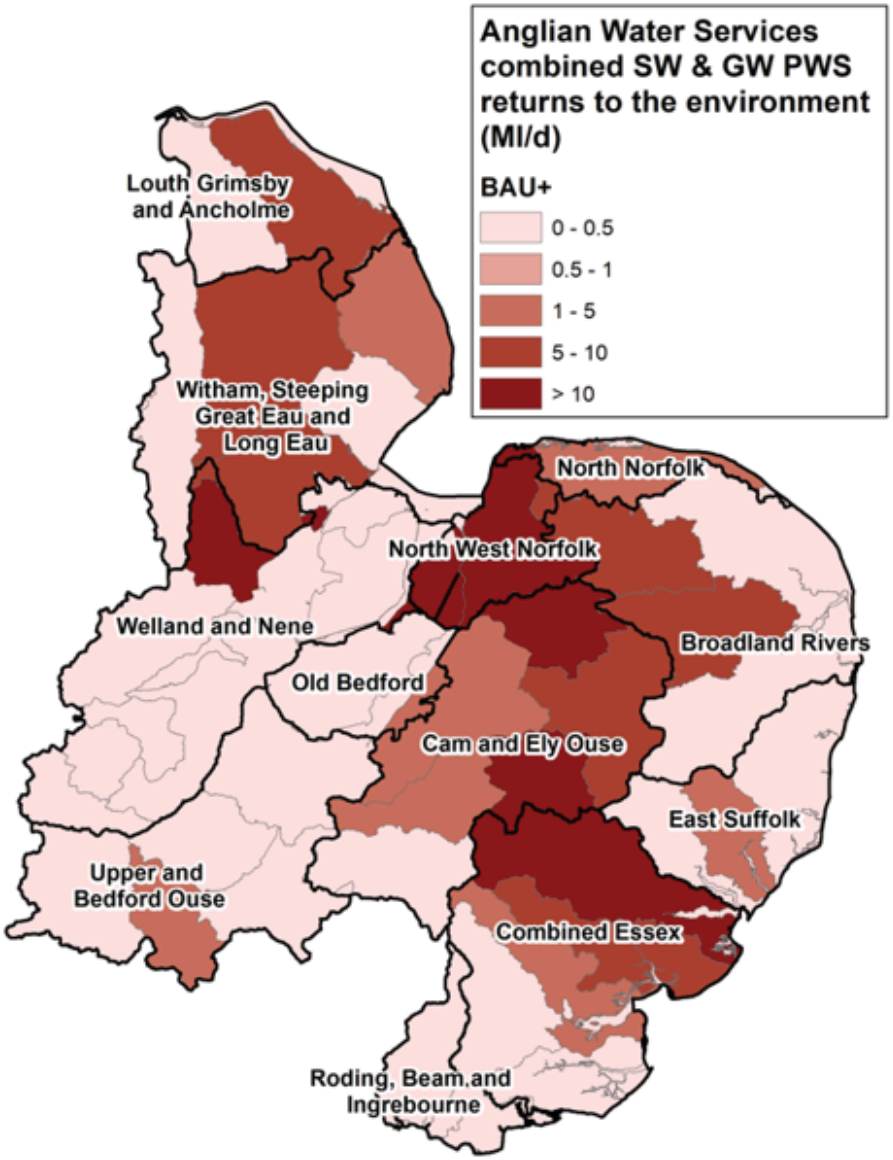


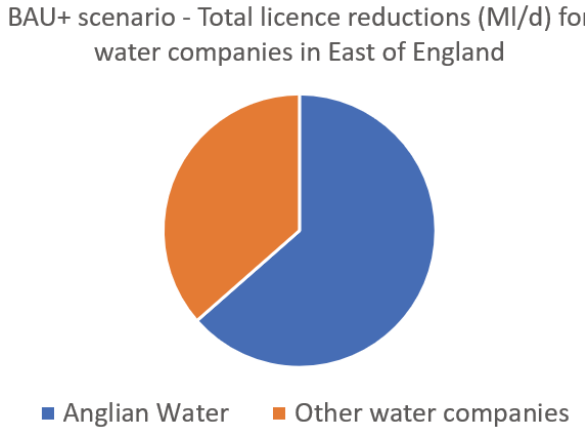
Table 11 shows the impact environmental destination on all water companies in WRE.

Table 11 Licence impacts of Environmental Destination scenarios for water companies in East of England (falling under Water Resources East)

	BAU	BAU+	Enhanced
Licence reductions (Ml/d) - All water companies in the East of England	-265	-337	-640
Returns to environment in an average year (Ml/d) - All water companies in the East of England **(Indicative - based on Future Predicted Abstraction)**	-233	-289	-452

In terms of all water companies in the East of England that fall under WRE (Anglian Water, Cambridge Water, Essex & Suffolk Water and Affinity Water), Anglian Water accounts for approximately two thirds of licence reductions under a BAU+ scenario, as shown in Figure 7.

Figure 7 Anglian Water's proportion of licence reductions compared to all water companies in the East of England (falling under Water Resources East)



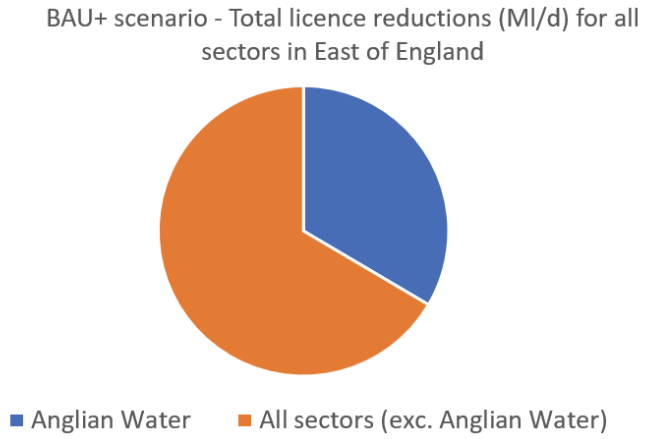
Across all sectors, water companies account for approximately 60-70% of licence reductions, as shown in Table 12.

Table 12 Licence impacts of Environmental Destination scenarios for all sectors in East of England (falling under Water Resources East)

	BAU	BAU+	Enhanced
Licence reductions (Ml/d) - All sectors in the East of England	-480	-666	-1,262
Returns to environment in an average year (Ml/d) - All sectors in the East of England **(Indicative - based on Future Predicted Abstraction)**	-342	-408	-766

When looking at all abstractors in the region, Anglian Water accounts for approximately one third of licence reductions under a BAU+ scenario as shown in Figure 8.

Figure 8 Anglian Water's proportion of licence reductions compared to all sectors in the East of England (falling under Water Resources East)



As the largest single abstractor in the region, this is expected to be the case. We are committed to continue working with other abstractors in the region through WRE to understand how an integrated approach to water management can both secure the provisions of water for all sectors, as well as ensure the needs of the environment are considered through adequate protection of flows.

6.4 Timing of Environmental Destination

Further guidance[18] suggests that we should look to investigate the timing of our environmental destination and identify short, medium and long term priorities. Key priorities could be certain rivers or Groundwater Dependent Terrestrial Ecosystems (e.g. wetlands) that are environmentally sensitive, possess important environmental features or have protected status. Given this, these are water-dependent sites that require further protection from abstraction and the uncertain impact of climate change in the future. In our region, we are fortunate to have important environmental features such as:

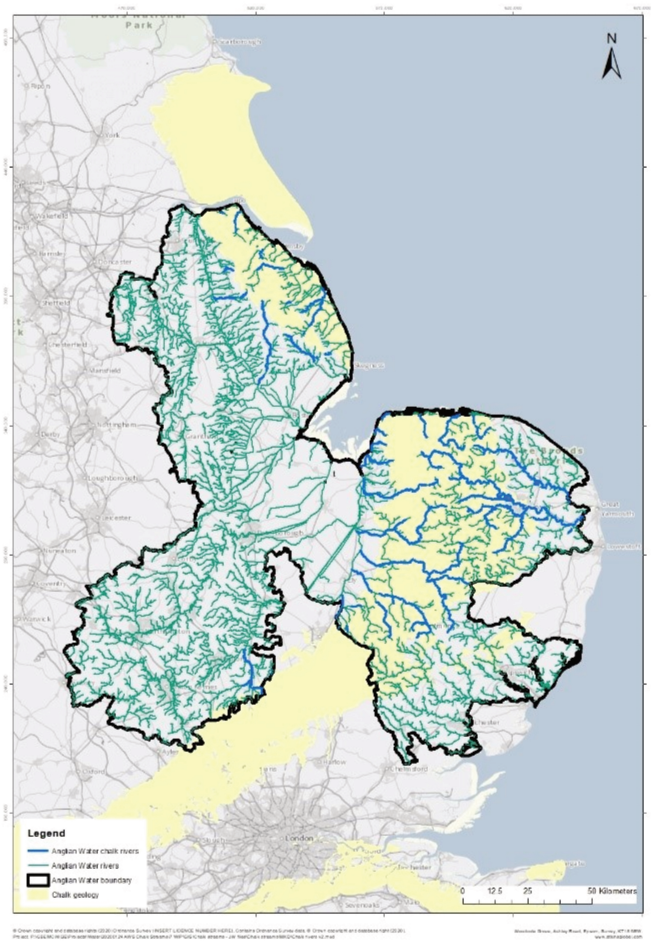
- Chalk streams
- Long reaches of rivers with special protections, such as the River Wensum and the River Nar
- Special wetlands with protections under the Ramsar Convention
- Many Sites of SSSIs, SACs, and Special Protected Areas (SPAs) such as marshes, meadows, fens, lakes and woods
- Estuaries and coastal sites also with special protections

Furthermore, certain management catchments in our region:

- Are considered as stressed catchments, especially at low flows (Q95), with little water to be licensed
- Possess sensitive headwaters for river and streams that are groundwater-fed and considered to be over abstracted

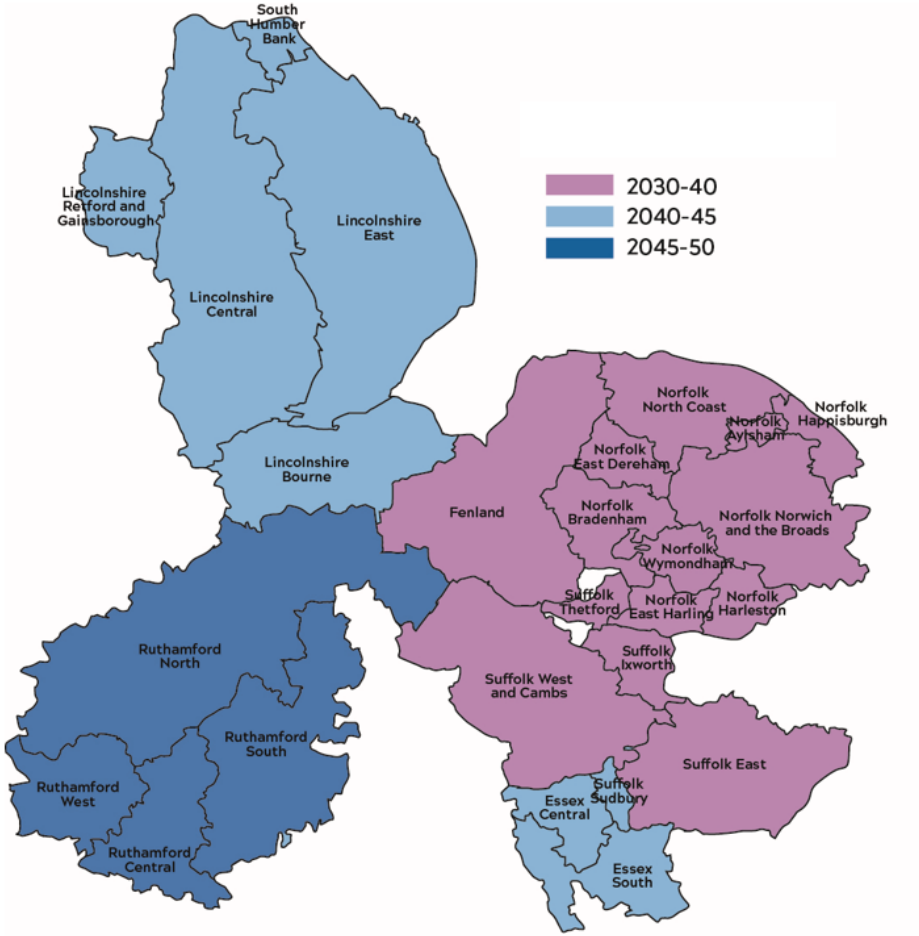
18 Environment Agency, Long-term water resources environmental destination- Appendix 4: Longer term environmental water needed, March 2020.

Picture 1 Map of the rivers and chalk rivers in the Anglian Water Region



For our modelling to develop plans using our Economics of Balancing Supply and Demand (EBSD) model (see our WRMP24 Decision making technical supporting document), we have tested different start dates and profiles for meeting environmental destination. These were tested in the EBSD model to investigate the earliest date at which reductions could start without causing any unresolvable deficit.

Figure 9 Prioritisation of WRZs for Environmental Destination reductions in the initial most likely scenario



We profiled environmental destination in EBSD by prioritising key Water Resource Zones (WRZs) that contain sources where reductions in abstractions have the potential to improve the environment in parts of our region that correspond to the criteria and environmental features identified above. We have used these to create a bespoke scenario referred to as our initial most likely scenario, which is used as the starting point for our modelling.

For the profiled scenarios we have prioritised Water Resource Zones that contain sources where reductions in abstractions have the potential to improve the environment in parts of our region. The batches of WRZs identified to establish priority are shown in Figure 9.

Please refer to the WRMP24 Decision making technical supporting document for further information.

7 Shaping WINEP AMP8 investigations

Having a series of environmental destination scenarios is starting to enable water companies, regulators and stakeholders to understand the types of interventions required to achieve varying degrees of sustainable abstractions. In our WRMP we have shown the type and scale of supply-side interventions and investments required to leave more water in the environment under different environmental destination scenarios. Whilst useful for long-term water resources planning, the scenarios, their deliverability and benefits remain highly uncertain due to the relatively simple technique by which they have been modelled to date. As a result, further investigations in AMP8 are required.

For PR24, there is a new WINEP driver termed 'Water Resources Regional Plan Long-term Environmental Destination'. This is reflective of the ambition set in the National Framework for environmental destination and the need for detailed investigations to define the locations, scale and benefits of changes to abstraction. Guidance[19] suggests it should be in in combination with other existing drivers under the Water Framework Directive:

- Hydrological regime
- Artificial and heavily modified waterbodies
- Groundwater
- Drinking water protected areas

Through the new tiered approach to the PR24 WINEP methodology, this driver has a tier 1 outcome of enabling the water company contribution to reducing abstraction to meet the outcomes of the regional plan. This AMP, we are working with WRE to shape a series of investigations to deliver early in AMP8 to improve our understanding and definition of environmental destination, with the following provisional aims and objectives.

Aims

- Determine the scale of sustainability reductions required to achieve the sustainable abstraction as defined by the environmental destination and Water Framework Directive.
- Inform the scale of deficits that will need to be considered for long-term water resources planning and the size and type of strategic solutions required to deliver the environmental destination. It is assumed that decisions relating to the costs and benefits of solutions will be incorporated into WRMP29 (2030-2055).

Objectives

Volumetric

- Achieve more volumetric certainty for sustainability reductions using detailed modelling (e.g. North-East Anglian Chalk regional model)
- Determine options for the timing and prioritisation of sustainability reductions, including the relative timing of WFD 'No-Deterioration' caps and environmental destination outcomes
- Understand the impact of other sectors on environmental deficits and work with non-PWS stakeholders on catchment abstraction planning (via WRE)

Environment

- Establish the scientific justification to return more water to the environment, where there are the greatest links between flow and ecology and where the greatest environmental benefit could be realised.
- Consider the potential impact of returning water on the historic environment, for which is defined, as per Historic England guidance, as all surviving physical remains of past human activity, whether visible, buried or submerged, and landscape and planted or managed flora[20].
- Understand if certain sites are more sensitive to climate change (e.g. wetlands and chalk streams) and also consider regulatory changes and critical drought pressures on these sites

19 Environment Agency, PR24 WINEP driver guidance -Water Resources Regional Plan Long-term Environmental Destination, 2022.
20 National Planning Policy Framework, Ministry of Housing, Communities & Local Government, 2019

- Determine if complementary catchment measures could help build environmental resilience (e.g. nature-based solutions and water-quality considerations)
- Consider alternative approaches to environmental improvement (e.g. approaches detailed in the CaBA Chalk Stream Restoration Strategy[21])

Other

- Identify any risk of perverse outcomes from significant reductions in abstraction, such as an increase in groundwater flood risk
- Identify several priority 'pilot' catchments to work with other parties to understand what is already happening, develop joint ideas, address uncertainties and make holistic plans for managing the environment to deliver the environmental destination
- Develop a clear understanding of the data needed to facilitate both local and regional cost-benefit analyses (e.g. understanding the data needed to conduct a cost-benefit analysis on a nature-based solution)
- Develop a regional and local view of the existing and planned environmental situation to allow further understanding for catchment prioritisation
- Develop a governance framework to understand how decisions relating to environmental destination will be made

Following the aims and objectives of the environmental destination investigations, we have had ongoing conversations with the Environment Agency and Natural England as to how we proceed with this work. In early 2023, a high-level scope of works was submitted in line with WINEP which detailed a strategic scale desk study at a regional scale, which will help us further understand our aims and facilitate the identification of pilot catchments. The strategic scale desk study will focus on:

- Groundwater and surface water modelling
- Hydroecological modelling
- Estuarine modelling
- Flood risk modelling

In addition to the strategic scale desk study, corresponding to the WRZs detailed in section 6.4, we aim to shape AMP8 investigations, prioritising high priority sources in our supply area. The results of these are expected to identify the catchments most at need and to identify where abstraction reductions, as well as further non-abstraction related activities such as river restoration are most likely to be effective. Furthermore, we will be working with WRE and associated governance groups to create a set of regional questions we aim to answer through these investigations and pilot catchments. This will ensure a multi-sector and holistic approach is used for the investigations.

Through this process, it will enable us to refine the environmental destination scenarios for WRMP29.

As our WRMP and environmental destination is helping to set a strategic direction to address the needs of the environment, the outputs will also feed into our Long-Term Delivery Strategy (LTDS), with AMP8 investigations being considered in our next business plan (for the 2024 Price Review that Ofwat will carry out for "our PR24 Business Plan").

21 CaBA Chalk Stream Restoration Group, Chalk Stream Restoration Strategy, 2021

8 Environmental Net Gain

Our WRMP possess a multitude of opportunities to deliver net-gain for the environment and to help deliver the goals set out by the 25-Year Environmental Plan and Environment Act. This is reinforced by our most recent commitment to Get River Positive by 2030. In partnership with Severn Trent, we will work collaboratively to drive real action and make the changes we all want to see for a better future for our rivers and environment. Most notably, our WINEP programme and work on environmental destination aims to realise these outcomes for the environment and mobilise investment to deliver them. In addition to these, our WRMP contains a series of further opportunities to help deliver environmental net gain.

8.1 Reservoirs - RAPID Strategic Resource Options (SROs)

In November 2022, we published our Gate 2 report for our three Strategic Resource Options (SROs) - The Lincolnshire Reservoir, the Fens Reservoir and the Anglian to Affinity Transfer. These SROs fall under the Regulators' Alliance for Progressing Infrastructure Development (RAPID), a regulatory alliance between the Environment Agency, Ofwat and the Drinking Water Inspectorate, tasked to help accelerate the development of new water infrastructure and design future regulatory frameworks. Following a gated process, we will be submitting our Gate 3 report for the two progressed SROs (Lincolnshire Reservoir and Fens Reservoir) in 2025, detailing further work on the associated infrastructure for the reservoirs and master-planning of the reservoir sites.

As we progress further through the gated process, the principles of environmental net gain and wider societal benefit will be central to the design and delivery of our SROs. Through careful planning and design, reservoirs have the potential to deliver the following benefits:

- **Gains in biodiversity** - under the Environment Act (2021), these sites will result in a minimum gain in biodiversity by 10%. In addition to this, reservoirs provide opportunities for wetland creation as a complementary asset, promoting ecological benefits and contributing to the restoration of the wetland landscape. Furthermore, features such as floating islands could provide a measurable increase towards habitat potential with the creation of terrestrial and aquatic habitats for species such as birds and invertebrates to thrive in.
  Species rich wildflower creation and shrub planting on the reservoir embankments could be introduced as well. Adjacent to the reservoir, there may be opportunities for wetland habitat creation and establishment of new hedgerows, scrub and woodland. This could help connect existing woodland links and enhance natural wildlife corridors of the landscape. Lastly, we are also considering potential opportunities to improve the existing habitats along pipeline routes through post construction remediation and replacement of low value habitats for those with greater value.
- **Recreation and amenity** - water stored in a reservoir can facilitate water-oriented activities (i.e. water sports and fishing), while the wider reservoir site, largely due to its proximity to water, can provide an attractive place to undertake recreational activities. Enhanced access and connectivity through the provision of footpaths, cycle paths and nature trails to both wetlands and the wider reservoir development could provide positive opportunities for the local community and other visitors. Where possible footpaths, cycle paths and nature trails could connect to and extend the existing Public Right of Way (PRoW) network. Visitor Centres or outdoor recreation hubs could serve as a multi-use venue, providing recreational activities, school visits, corporate workshops and a wider community hub.
- **Flood risk management** - through careful design, there are a variety of mechanisms that present opportunities to manage flood risk. This could be achieved by the creation and utilisation of Flood Storage Areas (FSAs), implemented by the widening of channels, creation of new channels, the diversion of water to onsite storage capacity and leveraging nature-based solutions by addressing connectivity to adjacent habitats.
- **Supply management** - we are currently exploring options to share water with other sectors to provide them with supply benefits that mitigate the risk of poor water availability through seasonal fluctuations. This could indirectly reduce the need for abstraction on waterbodies that have a risk of deterioration at times of dry weather and low flows.

8.2 Biodiversity net-gain

We fully support the introduction of a mandatory requirement for BNG for all development proposals which require planning permission under the Town and Country Planning Act (1990), as set out by the recent Environment Act (2021). This introduces a minimum 10% gain whilst habitats are secured for at least 30 years through mechanisms such as conservation covenants. There will be potential to deliver net gain on-site, off-site or through the use of biodiversity credit schemes. The Wendling Beck Environment Project (being delivered in partnership with Norfolk Rivers Trust, Norfolk Wildlife Trust, Norfolk FWAG, Norfolk County Council, The Nature Conservancy and Anglian Water) is an exciting and ambitious example of a ground-breaking approach to conservation and land management in England and will be one of Natural England's BNG Credit Scheme pilots for local developers and planning authorities, providing an opportunity to meet BNG requirements through the purchase of biodiversity units[22].

8.3 Nature-based solutions

Whilst there are numerous challenges that will typically require significant investment in grey infrastructure, we are also committed to exploring the benefits of nature-based solutions (NbS). If deployed effectively, NbS can help solve societal challenges by managing natural processes and restoring important ecosystems, ultimately resulting in positive outcomes for biodiversity.

In terms of the water resources challenges we face, NbS at varying scales in catchments could help offset the impact of abstraction or improve the drought resilience of our abstractions by combatting harmful nutrients in the environment. Stacking multiple outcomes for both the environment and societal challenges can help improve the business case for the deployment of NbS.

We are a partner of the Norfolk Water Strategy Programme (NWSP), alongside Water Resources East, Norfolk County Council and The Nature Conservancy. Norfolk is experiencing growing pressures as a result of water security challenges such as water resources and water quality. The NWSP aims to scale up investment into NbS by investigating their efficacy and how different types can be combined in an investible portfolio. It is hoped that a compelling business case for NbS can demonstrate how investment in the water sector can be less output-driven through grey infrastructure and more outcomes-based through more cost-effective solutions and better environmental outcomes.

Lastly, the NWSP aims to launch a blended investment vehicle, known as the 'Norfolk Water Fund'. A Water Fund can provide the legal and governance framework for blending investment from multiple sources of funding that could typically arise from public, philanthropic and private sources. There is a consensus that nature is underfunded and given this, existing forms of investment are unlikely to achieve the UK's environmental ambitions set out in the Environment Act (2021). Therefore, through the Water Fund we aim to stimulate wider forms of partnership funding in combination with our existing investment mechanisms for the environment, such as the WINEP.

In our WRMP, we have ensured that all supply-side options have undergone assessment (see WRMP24 environmental assessments) using Natural England's Biodiversity Metric tool, enabling the quantification of losses of habitat units across different portfolios of options, as well as the required units to achieve 10% net gain. These are costed and considered in our option costs, as well as aggregated across different plans in our WRMP to identify plans that are considered to be best value and best for environment (please refer to our WRMP24 Decision making technical supporting document). We understand that under the mitigation hierarchy for environmental impact assessment, it is important to 'Avoid' any impacts to the environment first where reasonably possible, before deciding to offset.

8.4 Northern Chalk case study

Parts of our supply area in North Lincolnshire can experience flooding at certain times of the year due to high groundwater levels, most notably, parts of Grimsby. Previously, all known sustainability reductions to our abstraction licences, including caps to Maximum Peak, were modelled and incorporated into WRMP19. This approach to licence reductions was previously agreed with the Environment Agency and conducted with the best-known information at that time. Since then, we have continued to develop our understanding of the environmental impact of these abstractions by working with the Environment Agency by using their detailed groundwater models. Within our WRMP24, we will be including the future Environment Agency capping to Recent Actual and the related

22 The Wendling Beck Environment Project, www.wendlingbeck.org.

capping to the BAU+ environmental destination scenario which will likely increase the risk of flooding. Given this, the potential benefit of defining rates of abstraction to mitigate flood risk was investigated.

The North Lincolnshire Chalk groundwater sources are controlled by a key group of licences that have changed as a result of modelling many scenarios looking at a variety of abstraction thresholds that cover flood risk, environmental flows, saline intrusion and risk of deterioration to Tetney Blow Wells SSSI. In July 2021 after discussion with the Environment Agency, new abstraction quantities were defined (within existing licence levels). Agreed licence quantities for thirteen licences on the North Lincolnshire Chalk ensured environmental requirements were accounted for and the risk of groundwater flooding to the local area was reduced.

Since 2021, Project Groundwater (Greater Lincolnshire) has been established to address the gaps in understanding of groundwater and how it can be managed[23]. This Lincolnshire County Council-led project has engaged with many sectors - public, private, non-governmental, and local communities across Lincolnshire with trial sites of Barton and Barrow Upon Humber, Grimsby and Scopwick being identified. This work is due to be completed in March 2027 and will provide learning for many sectors.

23 Project Groundwater (Greater Lincolnshire), https://engageenvironmentagency.uk.engagementhq.com/lin011-groundwater

9 Climate Change Mitigation

Our region is the driest and lowest lying in the UK, more vulnerable than most to the effects of climate change, which include hotter, drier summers and warmer, wetter winters, and causing sea level rise. The more the world warms, the more intense those effects will be. That is why we are playing our part in the global effort to limit further climate change: by moving to net zero operational emissions by 2030[24].

For many years we have been at the forefront of carbon reduction in the water industry. With a committed leadership and a determined supply chain, by 2020 we had reduced capital carbon by 63% in our capital programmes from our original 2010 baseline and reduced operational emissions by 34% from a new baseline set in 2014/2015. We are also supporting system-wide decarbonisation in the region, for example by exporting waste heat to warm tomato greenhouses in our region year-round - something we are looking to repeat at other sites.

We are on course to deliver our net zero commitment; net zero operational emissions by 2030 and to maintain this thereafter. Net zero covers our operational activities (Scope 1, 2 and outsourced Scope 3 operations). We have also set a 70 per cent capital carbon reduction target by 2030 from a 2010 baseline. In order to deliver against our 2030 target and beyond, we intend to work with partners within the water sector, with others in the infrastructure sector more broadly, and with our construction partners to drive market transformation to deliver improved capital carbon materials while ensuring this can be achieved in a cost effective manner.

In our WRMP, we have assessed both demand-side and supply-side options to account for both operational and capital carbon. This has helped to feed into cost-benefit analyses, as well as the formation of our best value plan, ensuring the carbon footprint of our plan is minimised as an optimal outcome (see our WRMP24 Decision making technical supporting document for further information).

24 Anglian Water, Our net zero strategy to 2030, 2021.

10 Customer Support for the Environment

We have engaged extensively with our customers on how they feel about the environment.

Our customers told us that[25]:

- We continue to be seen as stronger than benchmarking organisations when it comes to caring for the environment and thinking about the future.
- There is widespread approval of environmental ambition, and most want water companies to be ambitious and deliver enhanced protection for the environment, to support nature recovery and sustainable abstraction. But this is not at any cost.
- The pace of achieving our environmental destination is urgent for stakeholders but less so for household and non-household customers.
- Customers are eager for us to implement processes and taking actions that benefit and safeguard wildlife and boost biodiversity across the region and they view rivers and bathing waters equally.

We will continue to engage on the environment with our customers through our day to day engagement.

25 Faldrax Consulting, May 2023, Anglian Water Customer Principles v9, Flourishing Environment - Summary

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