Final Draft Water Resources Management Plan 2024

Annex 9: Protecting and enhancing the environment

May 2025

from Southern Water

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Glossary

Acronym	Term
Water Resource Zones (WRZs)	
HAZ	Hampshire Andover
HKZ	Hampshire Kingsclere
HWZ	Hampshire Winchester
HRZ	Hampshire Rural
HSE	Hampshire Southampton East
HSW	Hampshire Southampton West
IOW	Isle of Wight
SNZ	Sussex North
SWZ	Sussex Worthing
SBZ	Sussex Brighton
KME	Kent Medway East
KMW	Kent Medway West
KTZ	Kent Thanet
SHZ	Sussex Hastings
Others	
1:500	1-in-500 dry year
AMP	Asset Management Period
CaBA	Catchment Based approach
CSMG	Common Standards Monitoring Guidance
DO	Deployable Output
DYAA	Dry Year Annual Average
EFI	Environment Flow Indicator
gw	Groundwater
HoF	Hands-off flow
HWTWRP	Hampshire Water Transfer and Water Recycling Project
NYAA	Normal Year Annual Average
PR19	The 2019 Price Review process
RA	Recent Actual
RAPID	Regulatory Alliance for Progressing Infrastructure Development
RBMP	River Basin Management Plan

SAC	Special Area of Conservation
SDB	Supply-demand balance
SPA	Special Protection Area
SRO	Strategic Regional Option
SSSI	Site of Special Scientific Interest (Protected Areas)
SW	Surface water
TLL	Time Limited Licence
WFD	Water Framework Directive
WINEP	Water Industry National Environment Programme
WRSE	Water Resources South East - regional water resource group
Environment scenarios	
Alternative	Bespoke scenario designed through consultation with Environment Agency. Assumptions: We developed what we considered to be a best-case scenario in terms of maximising environmental benefit but a reasonable worst-case scenario in terms of future supply deficit. This scenario is based on the approach used in Enhanced that maintains and improves Protected Areas, but this scenario goes further to seek maximum environmental benefit by assuming some of our chalk sources are no longer viable for abstraction. In effect under this scenario, we propose to cease abstraction from all sources within River Itchen catchment and would also cease abstraction from our Pulborough source. This scenario was used as a stress test for the system to understand the long-term implications of sustainable abstractions and determine the scale of regional solutions required to address the deficit, such as desalination plants, water reuse schemes and the required increased network for large scale company transfers.
BAU+	Business as Usual Plus. This is based on the Environment Agency BAU scenario but goes further to include the Uneconomic waterbodies, where reducing abstraction would imply a significant investment (water bodies previously were deemed uneconomic through Restoring Sustainable Abstractions options appraisals). The BAU scenario assumes policy and regulatory approach stays the same with the same level of protection of natural flows (EFI) but the natural flows are adjusted for the impact of climate change on rivers and groundwater and the water bodies are assumed to alter to the impacts of climate.
Central	Bespoke scenario designed through consultation with Environment Agency. Assumptions: We developed a pragmatic approach based on emerging outcomes from our current, largely 'No Deterioration' WINEP studies, considering known and planned for likely changes to sources. This scenario was originally based on BAU+ addressing our company-specific understanding, and included effects like Recent Actual Licence capping, emerging outcomes from WINEP, and outcomes from a review of listed sources to remove non-operational mothballed sources that no longer exist.
Enhanced	The Enhanced scenario provides greater environmental protection for Protected Areas and Sites of Special Scientific Interest (SSSI) rivers and wetlands, principal salmon and Chalk Streams is increased. The most sensitive flow requirements are applied including the Common Standards Monitoring Guidance (CSMG) that sets water quality and quantity targets for designated sites. The natural flows for rivers and groundwater balances are altered for Climate Change. This scenario increases the proportion of natural flow required to protect the environment. The flows and balance test will evolve over the timeframe due to climate impacts.

1 Our Environmental Destination

This annex sets out our plans to protect and enhance the environment.

1.1 Why Environmental Destination?

Protecting and enhancing the environment is one of our key objectives. In the short to medium term, we are driving forward our 'Catchment First' strategy to improve water quality and investigate the impacts of our abstractions. This will help to ensure that our water supplies are sustainable and are not negatively impacting the environment.

In the longer term, we want to ensure that rivers and protected areas in our region meet flow and other environmental targets. This will require us to work closely with other stakeholders to develop innovative solutions that balance the need to maintain adequate water supply with the need to protect the environment. Our key goals are to:

- Achieve sustainable abstractions
- Protect the unique and iconic chalk streams across our region
- Integrate the Government's 25-year Environment Plan[1]
- Find solutions through a regional Best Value Plan.

Our existing water abstraction sources are mainly located within the district of the South East River Basin Management Plan (RBMP) with a few northern sources located within the Thames River Basin District. The RBMPs were first published in 2009 to meet the requirements of the Water Framework Directive (WFD). Through the RBMP process, the current conditions of these areas are assessed, and objectives are set to maintain or improve the conditions of the areas by 2027.

The types of protected areas in the South East RBMP and the Thames RBMP are:

- Drinking water protected areas
- Recreational waters (bathing waters)
- Nutrient sensitive areas (Nitrate vulnerable zones)
- Natura 2000 sites, water dependent Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) (designated by Natural England).

As well as benefiting from drinking water and nutrient sensitive protected areas, part of our work is to deliver the regulatory actions that are required to avoid the deterioration of protected areas and help to meet the targets to maintain (or improve) the quality of these areas. This work is investigated and delivered through our Business Plan and the Water Industry National Environment Programme (WINEP).

Our operational area includes some of the finest examples of chalk streams and rivers in the world, such as the River Test and River Itchen. These are rare ecosystems that support wildlife such as salmon, trout, white-clawed crayfish and Southern Damselfly. As part of the Government's 25-year Environment Plan, chalk

[1] Environmental Improvement Plan 2023 - GOV.UK (www.gov.uk)

streams are considered a priority for restoration in addition to those already protected areas designated as Natura 2000 sites.

As well as undertaking catchment management to protect water quality, we are also undertaking environmental studies and investigations in collaboration with the Environment Agency, Natural England and other catchment stakeholders to help ensure our abstractions are environmentally sustainable. This includes complex environmental monitoring and development of conceptual and numerical models to understand the potential linkages between our abstractions and environmental receptors. Where our impact on the environment is identified, we address that impact through a package of mitigation. This includes both abstraction licence changes and physical, nature-based enhancements.

Often increasing the amount of water to the environment in isolation does not fully address the challenges faced by chalk stream and wetland habitats as many are subject to other pressures such as historical modification for milling, fishing, urban development and land management. Consequently, we also carry out river and wetland environmental enhancement work alongside reductions in abstraction, to improve the ecological diversity and resilience of watercourses and wetlands to realise the greatest possible overall benefits. This work is carried out through our WINEP programme.

We are investing to ensure that our abstractions are sustainable into the future, whilst maintaining public water supplies. As an example, we are planning to reduce abstraction in the rivers Test and Itchen catchments in Hampshire through our Water for Life Hampshire programme, and the Hampshire Water Transfer and Water Recycling Project (HWTWRP) is being progressed as a Strategic Resource Option (SRO) through Regulators Alliance for Infrastructure Development (RAPID).

The government has set out reforms for the management of water abstraction. These are detailed in the Water Abstraction Plan (WAP) [2] by Department for Environment Food and Rural Affairs (Defra). The plan, in line with RBMPs, seeks to address unsustainable abstractions through three areas: environment, catchment focus and the abstraction licensing service. As part of the WAP, the Environment Agency has committed to setting out ambitions for ten Priority Catchments which are considered the most challenging catchments in England, along with updating the associated Abstraction Licensing Strategies (ALS). In our operational area, the rivers Test and Itchen, and Arun and Western Streams are among the Priority Catchments. Investigations are being undertaken through our WINEP programme to scientifically assess if there are environmental impacts from our abstractions. If confirmed, these will be addressed, as well as used to inform the ALS. This work is being done in partnership with the Environment Agency, Natural England and catchment partners.

Through our WINEP programme, we continue to engage with catchment partnerships to seek integrated solutions to find the best solutions for bridging the gap between supply and demand.

1.2 What is included in Environmental Destination?

There are three main elements to the development and delivery of our Environmental Destination. These are:

- Our ongoing WINEP

[2] Water abstraction plan - GOV.UK (www.gov.uk) (updated July 2021)

- Development and use of our Environmental Destination scenarios
- Use of adaptive planning to support delivery of a Best Value Plan

As part of our WINEP, we are investigating, monitoring, and delivering interim ecological resilience schemes to secure sustainable abstractions and improve ecological resilience in the short to medium term (5-15 years). In parallel, we are delivering our Catchment First strategy to improve water quality through the wider catchment.

The outcomes of our WINEP investigations will significantly contribute to achieving our longer-term Environmental Destination to ensure that our abstractions are sustainable and that appropriate targeted mitigations, where needed, are designed and implemented to restore and provide long-term environmental resilience.

The evidence from our WINEP will inform decision-making related to the potential changes needed to our abstraction licences at individual sources or group of sources. Additionally, the emerging outcomes from our WINEP studies are used as evidence, and combined with current guidance and policy, to develop our Environmental Destination scenarios.

In our Water Resources Management Plan 2024 (WRMP24), the Environmental Destination scenarios are used as part of our adaptive planning approach to develop different potential futures for the environment, where the timing and volume of abstraction reductions can be planned for, and solutions designed to address any resulting supply-demand balance deficits. Reducing this uncertainty through our environmental investigations is a key aim for us as it will reduce the uncertainty in our longer-term WRMP24 and enable us to target investments in alternative supplies more efficiently through our adaptive planning approach. The other components (population growth and climate change) of adaptive planning are summarised in the revised draft Water Resources Management Plan 2024 (rdWRMP24) Technical Report.

We consulted on our draft Water Resources Management Plan 2024 (dWRMP24) between November 2022 and February 2023. We have updated this annex to incorporate feedback from the consultation and have also provided supporting information as part of our Statement of Response (SoR) to dWRMP24. In addition to the components mentioned above, we have placed additional focus on the particularly sensitive locations of the River Itchen SAC and Arun Valley SAC, SPA and Ramsar (see Section 6.3) and discuss how our Environmental Destination incorporates our sources in these areas.

2 Assessing impacts of abstractions

We have aligned and incorporated our Environmental Destination scenarios with the ongoing AMP7 (2020-25) WINEP and the AMP8 (2025-30) WINEP (final submission in January 2023). Many current and planned WINEP investigations incorporate several environmental drivers such as Sites of Specific Scientific Interest (SSSIs), The Habitats Directive, Natural Environment Research Council (NERC) and WFD water resources drivers for surface water body flows, groundwater body status and 'No Deterioration' investigations. We have also incorporated Natural England's Nature Recovery Lists into our programme, along with investigating Common Standards Monitoring Guidance (CSMG) targets, including flow targets. There are often considerable overlaps between different regulatory drivers.

We are also working with the wildlife trusts, rivers trusts and other catchment partnerships to deliver nature based environmental improvements, to provide ecological resilience in catchments.

Our key initiatives are discussed below.

2.1 Catchment First

Catchment First is our commitment to put the well-being of the environment at the centre of the decisions we make and the services we deliver. It represents a shift in focus from relying on traditional engineering solutions, to working collaboratively with partners to deliver long-term sustainable improvements to the environment on which our business and customers depend.

This shift in approach has been accelerated as a result of two key drivers; the environment and our customers. A summary of Catchment First drivers and programme is given in Appendix A. It highlights how we are working with people and catchment partners in delivering long-term water quality improvements for water sources.

The revised draft Regional Plan developed by Water Resources South East (WRSE) has re-introduced a large number of catchment schemes across South East England.

For us, the suite of catchment management schemes comprises more than 77 distinct activities covering a broad range of themes:

- Environmental education programmes
- Nitrate, Pesticide and other agricultural land management schemes to protect groundwater quality
- Natural flood management and nature based solutions for River restoration and habitat enhancement and management.

We have organised our catchment schemes into 11 geographically distinct portfolios in each of our 14 water resource zones (WRZs) as set out Table 1. A more detailed description of each individual option is presented in Annex A.

The catchment portfolios we have proposed do not necessarily create a direct benefit to our WRMP24 supply-demand balance position since the majority do not directly create any new resources or lead to a reduction in demand. Whilst the Water Resource Planning Guidance (WRPG) allows us to present these schemes within our plan, without confirmed supply-demand balance benefits they are not eligible for supply-demand balance enhancement funding as part of our Business Plan 2024 (BP24). The majority of the catchment programme is regulated under WINEP and funding has been included under the enhancement case for supporting water abstraction in our BP24.

Table 1: Summary of our proposed catchment management portfolios.

Portfolio	Summary of Catchment Options	WRZ*
Adur and Ouse	3 Integrated catchment management schemes 2 Knowledge exchange, education and agricultural activity option 1 river restoration option	SNZ, SWZ, SBZ
Arun and Western Streams	6 integrated catchment management options 3 natural water retention measures (including NFM[3] and wetland creation) options 1 nutrient and sediment reduction options 2 pesticide reduction options 3 river restoration options 1 terrestrial habitat creation/management option 1 INNS[4] investigation scheme	SNZ, SWZ
Rother	1 Nutrient and sediment reduction options, 1 flow augmentation and licensing option 1 terrestrial habitat creation/management scheme	SNZ
Cuckmere and Pevensey Levels	1 natural water retention measures (including NFM and wetland creation) option	SHZ
Medway	4 integrated catchment management options 1 natural water retention measures (including NFM and wetland creation) option 1 nutrient and sediment reduction options 2 pesticide reduction options 1 river restoration option	KME, KMW
Stour	4 integrated catchment management options 2 knowledge exchange, education and agricultural activity options 2 river Restoration schemes 1 Nutrient and sediment reduction options	KTZ
Test and Itchen	2 integrated catchment management options 3 knowledge exchange, education and agricultural activity options 2 natural water retention measures (including NFM and wetland creation) options 5 river restoration options 8 other options (1 integrated constructed wetland option and 7 opportunities identified as part of Watercress & Winterbournes Project)	HAZ, HKZ, HWZ, HRZ, HSE, HSW
New Forest	2 integrated catchment management options, 2 knowledge exchange, education and agricultural activity options 1 nutrient and sediment reduction option.	HSW
Isle of Wight	2 integrated catchment management options 1 knowledge exchange, education and agricultural activity option, 1 natural water retention measures (including NFM and wetland creation) option 2 river restoration options.	IOW
Kennet and tributaries	1 river restoration option	HKZ

*HAZ = Hampshire Andover, HKZ = Hampshire Kingsclere, HWZ = Hampshire Winchester, HRZ = Hampshire Rural, HSE = Hampshire Southampton East, HSW= Hampshire Southampton West, IOW = Isle of Wight, SNZ = Sussex North, SWZ = Sussex Worthing, SBZ = Sussex Brighton, KME = Kent Medway East, KMW = Kent Medway West, KTZ = Kent Thanet, SHZ = Sussex Hastings

It is still likely that there may be indirect benefits to our supply-demand balance that are difficult to quantify at this stage, but which could be realised through delivery of our catchment portfolios. These include:

- Delaying partial or full loss of sources due to deterioration in raw water quality as a result of catchment management.

[3] NFM = Natural Flood Management
[4] INNS = Invasive Non Native Species

- Offsetting, mitigating or avoiding future abstraction licence reductions through delivery of river restoration and habitat enhancements that prevent or reduce the impacts of abstraction.
- Providing opportunities for enhancement of Natural Capital and Biodiversity Net Gain (BNG) to offset impacts from other schemes such as new supply options from water recycling or desalination.

2.2 Key WINEP investigations

Our AMP8 WINEP was recently confirmed and accepted by the Environment Agency. It details the specific regulatory drivers for each of our planned and ongoing investigations, monitoring and mitigation schemes. This programme will help to provide the evidence-base to inform and support the decision-making processes for our Environmental Destination to ensure our abstractions are sustainable in the long term.

There will be various outcomes from the WINEP investigations, informed through the options appraisal process that will set out various mitigation options, which may include possible future licence changes such as abstraction operational changes, licence amendments, and licence revocation in combination with ecological resilience measures. Such possible licence changes are likely to drive the need for options to address supply-demand balance deficits through new alternative supplies or SROs.

In preparing our rdWRMP24, we have incorporated the best available knowledge and evidence, from ourselves, regulators, and stakeholders. The known licence change risks and their associated drivers are summarised in Table 2. These include the following:

- Alresford groundwater licence (River Itchen SAC, SSSI)
- Itchen (surface water & groundwater licences and Twyford groundwater licence) (River Itchen SAC, SSSI)
- River Test surface water licence confirmed change to licence conditions from 2027 which increases Hands-off Flow (HoF) and change to monthly quantities.
- Pulborough groundwater licence subject to an ongoing sustainability study (nearby Habitats sites)
- Natural CSMG which we expect will be applied to SAC/SSSI designated rivers such as the River Test and River Itchen

Table 2: Investigations and drivers reflected in our Environmental Destination.

WRZ	Source(s)	Regulatory drivers	Comments and emerging outcomes
HWZ	Alresford, Winchester	Habitats Directive and SSSI investigations associated with the Candover Stream and River Itchen SAC wetlands including assessment of CSMG flow standards	Alresford source will need to stop operation; we currently assume this will occur in 2030 under all of our Environmental Destination scenarios with interim ecological resilience mitigation. Implications for our Winchester source are presently uncertain but are primarily thought to relate to a SSSI investigation associated with the River Itchen SAC wetlands rather than the CSMG flow standards which are compliant on the affected reach.
HSE	Twyford, Itchen surface water, Itchen groundwater	Habitats Directive and SSSI investigations associated with Itchen Wetlands SSSI and Itchen SAC including assessment of CSMG flow standards	Even though licences were recently changed (2019) and would prevent deterioration, we expect that future licence reductions will be required to meet CSMG flow standards and as mitigation for SSSI investigations. There is a high risk of further licence changes in this WRZ. The Lower Itchen licences are subject to renewal in 2025.

WRZ	Source(s)	Regulatory drivers	Comments and emerging outcomes
HSW	River Test surface water	River Test SSSI investigation assessment of CSMG flow standards	Licence was recently changed in 2019 and further changes to licence conditions are already confirmed for 2027. Further licence changes could be required if CSMG flow standards are applied in the future. HSW already has no DO[5] under drought conditions. CSMG standards would reduce normal year DO.
SNZ	Pulborough groundwater, Pulborough surface water	Pulborough sustainability study	Non-WINEP driven sustainability study including habitats assessment to examine the impact of our Pulborough groundwater source on nearby SSSI wetlands by 2025. This project will also include WFD 'No Deterioration' assessments and potential mitigations for the Pulborough source.

The Alresford and River Itchen investigations primarily relate to our AMP7 WINEP on the River Itchen. These include modelling and monitoring studies to assess abstraction impacts on the SAC and SSSI designated sites. They also include an assessment of the potential implications of Natural England's CSMG flow targets.

Natural England has raised concerns that it cannot be concluded that our existing groundwater licence for the Pulborough source is not having an impact on the Arun Valley European Protected Sites (SSSI, SAC, SPA and Ramsar). We are conducting a full sustainability study of the existing licence in collaboration with the Environment Agency, Natural England and other local stakeholders, to be concluded by Summer 2025. A monitoring programme is underway to gather data for an evidence-based assessment, with an enhanced numerical groundwater model and wetland models also being developed for the assessment. In the meantime, we have implemented minimisation of groundwater abstraction from the source since November 2021. In parallel to these investigations, we have committed to support the Local Planning Authorities achieve water neutrality in SNZ for new developments. Water neutrality is further discussed in our fdWRMP24 Technical Report and Annex 22.

We have already put in place interim measures in some catchments to support ecological resilience and assist the water environment whilst solutions are developed. The following three river schemes are currently in progress.

- Upper Test, River Anton. River enhancement scheme to be completed during 2024 with associated abstraction licence cap applied to our Andover source from 2027.
- IOW, Lukely Brook: River enhancement scheme with physical enhancements to Plaish Meadows, with some elements already completed in 2023 and the remainder to be delivered in 2024. Associated licence caps were applied to our Lukely Brook and Newport abstractions in 2021.
- Adur and Ouse, Lewes Winterbourne Stream: River enhancement scheme completed in July 2023.

Our ongoing AMP7 programme continues to focus on determining the possible impacts on protected sites with emphasis on assessing high priority operation catchments. For most of our existing abstraction sources, the outcomes of our environmental investigations will be known between 2025 and 2027 and will define the magnitude of our Environmental Destination and the overall strategy we will need to deliver through our adaptive plan to ensure long-term sustainable supplies.

[5] DO = Deployable Output

Investigations will continue during AMP8 for some protected sites and other operational catchments to support evidence-based environment decisions to be made during the next water resource planning cycles for our Water Resources Management Plan 2029 (WRMP29).

2.3 Interim in-river enhancement and mitigation plans

As part of our AMP8 WINEP programme, interim nature-based solution schemes have been planned to support the findings and outcomes of our AMP7 investigations. These schemes will help to make ecological improvements to support habitats and ecological resilience in the short-term, whilst security of supply can be maintained till the availability of the longer-term solutions. The longer-term solutions will replace the reduction of water available in the WRZs where WINEP investigations establish the need for abstraction license changes as part of the mitigation package, including possible annual quantity reductions, or revoking licences altogether to enable sustainable abstractions.

A location map of WINEP ecological resilience schemes for AMP7 (2020-25) and AMP8 (2025-30) in-river locations is shown in Figure 1 with summary provided in Table 3, Table 4 and Table 5 for the Western area (comprising of HAZ, HKZ, HWZ, HRZ, HSE, HSW and IOW WRZs), Central area (consisting of SNZ, SWZ and SBZ WRZs) and Eastern area (consisting of KME, KMW, KTZ and SHZ WRZs) respectively.

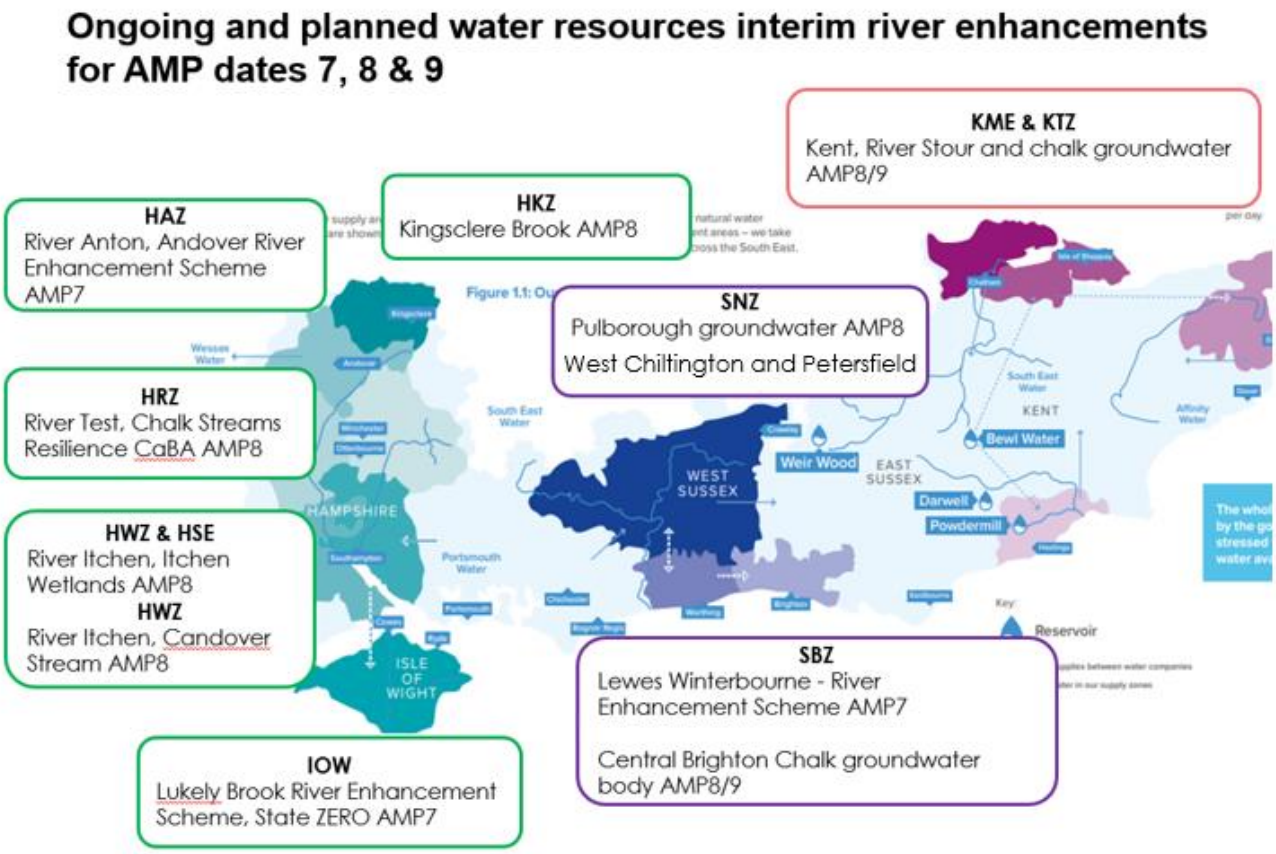

Figure 1: Location map of ecological resilience schemes planned for AMP7 to AMP9.

Table 3: Western area WINEP river enhancement, nature-based solutions and ecological resilience schemes.

Management catchment	Operational catchment	Water body	Related Natural England recovery list sites	WINEP suggested horizon for reductions	WINEP description	WRZ	WINEP dates	River enhancement, nature-based solutions and ecological resilience schemes
Kennet and tributaries (Thames)	Kennet	Near Basingstoke		2045	Prevent possible impacts from groundwater abstraction on surface water body if identified from AMP7 Investigation. AMP8 implementation of nature-based solution, delivering ecological resilience, preventing deterioration and further abstraction impacts till annual licence reduction implementation based on WRMP scheme timeline	HKZ	AMP8	AMP8
Test and Itchen	Test Upper and Middle	Upper Anton		2035	Andover - River enhancement scheme to be completed in 2025.	HAZ	AMP7 scheme	AMP7
Test and Itchen	Test Lower and Southampton Streams	Fairbourne Stream to Fishlake Meadows	River Test SSSI	2045	CaBA[6] national chalk stream flagship strategy project on the River Anton. Implementation of nature-based solution, delivering ecological resilience, in collaboration with catchment partners	HRZ	AMP8	AMP8
	Test Upper and Middle	Test – confluence with Anton to confluence with Dun		2040				
Test and Itchen	Itchen	Candover Brook	River Itchen SSSI, SAC (Candover)	2030	Candover Stream / Alresford source - AMP8 Implementation of nature-based solution, delivering ecological resilience specifically focused on possible Alresford abstraction impacts. Licence to be revoked in 2030, as defined in all WRMP scenarios. SEW potential Lasham source impacts to be addressed after re-coupling of investigation.	HWZ	AMP8 with licence revoked in 2030	AMP8
Test and Itchen	Itchen	Itchen	River Itchen SSSI, SAC	2040	Itchen Wetland habitat improvement - AMP8 implementation of nature-based solution, delivering ecological resilience, preventing deterioration and	HWZ & HSE	AMP8	AMP8
		Nuns Walk Stream		2040				

[6] CaBA = Catchment Based Approach

Management catchment	Operational catchment	Water body	Related Natural England recovery list sites	WINEP suggested horizon for reductions	WINEP description	WRZ	WINEP dates	River enhancement, nature-based solutions and ecological resilience schemes
		Bow Lake	(Itchen Wetland WINEP)	2040	abstraction impacts if abstraction impacts are identified from the AMP7 investigation, till annual licence reduction implementation based on WRMP scheme timeline			
Isle of Wight	Isle of Wight Rivers	Lukely Brook	Lukely Brook	2035	Lukely Brook - River enhancement, including physical enhancements to Plaish Meadows and Lukely Brook completed in 2023.	IOW	AMP7 scheme	AMP7

Table 4: Central area WINEP river enhancement, nature-based solutions and ecological resilience schemes.

Management catchment	Operational catchment	Water body	Natural England recovery list sites	WINEP suggested horizon for reductions	WINEP description	WRZ	WINEP dates	River enhancement, nature-based solutions, and ecological resilience schemes
Adur and Ouse	Adur Upper	Adur (Lancing brook)		2040	West Chiltington and Petersfield AMP8: Prevent possible impacts from groundwater abstraction on surface water body if identified from the AMP7 investigation. Implementation of nature-based solution, delivering ecological resilience, preventing deterioration till annual licence reduction implementation based on WRMP scheme timeline	SNZ	AMP8	AMP8
Arun and Western	Arun Lower	Chilt		2040				
	Rother Western	Hammer Stream (West Sussex)		2045				
		Western Rother Durford		2045				
Arun and Western streams	Arun Upper	Arun downstream Pallingham Weir	Arun Valley Ramsar, SAC, SPA, Pulborough Brooks SSSI, Waltham Brooks SSSI, Amberley Wild Brooks SSSI	2045	Pulborough groundwater - Wetland enhancements. AMP8 Water Neutrality program. AMP8 - Possible mitigation if groundwater abstraction is identified as having an impact on designated sites from AMP7 investigation. Implementation of nature-based solution, to deliver ecological resilience, and provide mitigation.	SNZ	AMP8	AMP8
Adur and Ouse	Ouse Upper	Winterbourne Steam at Lewes		2025	Lewes Winterbourne - River Enhancement Scheme AMP7 completed July 2023.	SBZ	AMP7 scheme	AMP7

Management catchment	Operational catchment	Water body	Natural England recovery list sites	WINEP suggested horizon for reductions	WINEP description	WRZ	WINEP dates	River enhancement, nature-based solutions, and ecological resilience schemes
				2040	Investigation of Brighton Chalk WFD groundwater body for 'No Deterioration'. Implementation of nature-based solution, to deliver ecological resilience, and provide mitigation in AMP9 if possible abstraction impacts from the investigation are identified. Any future licence annual reduction implementation based on WRMP scheme timeline.	SBZ	AMP8	AMP9
South East groundwater	Brighton Chalk Block	Brighton Chalk Block	Arundel Park SSSI and Beeding Hill to Newtimber Hill SSSI	2045	SSSI investigations to review conceptualisation of the SSSIs, and if there are hydrogeological paths for abstraction impacts. Implementation of nature-based solution, to deliver ecological resilience, and provide mitigation in AMP9 if possible abstraction impacts identified. Any future licence annual reduction implementation based on WRMP scheme timeline.	SBZ	AMP8	AMP9

Table 5: Eastern area WINEP river enhancement, nature-based solutions and ecological resilience schemes.

Management catchment	Operational catchment	Water body	Natural England recovery list sites	WINEP suggested horizon for reductions	WINEP description	WRZ	WINEP dates	River enhancement, nature-based solutions, and ecological resilience schemes
Thames groundwater	Kent North Chalk and Tertiaries	North Kent Swale Chalk		2050	Prevent possible impacts from groundwater abstractions on the groundwater bodies, and groundwater dependant terrestrial ecosystems (North Kent marshes) if identified from the AMP7 investigation. Continuation of investigation from AMP7 till 2027. Early implementation of nature-based solution, delivering ecological resilience in AMP8 - Otherwise by guidance scheme starts AMP9. Any future licence annual reduction implementation based on WRMP scheme timeline.	KME	AMP8/9	AMP8
	Kent North Medway Chalk	North Kent Medway Chalk		2050				
Kent North (Thames)	White Drain and Lakes	White Drain		2050				
Stour	Little Stour and near Canterbury	near Canterbury and Little Stour		2040 – 2050	Prevent possible impacts from groundwater abstraction on surface water body if identified from AMP7/8 investigation. Continuation of investigation from AMP7 till 2027. Implementation of nature-based solution, delivering ecological resilience in AMP9. AMP9. Licence annual reduction implementation based on WRMP scheme timeline	KTZ	AMP7/8	AMP9
	North and South Streams	North and South Streams at Northbourne						
	Stour Marshes	Monkton and Ramsgate Marshes						

3 Water Framework Directive

A key aim of the WFD is to return rivers and groundwater bodies closer to their natural state and to prevent any deterioration i.e. not to make the physical or ecological condition of any river or groundwater body worse.

Since the emergence of the original 'Sustainable Catchments' guidance[7], we have taken a pro-active approach in engaging with the Environment Agency to assess the potential risk of deterioration from our abstractions in view of the WFD.

We engaged with the Environment Agency to agree and produce a screening process to assess the possible risk of growth and deterioration at all our sources. This resulted in 59 of our abstraction sources (around 60% of our sites) being put forward into our Price Review 2019 (PR19) WINEP for investigation and options appraisal between 2018 and 2030 for assessment following the Environment Agency's 'No Deterioration' guidance[8]. A number of our sources were assessed and screened out from further investigation as they posed no risk of deterioration.

In AMP6 (between 2015 and 2020) we carried out the first of our 'No Deterioration' investigations at three of our sources, to assess if they posed a possible deterioration risk to the surface water bodies in each catchment. Through the investigation and subsequent options appraisal process, we agreed a suite of mitigation measures to ensure there was no risk to future deterioration including river enhancement to deliver ecological resilience measures and licence changes to prevent increase in abstraction. These licence changes (for Andover, Newport and Lukely Brook) are included within our baseline supply forecast for WRMP24.

Many of the selected sources for 'No Deterioration' investigations and options appraisal from AMP7 were included in our PR19 WINEP submission and were mapped across to our PR24 'pre WRMP24' information provided to us by the Environment Agency in 2021.

For Price Review 2024 (PR24), there have been changes to the development of the WINEP programme. Previously, it was the Environment Agency who compiled the list of investigations and actions required. However, from Autumn 2022, water companies have developed their WINEP using an integrated catchment approach. Through consultation with our regulators and catchment partners, we have developed a WINEP programme for PR24 and beyond.

We have agreed numerous revisions to the PR19 WINEP with the Environment Agency, which we expect to be reflected in the final PR24 WINEP. This includes bringing investigations into many low priority sites forward into our AMP7 (2020-25) and AMP8 (2025-30) programme to efficiently align with other work in those catchments.

Our subsequent proposed 'No Deterioration' WINEP and confirmed regulatory completion dates were based on the 'No Deterioration' guidance. We completed the first two steps of the assessments to inform the priority classification (Priority A - D) of our WFD investigations in 2020 and submitted the proposed completion dates of the 'No Deterioration' investigations to the relevant Environment Agency teams in November 2020.

[7] Environment Agency, 2016, Achieving sustainable abstraction: management and process, Public water supply sector
[8] Environment Agency, 2018, Guidance on water resources investigations into the risk of WFD water body deterioration

These changes in regulatory completion dates are due to several factors:

- Some sources were screened out of the future 'No Deterioration' investigations because there is no risk of abstraction increase and hence no risk of deterioration. Typically, these are sources where output is constrained by infrastructure or abstraction licence or the source is mothballed and where there are no planned enhancement schemes to allow these sites to abstract more water than historical 'recent actual' rates.
- Sites where risk of abstraction increase and hence deterioration was unlikely before 2030. This is because we expect demand to reduce across our WRZs as a result of demand management. However, demand may increase, mainly due to forecast population growth, in some WRZs after 2030. In these cases, as set out in the 'No Deterioration' guidance, the investigation priority changed with associated sources assigned a lower priority (typically Priority C or D); and so the investigations were deferred to either later in AMP7, AMP8 or AMP9.
- Sites where relevant hydrological and ecological data needs to be collected over a longer period of time for evidence-based decisions on the nature of mitigations, including possible future licence changes.

Table 6 summarises the number of sources and which we are proposing for our PR24 WINEP with 'No Deterioration' associated drivers and their regulatory dates.

Table 6: Summary of our current and proposed WINEP actions to prevent deterioration under the Water Framework Directive.

WRZ	Total sources	Sources with 'No Deterioration' drivers	Regulatory date(s)	Comment
HAZ	5	0	N/A	'No Deterioration' investigation for Andover completed in 2020. Recent actual licence cap applies from 2027. Interim ecological resilience river enhancement scheme is being implemented 2020 to 2025. Other sources in WRZ screened out as no risk of growth (asset constrained) and DO is approximately equal to 'recent actual' outputs. These sources do not appear in the PR19/PR24 WINEP.
HKZ	2	1	2025 for investigation AMP8 implementation	Our near Basingstoke source is currently subject to 'No Deterioration' investigation. Our Newbury source does not appear in the AMP7 WINEP and is presently asset constrained so there is no risk of growth. In addition, following our 'No Deterioration' investigation screening process, our demand forecasts show a long-term reduction in demand in this WRZ through delivery of our water efficiency and leakage reduction programmes.
HRZ	2	2	2025 for investigation AMP8 implementation	Both sources in this WRZ have AMP7 'No Deterioration' investigations.
HWZ	3	2	2025	We propose to cease our Alresford abstraction in 2030 to meet obligations from other drivers (Habitats Directive investigation in the River Candover). Two sources (one being Alresford) have AMP7 'No Deterioration' investigations alongside other WINEP drivers including SSSI and Habitats Directive investigations. One source is forecast to have planned abstraction increase due to likely future licence changes arising from ceasing abstraction from our Alresford source. We are not currently forecasting 'No Deterioration' based reductions for this source. Our Barton Stacey source has been screened out due to no risk of increase and is excluded from AMP7 WINEP.
HSW	1	0	N/A	Licence change already implemented in 2019 which removes risk of deterioration at this source, and so has been removed from the WINEP.
HSE	3	3	2025	Sources with 'No Deterioration' driver are not forecast to have planned abstraction increase due to likely future licence changes arising from other Habitats Directive driver and hence we are not currently forecasting 'No Deterioration' based reductions for these sources.
IOW	9	9	2020 AMP7 implementation	Two sources have already completed 'No Deterioration' investigations with licence reductions implemented in 2020. Additional ecological resilience river enhancement scheme is being implemented in 2020-2025. Most other sources have been removed from the WINEP because no growth is forecast, sites are mothballed (no DO) or increase is not possible due to other constraints. Sources associated with the flow augmentation scheme have been removed from the 'No Deterioration' risk because of how the sites operate to supplement river flows, only being operational for short durations and not every year, during periods of low natural flow.
SNZ	9	6	2025 AMP8 implementation	Petersfield and West Chiltington have growth factors greater than one which relate to proposed supply options from WRMP19 and fdWRMP24. Until those investigations conclude in 2025. Other sources have been screened out either because our assessment has shown there is no potential for growth or there are likely to be future licence changes arising from other drivers. Hence, we are not currently forecasting 'No Deterioration' based reductions for these sources.
SWZ	12	12	2027 AMP9 implementation	Our screening assessment has ruled out potential growth before 2030 at all sites; however, an investigation to assess potential deterioration risk from growth after 2030 with potential mitigations in AMP9 has been included.
SBZ	12	12	2030 AMP9 implementation	Many of these sources were not included in the original WINEP provided by the Environment Agency. We have added them for investigations in AMP8 to align with those in our neighbouring SWZ. Surface water 'No Deterioration' risk to Lewes Winterbourne has been addressed through our AMP7 ecological resilience river enhancement mitigation scheme.
KMW and KME	24	24	2027 AMP8/9 implementation	We are undertaking a joint 'No Deterioration' investigation across both KMW and KME WRZs for completion in 2027. 13 sources were identified as having a potential risk of growth after 2030. It is possible there could be licence changes, but the magnitude is presently highly uncertain. However, there is no risk of increase prior to 2030 and hence implementation is likely to be

WRZ	Total sources	Sources with 'No Deterioration' drivers	Regulatory date(s)	Comment
				from AMP9 for licence changes. We proposed to screen out the other 11 sources from 'No Deterioration' as there is no risk of growth due to licence and infrastructure constraints. *We have included for AMP8 an ecological resilience scheme, as an interim mitigation scheme if required.
KTZ	11	11	2027 AMP9 implementation	Our screening assessment has ruled out potential growth before 2030 at all sites, however an investigation to assess potential deterioration risk from growth after 2030 with potential mitigations in AMP9 has been included.

*The North Kent Marshes are situated in the KME and KMW WRZs and are currently being investigated via the North Kent 'No Deterioration' WINEP due for completion in 2027. As well as considering the prevention of deterioration under the WFD, they include consideration of adverse effects from groundwater abstraction on the following designated locations:

- Medway Estuary and Marshes SSSI
- South Thames Estuary and Marshes SSI
- The Swale SSSI

3.1 Our proposed baseline rates for licence reductions

As the first step in our 'No Deterioration' investigations and as part of the screening process for all sources to determine the risk of any increase in abstraction, we have undertaken an assessment of historical 'recent actual' abstraction rates to set a baseline against which any increase in abstraction and deterioration risk can be assessed.

In undertaking this assessment, we undertook a review of our long term abstraction data to remove periods of atypical abstraction as set out in the WFD 'No Deterioration' guidance. These rates are based on our review of our abstraction returns over the past 20 years, considering abstraction patterns and site outage through the RBMP cycles 1, 2, and 3 baseline periods. We have shared and discussed our proposed baseline rates with the Solent and South Downs and Kent, Sussex and South London Environment Agency area teams through our ongoing 'No Deterioration' WINEP investigations.

The baseline rates we have used to develop individual source screening growth factors, as required by the 'No Deterioration' guidance, were then used to review the risk of potential deterioration from the potential growth in sources and prioritise the WINEP investigations through AMP7, AMP8 and AMP9.

The purpose of these screening assessments was to:

- Review abstraction rates to establish initial proposals for baseline abstraction and subsequent proposed individual screening factors as source level to inform our WINEP and Water Resource Planning
- Determine if there is the potential for future increase in abstraction, and prioritisation of our 'No Deterioration' investigations to establish if there is a potential risk of deterioration.

A full list of these screening reports is provided below:

- Technical Note WFD No Deterioration – Group 1 IOW Chalk, Issued to the Environment Agency Solent and South Downs Region in November 2020
- Technical Note WFD No Deterioration – Group 2 IOW LGS, Issued to the Environment Agency Solent and South Downs Region in November 2020
- Technical Note WFD No Deterioration – Group 3 Worthing, Issued to the Environment Agency Solent and South Downs Region in November 2020
- Technical Note WFD No Deterioration – Group 4 Sussex North, Issued to the Environment Agency Solent and South Downs Region in December 2020
- Technical Note WFD No Deterioration – Group 5 Itchen Chalk, Issued to the Environment Agency Solent and South Downs Region in December 2020
- Technical Note WFD No Deterioration – Group 6 Test Chalk, Issued to the Environment Agency Solent and South Downs Region in December 2020
- Technical Note WFD No Deterioration – North Kent, Issued to the Environment Agency Kent and South London Region in November 2020
- Technical Note WFD No Deterioration – South East Kent, Issued to the Environment Agency Kent and South London Region in November 2020
- Technical Note WFD 'No Deterioration' – Thanet Group, Issued to the Environment Agency Kent and South London Region in November 2020
- Technical Note WFD 'No Deterioration' – Near Canterbury and North and South Streams, Issued to the Environment Agency Kent and South London Region in November 2020

Our proposed baseline abstraction rates represent the best available evidence for assessing the potential DO impact of licence capping for WRMP24. These will be reviewed once our ongoing WINEP investigations are complete.

The screening baseline abstraction rates as discussed with the Environment Agency area teams will be used to determine the magnitude of potential licence reductions until our ongoing 'No Deterioration' investigations conclude between 2025 and 2035. The rates are also consistent with adopted 'recent actual' rates used in recent regional numerical groundwater modelling studies (for example the Test and Itchen and East Hampshire and Chichester Chalk Models).

In their representation to our dWRMP24, the Environment Agency has noted that in many cases, the rates we have proposed are the same as the DO of a source. This is correct and is most commonly the case where source recent actual output is not drought sensitive and is instead limited by the existing abstraction licence or infrastructure.

As an example, without a dedicated enhancement scheme at some groundwater sources, there is no present capacity at that source to increase abstraction in the future since its 'recent actual' rate is already consistent with its DO. In such cases, there may still be licence headroom (e.g. if a treatment process or infrastructure constraint to output applies), but the impact of applying licence cap on DO for planning purposes would be negligible since that licence volume cannot presently be utilised nor is it planned to be used in the future as part of our WRMP.

3.2 Applying licence capping

Following our screening exercise and our discussions with the Environment Agency, we have already started a large number of WINEP investigations (Table 6) to understand the risk of future deterioration and consider any mitigation, inlcuding licence caps required. We expect the majority of these investigations will conclude between 2025 and 2027 after the publication of final WRMP24.

The impact of applying licence caps to DO of our sources is therefore currently uncertain and will not likely be known with confidence until well within the WRMP29 development period. Based on our intial screening assessment for all of our sources being currently investigated, our Distribution Input (DI) will reduce in the first 5 to 10 years of our WRMP24 due to demand management. Therefore all of our sources not already assessed for potential deterioration risk, were assessed to be priority C or D (a risk of deterioration after 2030).

Environment Agency guidance requires that action should be taken to prevent deterioration before it occurs. In line with this, and following our screening excercices, we expect any risk of deterioration to occur from 2030 onwards.

Figure 2 illustrates the general principal of the way we have applied licence caps to prevent deterioration to our sources in view of any further reductions which we are planning for as part of our long Environmental Destination (see Section 5). Appendix C provides a full set of plots for each of our sources in the same format to illustrate the timing and magnitude of licence caps as included in our plan. We have summarised the total potential impacts on DO from application of these potential licence caps in Table 7. It shows the amount of water we would need to replace if licence caps are implemented and the screening 'recent actual' rates used as part of the initial assessment for the 'No Deterioration' investigations is implemented.

Figure 3 shows the impact of licence reductions on DO across the Environment Agency operational catchments.

For some of our sources we have proposed to implementation of licence capping later than 2030. This occurs in two areas:

- SWZ: Here the implementation of licence caps has been assumed to occur from 2034.

- Hampshire WRZs: The implementation of licence caps has been assumed to occur from 2038 noting that a licence cap has already been applied to our Andover source (section 4.1).

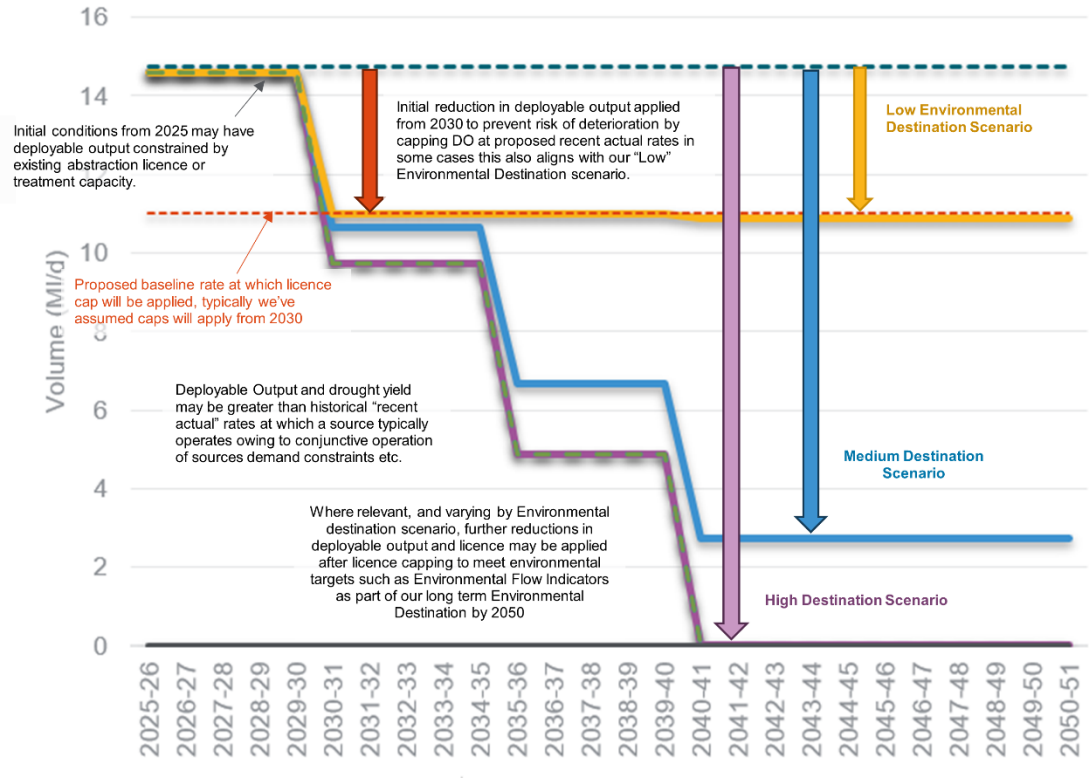

Figure 2: Schematic illustration of how we have applied licence caps to DO for each of our sources for our longer term Environmental Destination scenarios.

Table 7: Projected impacts of licence reductions on DO.

WRZ	Projected DO (DYAA) impact by return period (Ml/d)			
	1:2 (NYAA)	1:100	1:200	1:500
HKZ	-3.28	-3.28	-3.28	-3.28
HAZ	-1.40	-1.40	-1.40	-1.40
HRZ	-3.45	-3.45	-3.45	-3.45
HWZ	-6.51	-6.51	-6.51	-6.51
HSE	0.00	0.00	0.00	0.00
HSW	-20.84	0.00	0.00	0.00
IOW	-1.27	-1.27	-1.20	-0.86
SNZ	-8.15	-7.15	-5.55	-5.55
SBZ	-12.22	-6.85	-6.68	-6.38
SWZ	-9.58	-7.98	-7.91	-7.86
KME	-12.55	-9.28	-9.18	-8.97
KMW	-3.88	-3.42	-3.37	-3.31
KTZ	-13.83	-4.67	-4.54	-4.54
SHZ	-12.48	-3.04	-2.29	-1.56
Western area	**-36.75**	**-15.91**	**-15.84**	**-15.50**
Central area	**-29.95**	**-21.98**	**-20.14**	**-19.79**

Eastern area	-42.75	-20.41	-19.38	-18.38
Total for each return period.	-109.45	-58.30	-55.36	-53.68

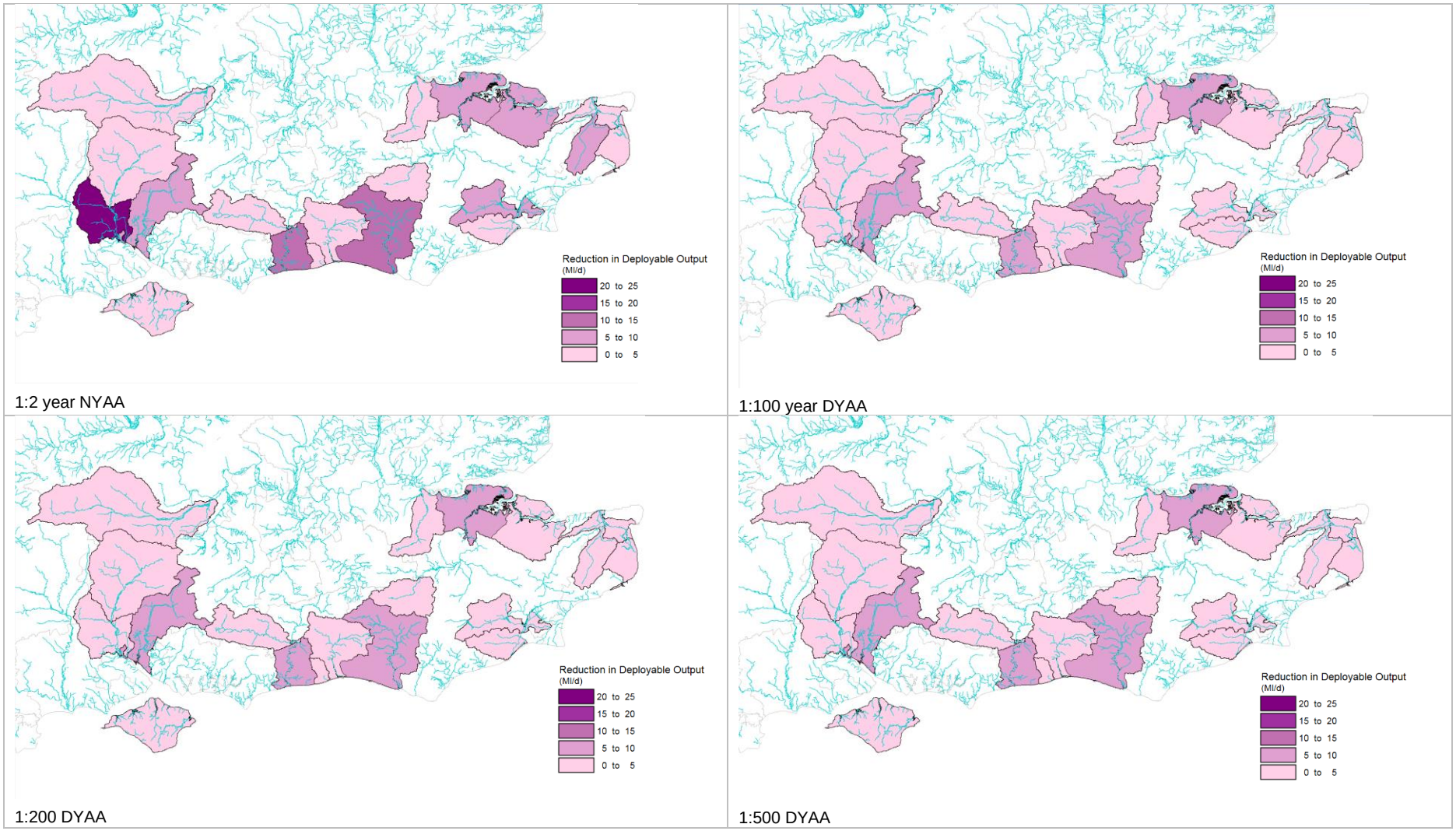

Figure 3: Impact of licence reductions on Deployable Output by return period and Environment Agency operational catchment.

3.2.1 Licence caps to prevent deterioration in Sussex Worthing WRZ

All of the SWZ groundwater sources were reviewed and assessed as having no risk of deterioration before 2030 and were classified as Priority C. Under the Environment Agency guidance, this would require investigation and options appraisal to be completed in AMP8, with mitigation if required, to be implemented in AMP9 (2030-2035) in line with our confirmed WINEP investigations.

Our WRMP24 final demand forecast for SWZ shows that DI reduces over time. The forecast reduction is a consequence of demand management which offsets any potential increase in demand as a result of population growth. The baseline DI under DYAA conditions is forecast to increase from 41.1Ml/d in 2025 to 42.5Ml/d by 2035, an increase 1.4Ml/d. Our final DI forecast for 2035, after implementation of demand management measures and in the absence of any other sustainability reductions, is 38.4Ml/d. The risk of deterioration is therefore low.

Unlike most WRZ, where we have proposed introduction of licence caps in 2030, we have assumed that this will occur after 2034 in SWZ. This was initially done to offset the delay to the delivery of Littlehampton recycling option and abandonment of the Sussex Coast desalination option in the Central area. We have however run a sensitivity test to see the impact of licence capping being forward to 2030 in SWZ as well. The results show that supply-demand balance can be achieved under this scenario as well. See Section 7 in the main fdWRMP24 Technical Report for details.

Implementation of licence cap from 2034 is still consistent with No Deterioration guidance which requires licence caps to be applied by 2035 at the latest if the risk of deterioration occurs after 2030.

Table 8 lists the sources in SWZ where licence caps are applied from 2034.

Table 8: List of sources in Sussex Worthing WRZ where licence cap is applied from 2034.

Source	Comment
Littlehampton	Potential licence cap
Arundel	Potential licence cap
South Arundel	Licence cap followed by further reduction to meet flow targets as part of long-term Environmental Destination
Long Furlong A	Licence cap followed by further reduction to meet flow targets as part of long-term Environmental Destination
Long Furlong B	Licence cap followed by further reduction to meet flow targets as part of long-term Environmental Destination
Durrington	Licence cap followed by further reduction to meet flow targets as part of long-term Environmental Destination
South Arundel A	Licence cap followed by further reduction to meet flow targets as part of long-term Environmental Destination
Worthing	Licence cap followed by further reduction to meet flow targets as part of long-term Environmental Destination
North Worthing	Licence cap followed by further reduction to meet flow targets as part of long-term Environmental Destination
North Arundel	Licence cap followed by further reduction to meet flow targets as part of long-term Environmental Destination
East Worthing	Licence cap followed by further reduction to meet flow targets as part of long-term Environmental Destination

3.2.2 Licence caps to prevent deterioration in Hampshire

The other area where we have applied licence caps after 2030 is Hampshire. In our Hampshire area, we have an existing baseline supply-demand balance deficit driven by changes to our abstraction licences in the Lower River Test and River Itchen in 2018.

These supply-demand deficits cannot be fully resolved without the use of drought permits and orders until the Havant Thicket Reservoir and Hampshire Water Transfer and Water Recycling Project (HWTWRP) are delivered. The HWTWRP will not be delivered before 2034. Any additional sustainability reductions that occur prior to 2034, either due to licence capping or from other drivers such as meeting Environmental Flow Indicators (EFI) or CSMG flow targets, serve to increase this existing supply-demand balance deficit. Our short-term resilience options (see Annex 20) partially reduce the volume of water needed from drought permits and orders in HSW, they do not do so fully and hence reductions would potentially lead to greater

use of drought permits and orders. Greater reliance on drought permits and orders in Hampshire is not supported by the regulators and other stakeholders in the area.

As a result we have imposed licence capping to our sources in Hampshire from 2027. This will allow HWTWRP to be delivered in addition to savings from demand management, which will create sufficient supply-demand balance surplus for abstraction licences to be reduced.

Table 9 lists the sources in Hampshire with dates for applying licence caps.

Table 9: List of Hampshire sources and dates for application of licence caps.

WRZ	Source	Year licence cap applied	Comment
HAZ	Andover	2027-28	Licence cap already agreed as outcome from WINEP investigation
HAZ	Near Whitchurch	2035-36	Site is presently asset constrained but potential licence cap assumed to remove licence headroom.
HAZ	Overton	2035-36	These sources are asset and licence constrained and recent actual rates assessed as being equivalent to deployable output. They were screened out of further No Deterioration Studies and do not appear in our WINEP programme for a No Deterioration Driver. However we still apply licence caps to all sites in 2035-36
HAZ	Whitchurch	2035-36	
HKZ	Newbury	2035-36	
HKZ	Near Basingstoke	2035-36	No Deterioration Investigation for 2025 Potential licence cap.
HWZ	Winchester	2035-36	Likely future licence changes arising from other drivers within the Itchen Catchment. We are not currently forecasting 'No Deterioration' based reductions for these sources however a licence cap has been built into sustainability reduction from the mid 2030s. .
HWZ	Alresford	2030-31	We propose to cease our Alresford abstraction in 2030 to meet obligations from other drivers (Habitats Regulations investigations in the River Candover).
HWZ	Barton Stacey	N/A	Source was screened out of No Deterioration Study and does not appear in WINEP for a No Deterioration Driver
HRZ	Romsey	2035-36	No Deterioration' investigation for 2027, however our potential for growth after 2030 and linked to short term resilience option.
HRZ	Kings Sombourne	2035-36	Potential for growth after 2030 linked to short term resilience option.
HSE	Itchen Surface Water	NA	No planned abstraction increase due to likely future licence changes arising from meeting CSMG flow targets, and hence we are not currently forecasting 'No Deterioration' based reductions.
HSE	Itchen Ground Water		
HSE	Twyford		
HSW	Test Surface Water	NA	Licence change already implemented in 2019 which removes risk of deterioration at this source, and so it has been removed from the WINEP for a 'No Deterioration' Driver.

We have tested scenarios whereby the introduction of licence capping and Environmental Destination occurred in 2030. However, this resulted in unresolved supply-demand deficits in some WRZs because there are no options that can provide the required DO and can be delivered by 2030 without placing additional reliance on drought permits and orders.

The offsetting of any supply-demand balance deficits introduced by future, but as yet uncertain, licence changes through increased utilisation of drought permits and orders, particularly in sensitive catchments does not necessarily achieve environmental improvement or meet environmental targets. Drought permits and orders potentially have environmental impacts of their own and their use effectively overrides the protections the Environmental Destination is seeking to resolve. We therefore do not consider it appropriate to introduce licence reductions in such situations that would result in more frequent or extended use of some drought permits and orders. We have therefore delayed the implementation of uncertain sustainability reductions until alternative supplies are available. Regardless of whether we use these sources under abstraction licences or drought permits or orders, they are needed until replacement sources are in place.

Our ongoing 'No Deterioration' investigations will continue to build an evidence base to support future decisions on abstraction licences through environmental monitoring and modelling. However, it is useful to emphasise that in many cases, we may need to further reduce our abstraction licences beyond just 'recent

actuals' to achieve sustainable abstractions and environmental flow targets (e.g. as shown in Appendix C and consistent with 'No Deterioration' guidance).

These further anticipated sustainability reductions are incorporated into our WRMP24 and have been used to define supply-demand balance scenarios to be considered as part of adaptive planning.

4 Assessing other impacts

4.1 Confirmed licence changes

We have included confirmed abstraction licence changes, also referred to as sustainability reductions, where licence changes have already been agreed with the Environment Agency following our AMP6 WINEP investigations and the 2019 changes to our Test and Itchen licences.

A summary of the confirmed reductions included in our baseline supply forecast is provided below.

- Our River Test surface water abstraction had a licence change in 2019. It included a condition for adjusted HoF conditions to vary seasonally on the channel of the Great Test and added further conditions to apply from 2027. This reduction is included in our baseline supply forecast but does not affect drought DO since it is already zero.
- Our Andover source in HAZ has a licence reduction and new monthly abstraction volumes due to be implemented from 2027. This reduction is included in our baseline supply forecast. These changes provide protection against deterioration in water body status by introducing a cap on water abstracted from the site. A larger sustainability reduction, which would restore river flows in the River Anton to EFI standards, was screened out of the AMP6 investigation on cost-benefit grounds, and the heavily modified nature of the waterbody. However, as part of our long-term Environmental Destination scenarios, the additional reduction to support EFI standards is being considered further.
- Our Newport and Lukely Brook sources (IOW) have licence reductions and new limits on monthly volumes. These licence changes provide protection against deterioration in water body status by providing a cap on abstraction output. A larger reduction, which would restore river flows to EFI standards was screened out of the AMP6 investigation on cost benefit grounds, and the heavily modified nature of the waterbody. However, as part of our long-term Environmental Destination scenarios, the additional reduction to support EFI standards is being considered further.

At present, we have no other confirmed sustainability reductions or licence changes which affect DO. All other uncertain licence changes in the longer term have been included within our Environmental Destination scenarios.

4.2 Time-limited licences

The Environment Agency guidance on preventing deterioration requires us to consider if ‘recent actual’ licence capping may be applied to any time-limited licences on renewal in the first instance and the risks of non-renewal. Key summary information for our time-limited licences is shown in Table 10.

Table 10: Summary of time-limited licences considered in our Environmental Destination scenarios.

Source(s)	WRZ	Operational catchment	Expiry date	Relevant studies and likely outcome
Itchen groundwater	HSE	Itchen	31/03/2025	Licence reductions applied in 2019. Currently under WINEP investigation with the regulatory drivers, Habitats Directive, SSSI and WFD.
Itchen surface water	HSE	Itchen	31/03/2025	

Source(s)	WRZ	Operational catchment	Expiry date	Relevant studies and likely outcome
Twyford	HSE	Itchen	31/03/2025	Investigations and options appraisal will conclude in March 2025. Draft outputs from the WINEP investigations are being used to inform discussions around the current licence renewals. The renewal will be subject to a derogations application, with an IROPI[9] test. Future licence changes following WINEP studies are likely and will be considered in our Environmental Destination scenarios. Given we have yet to deliver a long term water resource solution for Hampshire following the 2019 licence change, additional licence changes are likely to exacerbate existing baseline deficits.
Test Surface Water	HSW	Lower Test and Southampton Streams	31/12/2027	Licence reductions, including consideration of deterioration risk were applied in 2019. Additional conditions will apply from 2027 further restricting use and preventing deterioration. We do not currently expect further licence reductions under current WINEP unless CSMG flow standards are applied. Licence has been screened out of 'No Deterioration' risk and has no DO, except in normal years.
River Arun	SNZ	Lower Arun	31/3/2022 Renewed 31/07/2024	Application submitted to Environment Agency in December 2021. The Environment Agency has given us permission to continue abstracting until the application is determined. New licence time limited to 31st March 2030.
Robertsbridge (Darwell Reservoir)	SHZ	Rother Levels	01/04/2025	This operational catchment is currently not flagged as high priority and was not considered as requiring licence reduction in Environment Agency Environmental Destination review. There are no active WINEP investigations, and we expect licence to be renewed.
River Medway	KMW	Lower Medway	31/12/2025	There are no active investigations, we expect licence renewal to be time limited.

4.3 Common Standards Monitoring Guidance

The CSMG set out by Natural England aim to establish a consistent approach across the UK for monitoring the condition of protected sites designated under various legislation like SSSIs, SACs, SPAs, and Ramsar sites. The CSMG flow targets were based on research undertaken by Natural England[10] and were endorsed by the Joint Nature Conservation Committee[11].

A key principle of the CSMG flow targets is to ensure tighter restrictions on the amount of water that can be abstracted compared to the expected 'natural' flow, with the allowable change in flow (for example due to abstraction) from a natural baseline. The targets vary based both on the size of the river in question and the natural flow state. Therefore, larger changes in flow would be allowable at higher flow rates but much tighter restrictions would apply when flows are lower.

A key difference between CSMG flow targets and WFD flow targets such as the EFI is that CSMG targets apply across the entire range of the River hydrograph, i.e. even under high or average flows whilst EFIs tend to be focused on low flow conditions (e.g. Q_{95}). This is critical in the context of water resource planning since significant impacts on normal year DO may result from application of CSMG standards rather than just during low flows or droughts as might be the case with a EFI-based HoF condition or similar.

[9] IROPI = Imperative Reasons of Overriding Public Interest
[10] An evidence base for setting flow targets to protect river habitat - NERR035 (naturalengland.org.uk)
[11] Common Standards Monitoring Guidance for Rivers (jncc.gov.uk)

4.3.1 Our CSMG WINEP investigations

We identified a requirement for investigations through our AMP7 (2020-2025) WINEP to determine if abstraction licences are impacting on the ability of flows in the River Test and its tributaries to achieve favourable condition for SSSI, as defined by Natural England's CSMG daily flow time series standards, and also to protect Salmon as proposed by the Salmon 5 Point Approach[12]. Work was also required to clarify the hydrological regime status of the Test in relation to EFI thresholds set by the Environment Agency to support WFD good ecological status.

In parallel, we were also required to undertake an investigation to determine if abstraction licences are impacting on the ability of flows in the River Itchen and its tributaries, to achieve favourable condition for SSSI and riverine SACs, as defined by Natural England's CSMG daily flow time series standards and described in the European Site Conservation objectives for the River Itchen SAC, and also to protect Salmon, as proposed by the Salmon 5 Point Approach.

The objective of our AMP7 CSMG WINEP investigation was not to establish the science or benefits of applying CSMG flow standards to these rivers, but to consider the potential changes to abstraction required to meet the flow targets as defined in guidance.

The investigation and options appraisal for both the Test and the Itchen took place between 2020 and 2022. The results[13] were shared with Natural England and the Environment Agency.

Groundwater and river flow modelling carried out for the CSMG and associated WINEP investigations indicated that the only way to meet the CSMG flow standards under investigation - all the time and throughout the SSSI protected reaches associated with the River Itchen SAC - would be by cessation of current typical abstraction at our Alresford source (~2.9 Ml/d), combined with significant reductions at Itchen and Twyford sources under most flow conditions in addition to the much greater loss of potential peak pumping rates during droughts. Cessation of abstraction or significant reduction would also be needed at a South East Water's source to achieve compliance with the 'very close to natural' headwater flow standards set for the Candover Stream. Capping of abstraction at a Portsmouth Water source on the Lower Itchen close to current rates would also need to be considered, linked to the discharge rates from an upstream wastewater treatment works.

To meet CSMG targets, multi-stepped HoF constraints would be likely required with dynamic daily management of abstraction rates to maintain compliance. Table 11 indicates potential example of a multi-level set of HoF conditions for the Lower River Itchen abstraction at Itchen WSW of the type that would potentially be required to be imposed to meet CSMG flow standards.

In addition, the investigation showed that only way to meet the CSMG or high sensitivity EFI flow standards under investigation - all the time and throughout the SSSI protected reaches associated with the River Test - would be by complete cessation of current typical abstraction at Southern Water Service's Overton, Whitchurch and Alresford sources, combined with significant flow-dependant reductions at the River Test source in addition to the much greater loss of potential peak pumping rates during droughts. Further

[12] Environment Agency et al, 2020, Salmon Five Point Approach – restoring salmon in England, Annex-1-Salmon-Five-Point-Approach-Restoring-Salmon-in-England-v2.pdf (anglingtrust.net)
[13] Wood, 2022. River Test CSMG flow target and Salmon Five Point Approach WINEP investigations, Investigation and Options Appraisal Report

significant reductions in the abstraction and discharge associated with a papermill in the upper Test would also be needed.

Table 11: Itchen WSW and Twyford HoF constraints (at Allbrook and Highbridge) for possible CSMG compliant multi-level HoF.

Flow exceedence percentile (%)	Hands off Flow Constraint	Modelled Natural Flow	Abstraction Limit (Ml/d)*
Maximum		1838.32	68
10%		920.29	68
30%	HOF6	639.66	68
50%	HOF5	555.83	40
70%	HOF4	462.98	27
90%	HOF3	373.94	17
95%	HOF2	346.82	14
99%	HOF1	305.78	11
Min	MRF	274.27	0

*includes a 10% factor of safety within compliance targets and accounts for the impacts of upstream abstraction

Figure 4 summarises the overall assessment of EFI and CSMG flow target compliance for the River Test and Itchen as a result of our WINEP investigations.

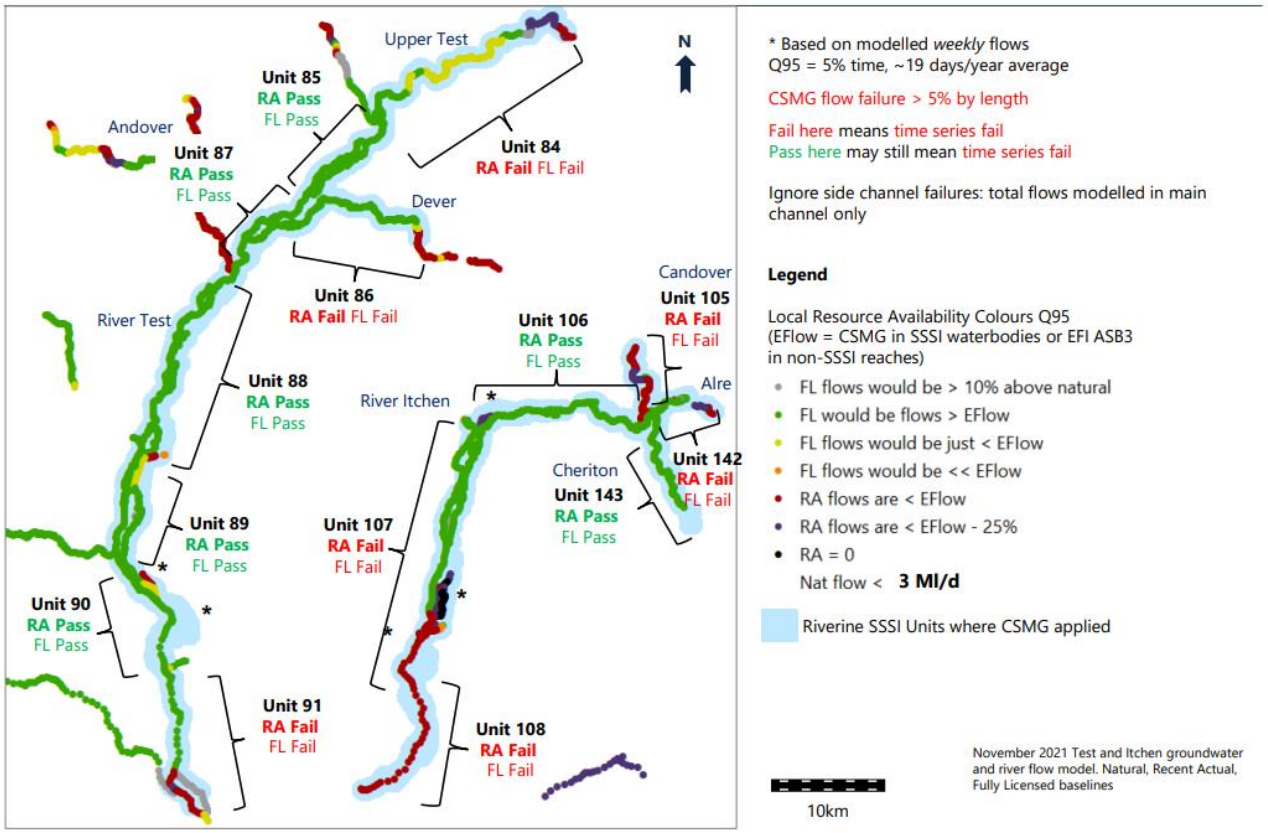

Figure 4: Spatial screening of 'recent actual' and 'fully licensed' Q_{95} flow compliance with EFI and SSSI unit CSMG standards (failures defined where reaches are > 5% non-compliant by length).

4.3.2 Incorporation of CSMG flow standards in our Environmental Destination scenarios

During development of our dWRMP24, the timing at which we will be required to meet the CSMG flow conditions has, up until recently, been uncertain. The position of CSMG flow standards within regional WRSE planning was also unclear; for example, the extent to which CSMG flow standards represented

Business-as-Usual (BAU) or minimum legal requirements or as a part of an 'Enhanced' set of environmental outcomes.

Natural England has updated the River Itchen SAC integrity targets to include the CSMG flow standards. The Environment Agency confirmed in autumn 2023 that the CSMG flow targets would apply in consideration of our 2025 River Itchen surface water and River Itchen groundwater licence renewals. Unlike the River Itchen, the River Test is not designated as a SAC, and as yet it is not clear if and when CSMG flow targets would be implemented for the Test. In our developing out Environmental Destination scenarios, we have been conservative and under our 'High' (Alternative) Environmental Destination scenario, we have assumed that CSMG flow standards could potentially be applied in the future to the River Test. This has little material impact on DO as the DO of the source under drought conditions is already zero.

When we received the 'Enhanced' scenario from WRSE, our review of the outcomes for the Lower Itchen licences suggested that the magnitude of the DO impact, as evident from our WINEP investigations, had been underestimated. In particular the 'Enhanced' scenario had underestimated the potential DO loss needed to ensure compliance under 'normal' year conditions and any impacts on peak abstraction. We therefore included larger sustainability reductions in our company specific 'Alternative' scenario that was designed to meet the CSMG targets as identified in our WINEP study.

Whilst timelines on the implementation of CSMG are clearest for the time-limited Lower Itchen and River Test abstraction licences, the implementation for the Upper Test abstractions is less clear. Our Overton and Whitchurch sources are not currently time-limited licences and are also not the subject of any active WINEP studies that might trigger a licence review as they have been screened out of our 'No Deterioration' studies. However, the WINEP review indicated that both sites would need to eventually cease abstraction to allow CSMG targets for the Upper River Test to be met.

Table 12 describes how we have accounted for the potential magnitude of licence reductions required to meet CSMG flow targets within our Environmental Destination scenarios.

Table 12: Summary of inclusion of CSMG standards in our Environmental Destination scenarios.

Source	WRZ	Potential DO loss	CSMG WINEP recommendation	Environmental Destination
Alresford	HWZ	4.55Ml/d	Cessation of Abstraction	Cessation of abstraction and licence revoked in 2031'
Winchester	HWZ	18.17Ml/d	Not required to meet CSMG standards but reductions possible to support Itchen Wetland receptors	Licence reduction to 13.30Ml/d (Enhanced/Low scenario), 9.91Ml/d (Central/Medium scenario), Cessation of abstraction under High/Alternative scenario by 2040 once potential impacts on Itchen Wetlands Habitat sites considered.
Itchen Surface, Itchen Ground and Twyford	HSE	77Ml/d	Significantly constrained by multi-level HoF across all flow conditions with raised MRF.	Cessation of abstraction under High/Alternative scenario by 2040 once potential impacts on Itchen Wetlands Habitat sites considered.
Overton	HAZ	1.5Ml/d	Cessation of Abstraction	Licence cap in 2036, cessation of abstraction and licence revoked in 2041.
Whitchurch	HAZ	1.5Ml/d	Cessation of Abstraction	Licence cap in 2036, cessation of abstraction and licence revoked in 2041.
River Test	HSW	0 to 65Ml/d	Significantly constrained by multi-level HoF across all flow conditions with raised MRF.	Site has no current drought DO due to existing HoF conditions. Normal year DO/licence capped at 50Ml/d in 2036 in line with Q_{50} outcome from multi-step HoF. Licence cap at 30Ml/d (Q_{70} outcome) under the High scenario. No abstraction at greater exceedance flow percentiles.

For our Alresford source in the Candover Stream catchment, we are already committed to deliver an interim nature-based solution in AMP8, delivering ecological resilience specifically focused on possible Alresford abstraction impacts. Our plan also assumes that we will revoke this licence in 2030 and this outcome is included in all of our WRMP Environmental Destination scenarios.

We have also considered a scenario under which CSMG flow standards would be applied early in the planning cycle as part of the 2025 Itchen licence renewals. This scenario results in unresolved supply-demand deficits under all planning scenarios. See section 7.4.2 of our fdWRMP24 Technical Report for details.

Through ongoing discussions with the Environment Agency and Natural England, the emerging outcome of the River Itchen Licence renewals is that we are preparing a Habitats Regulations derogation case to support our need for the River Itchen surface water and Itchen groundwater sources until new sources such as the HWTWRP and Thames to Southern Transfer (T2ST) are delivered. This will include consideration of appropriate mitigation and compensatory measures. We will continue to engage with the Environment Agency and Natural England regarding CSMG in the lead up to the renewal of the River Test abstraction licence in 2027.

4.3.3 Further work

We will be carrying out a further WINEP investigation in AMP8 to establish and further quantify the ecological benefits of applying CSMG flow standards to the affected reaches of the River Test and River Itchen.

Considerable uncertainties remain as to what a CSMG compliant licence might look like and how in could be implemented in practice, since it would require significant additional real-time monitoring of flows and dynamic daily abstraction control as well as a complex set of stepped HoF conditions that would need to be met as flows naturally vary.

Future regulatory decisions on the application of CSMG flow targets to individual river channels would further tighten constraints. Our WINEP study suggested that individual channel flow regulation would only serve to confuse abstraction management, especially for the River Itchen, and would result in greater uncertainty of flow assessment.

We are not aware of a case where such a licence has yet been established and further consultation will be needed with both the Environment Agency and Natural England to define an appropriate suite of licence conditions.

5 Environmental Destination scenarios

5.1 Overview of development

The development of our Environmental Destination scenarios builds on the initial work undertaken by the Environment Agency to understand the long-term overall scale of regional environmental needs for additional water by 2050. A brief summary of the Environment Agency approach is given for context.

5.1.1 Environment Agency long-term forecast

The Environment Agency undertook an assessment based on the high level of drought resilience (1-in-500 year or 1:500 drought) required by the government, to ensure a greater level of environmental protection than currently included in water company plans. For each of its five regions, the Environment Agency made an assessment for the amount of water required by 2050, from a combination of potential savings from demand management, infrastructure projects and drought actions. It also assessed where there might be surplus water at the regional level for potential future use by other regions.

The Environment Agency through the Catchment Abstraction Management Strategies (CAMS) reviews, assesses water needs, to determine the volume of water required to address unsustainable abstractions that might be impacting the health and condition of WFD water bodies.

It has developed four policy-based scenarios to achieve long-term sustainable abstraction, and to refine the understanding of the scale of reductions to abstractions required to protect the environment and meet public water supplies by 2050. The scenarios are:

- **Business As Usual (BAU):** This scenario assumes policy and regulatory approach stays the same with the same level of protection of natural flows, but the natural flows are adjusted for the impact of climate change on rivers and groundwater and the water bodies are assumed to alter in response. This scenario initially discarded licence changes in water bodies, which were previously determined to be uneconomic through cost-benefit assessments as part of WINEP Restoring Sustainable Abstractions (RSA) option appraisals.
- **Enhanced:** This scenario provides greater environmental protection for protected areas and SSSI rivers and wetlands, principal salmon and chalk streams. The most sensitive flow requirements are applied including the CSMG that sets water quality and quantity targets for designated sites. The natural flows for rivers and groundwater balances are altered for climate change. This scenario increases the proportion of natural flow required to protect the environment. The flows and balance test will evolve over the timeframe due to climate impacts.
- **Adapt:** This scenario allows for future policy change given that not all environmental objectives can be achieved in a shifting climate. It allows flexibility on the level of protection that can be achieved for less sensitive or modified water bodies allowing continuation of planned water abstraction. It also allows for evolving and adapting river flow and groundwater balance for climate change.
- **Combined:** Includes all the above, with greater sensitivity for protected areas etc. but with a view that good status cannot be achieved everywhere (with shifting climate) and requires more detail to understand how best to protect the environment.

The Environment Agency has carried out an impact assessment of these potential policies, which assume water company licence changes planned between 2020 and 2025 had already occurred. The forecasts include the impact of climate change on natural flows by 2050 and future predicted abstractions, reflecting planned patterns of demand, were also used. They indicated a considerable amount of additional water for the environment is required, about 880Ml/d nationally, to meet Environment Agency targets by 2027 (based on ‘recent actuals’).

These scenarios formed the initial basis for sustainable abstraction scenarios. These have been superseded and continue to be developed as local and regional knowledge and data is incorporated.

5.1.2 Developing regional and our own Environmental Destination scenarios

We have developed and continue to work with our own Environmental Destination scenarios to understand the long-term overall scale of regional environmental needs for additional water by 2050 based on the high level of drought resilience (1:500 drought). These are formed through taking on board current guidance, policy and evidence from the emerging outcomes of our WINEP investigations. Being a member and contributor to the work done by WRSE, we are involved in developing the regional plans and have worked with the Environment Agency to develop Environmental Destination scenarios both for the region and Southern Water. These scenarios are based on our own knowledge and understanding of the environment, combined with consultation with the Environment Agency regional and local teams.

During this process we also developed our own specific Environmental Destination scenarios (**Central and Alternative**) to reflect the likely environmental requirements for highly sensitive catchments such as the Arun Valley and the River Itchen (see Appendix D). These scenarios helped to determine the long-term implications of maximising sustainable abstractions and the associated scale of regional schemes, such as desalination plants and water recycling, to address the generated deficits.

- For our '**Central scenario**', we developed a pragmatic approach based on emerging outcomes from our current, largely 'No Deterioration' WINEP studies, considering known and planned for likely changes to sources. This scenario was originally based on BAU+, addressing our company specific understanding. It included effects like 'recent actual' licence reductions, emerging outcomes from WINEP, and outcomes from a review of listed sources to remove non-operational mothballed sources that no longer exist.
- For our '**Alternative scenario'** we developed what we considered to be a best-case scenario in terms of maximising environmental benefit but a reasonable worst-case scenario in terms of future supply reduction. This scenario is based on the approach used in the Enhanced scenario that maintains and improves protected areas, but goes further to seek maximum environmental benefit by assuming some of our chalk sources are no longer viable for abstraction. In effect, under this scenario, we proposed to cease abstraction from all sources within the River Itchen catchment, and would also cease abstraction from our Pulborough source in the Arun Valley. This scenario was used as a stress test for the system to understand the long-term implications of sustainable abstractions and determine the scale of regional solutions required to address the deficit, such as desalination plants, water recycling schemes and large-scale company transfers.

The WRSE-led Environmental Destination scenarios were then redefined and renamed **'High', 'Medium', and 'Low'** in 2022[14] to relate more directly to the adaptive planning approach. The 'High' environmental scenario best aligns with BAU+, which is the minimum environmental ambition scenario required to be considered in WRMPs. It has therefore been used as a reference scenario for regional planning. Appendix D describes the context and assumptions around the development of these Environmental Destination scenarios in more detail. Section 6 summarises the link between the regional scenarios and adaptive planning.

[14] WRSE, 2022. Method Statement: Environmental Destination, Post-consultation version January 2022

Figure 5 shows the linkages and conceptual development process between the Environment Agency scenarios, the company scenarios and the scenarios developed by WRSE at the regional level.

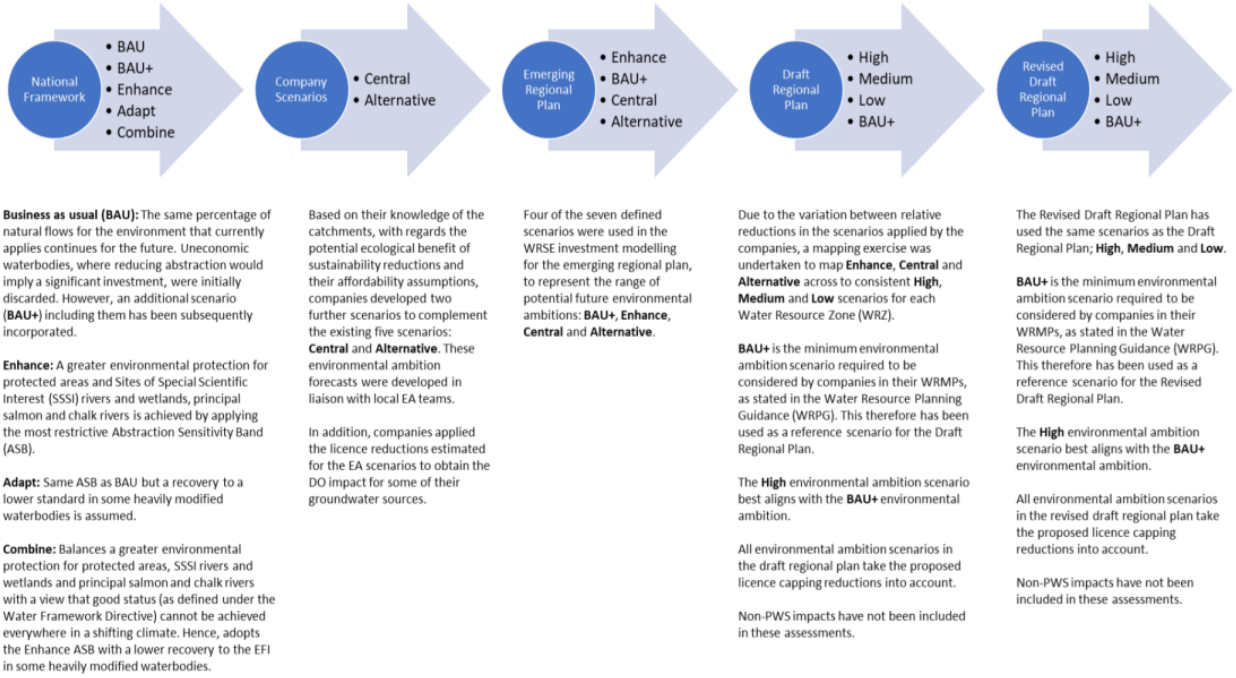

Figure 5: Development of WRSE's environmental ambition scenarios on the basis of the National Framework.

For Southern Water, the required licence and abstraction reductions determined by WRSE under each of the combined WRSE and Environment Agency scenarios are presented in Table 13.

Table 13: Summary of licence and abstraction reductions required for Southern Water to meet flow and environmental targets for each scenario as determined by WRSE.

Scenario	Baseline (Ml/d)	**BAU** – policy & regulatory approach stays the same (Ml/d)	**Adapt** – allows for flexibility with future policy changes and evolution of water body flows from climate change (Ml/d)	**BAU+** - as BAU but includes uneconomic water bodies (Ml/d)	**Combined** – includes BAU, Enhanced & Adapt but allows for future changes in water body status targets (Ml/d)	**Enhanced** – greatest protection for Protected Areas & chalk streams with most sensitive flow targets (CSMG) (Ml/d)
Licence	1,179	-320	-640	-645	-695	-698
Future abstraction	578	-78	-176	-181	-210	-213

The following sections describe the likely timing (prioritisation of operation catchments) and magnitude (Environmental Destination scenarios) for our own sustainability reductions and their development. We also discuss the long-term sustainability requirements for the River Test and River Itchen and water sources in the vicinity of Pulborough in the Arun Valley, which are highlighted as a particular concern.

5.2 Determining the timing of Environmental Destination

By using information from our previous and ongoing WINEP investigations, we have determined the possible reductions in abstraction that are likely to be required. However, much more uncertainty exists regarding the

timing of required licence changes in the medium to long-term, both to meet environmental flow targets and to prevent the risk of deterioration.

To address this uncertainty, we have applied a prioritisation approach to help us act sooner in catchments where there is a greater degree of certainty of the benefits of restoring flows, and where the potential impacts are greatest.

A semi-quantitative set of screening principals was initially developed by WRSE Environmental Advisory Group (EAG), in consultation with the Environment Agency[15]. We have applied this screening principal approach, at a WFD water body scale, to each of our abstraction sources.

The approach is summarised in Table 14. It sets out a prioritisation of timing of licence reductions in the medium to long term and incorporates the following:

- Is weighted towards the most vulnerable catchments, for example, those with protected sites or chalk streams.
- Favours reductions where the benefits will be greatest, for example, in headwater catchments or where flow impacts will be greatest or more certain.
- Prioritises catchments with public amenity benefits using population within the catchment as a proxy. Note that for catchments where there is only a groundwater benefit, for example parts of the Brighton Chalk block we have assumed there would not be a benefit to people as these changes would not be visible.

Table 14: Our Environmental Destination prioritisation approach based on methodology agreed by the WRSE Environment Assessment Group.

Aim	Proposed method	Score	
Highest ecological potential	Protected area (SSSI etc.)	Present in catchment	+2
	Biodiversity Action Plan Water bodies (e.g. chalk stream)		
	Flagship chalk stream		
Maximise benefit	Upstream first (prioritise head waters over downstream water bodies)	Headwaters	+2
Certainty of benefit (to flow and ecology)	Scored using available evidence and knowledge of each catchment. Environment Agency technical teams to propose scores taking into account: • Level of certainty that reducing abstraction results in improved flow • Significance of other issues in the catchment which may limit ecological improvements in the short to medium term (e.g. water quality and modified habitat)	High Medium Low	+2 +1 0
Scale of issue	% below EFI Measure of whether current average low flows (Q_{95}) are meeting the standard flow target (EFI) Option to use abstraction as a % of recharge as an alternative for some catchments (e.g. where a discharge masks the scale of issue using the EFI method)	25% below EFI Below EFI	+2 +1
Benefit to people	Population in catchment (rank catchments; top third are ranked High, middle third are ranked Medium and bottom third are ranked Low)	High Medium Low	+2 +1 +0

[15] Environment Agency 2021. EAG Feedback on Prioritization Ideas, WRSE EAG meeting 18-10-21

The results of our prioritisation approach were shared with the Environment Agency. It considers an independent assessment conducted by the Environment Agency which followed similar principles, except that scores allocated for protected areas or benefit to people were not included the assessment.

WRSE further developed the prioritisation approach including additional metrics on population, accessibility (in relation to tangible benefits of reductions) through consideration of drinking water protected areas and Natural England recovery list of sites.

A comparison of all three prioritisation assessments is presented in Table 15.

Table 15: Comparison of Environment Agency, WRSE and Southern Water prioritisation assessments (excluding protected areas and population) priority scores, with our proposed time horizon.

Operational catchment	Environment Agency prioritisation score (Max 6) [Rank]*	WRSE prioritisation score (Max 15) [Rank]**	Southern Water prioritisation Score (Max 9) [Rank]	Our proposed horizon for reductions
Isle of Wight Rivers	5 [Rank 3]	9 [Rank 1]	10 [Rank 8]	High Priority (2040)
Upper and Middle Test	3 [Rank 13]	9 [Rank 1]	12 [Rank 4]	High Priority (2040)
Upper Ouse	5 [Rank 3]	9 [Rank 1]	12 [Rank 4]	High Priority (2040)
Teville	5 [Rank 3]	9 [Rank 1]	8 [Rank 12]	High Priority (2040)
Lower Arun	6 [Rank 1]	9 [Rank 1]	12 [Rank 4]	High Priority (2040)
Itchen	6 [Rank 1]	8 [Rank 6]	15 [Rank 1]	High Priority (2040)
Little Stour and Near Canterbury	4 [Rank 10]	8 [Rank 6]	9 [Rank 10]	High Priority (2040)
White Drain and Lakes	5 [Rank 3]	8 [Rank 6]	9 [Rank 10]	High Priority (2040)
North and South Streams	4 [Rank 10]	8 [Rank 6]	8 [Rank 12]	High Priority (2040)
Kennet	5 [Rank 3]	7 [Rank 10]	14 [Rank 2]	Medium Priority (2045)
Lower Test and Southampton Streams	3 [Rank 13]	6 [Rank 11]	11 [Rank 7]	Medium Priority (2045)
Western Rother	3 [Rank 13]	6 [Rank 11]	7 [Rank 14]	Medium Priority (2045)
Darent	5 [Rank 3]	6 [Rank 11]	13 [Rank 3]	Medium Priority (2045)
Upper Adur	5 [Rank 3]	5 [Rank 14]	10 [Rank 8]	Medium Priority (2045)
Upper Medway	1 [Rank 17]	3 [Rank 15]	6 [Rank 17]	Low Priority (2050)
Stour Marshes	0 [Rank 19]	3 [Rank 15]	5 [Rank 18]	Low Priority (2050)
Brede and Tillingham	4 [Rank 10]	3 [Rank 15]	7 [Rank 14]	Low Priority (2050)
Lower Medway	0 [Rank 19]	2 [Rank 18]	7 [Rank 14]	Low Priority (2050)
Rother Levels	1 [Rank 17]	1 [Rank 19]	3 [Rank 19]	Low Priority (2050)
Thanet	2 [Rank 16]	0 [Rank 20]	2 [Rank 20]	Low Priority (2050)

*Excludes protected area and population benefit scoring.

**Includes changes to protected areas, benefits to people, chalk streams

When the relative differences in scoring were converted to rankings, the three assessments broadly agree and, for us, places particular focus on the catchments of the River Itchen, River Test, River Arun and IOW streams.

There are also a few catchments where we suggested revisions to the WRSE prioritisation scores based on catchment specific details. These are summarised below:

- There was no chalk stream score for the IOW rivers which we consider to be incorrect as there are several headwater streams (e.g. Lukely Brook, Caul Bourne) within that operational catchment (although the geology is quite mixed).

- There is no chalk stream score for the White Drain, Teville Stream and Lower Arun catchments all of which have chalk groundwater inputs (streams then flow over younger strata).
- Assessment scores for (and therefore rank) the rivers Darent and Kennet are a little lower, falling into our middle band. This is probably as our potential flow impacts for both are more limited in reach length, compared to other WRSE companies. We have only one source in each catchment, so we did not assess impacts across the entire catchment. For example, we have no abstractions which impact on the River Darent headwaters as this falls outside our supply area.

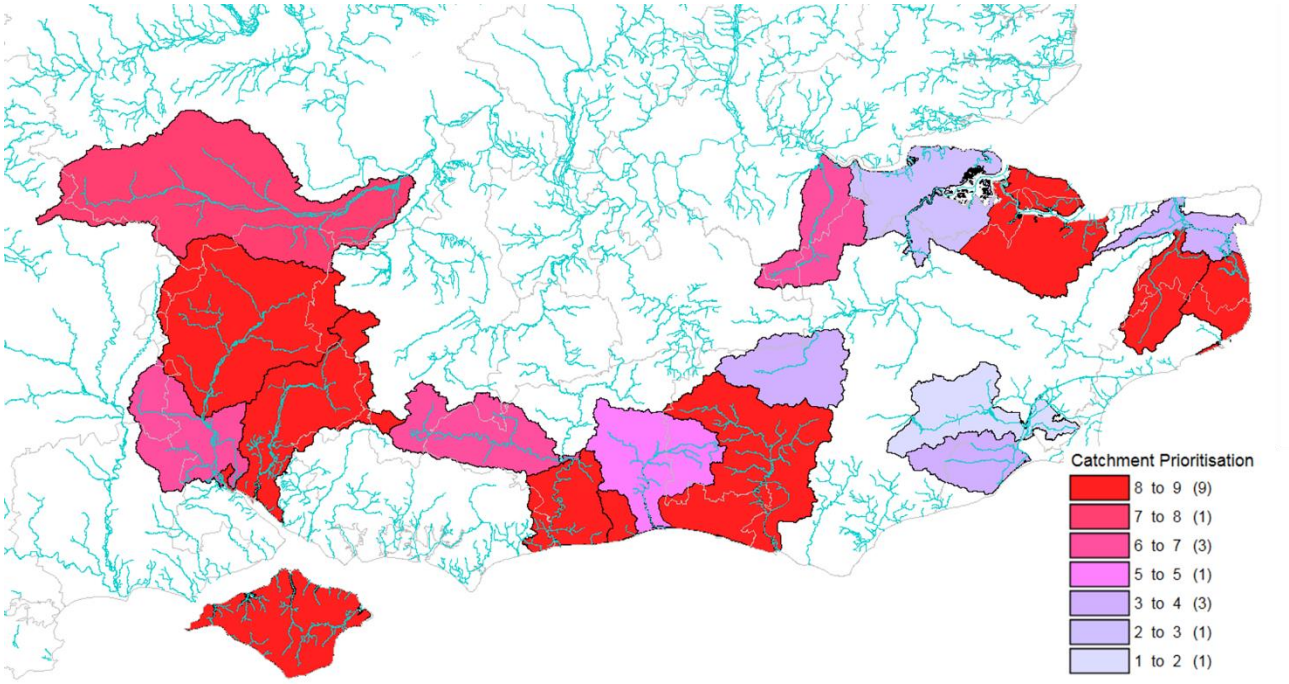

Figure 6: Summary of our catchment prioritisation scores showing operational catchments. Those scoring 8 to 9 are Test Upper and Middle, Itchen, Isle of Wight, Arun Lower, Ouse Upper, North and South Streams, Little Stour and Near Canterbury near Canterbury and Thames Basin White Drain and Lakes.

In view of the differences around the characterisation of some catchments in the WRSE level assessment, we have chosen to adopt our internal prioritisation approach based on the original set of criteria agreed by the EAG and Environment Agency. These are mapped at an operational catchment level in Figure 6.

In our assessment, we have aggregated the scores from river basin water bodies to operational catchments and have used these to propose three different time horizons for prioritising abstraction reductions based on a high, medium and low ranking. For operational catchments the highest scoring water body in each catchment has been used to set priority.

To aid profiling of our abstraction reductions, we propose that the highest priority scores (>7) should be addressed in 2030s or early 2040s (depending on options). Medium scores (5-7) should be addressed in the 2040s and lowest scores (<5) by 2050.

However, we recognise that whilst the prioritisation scores should be respected as much as possible, it might not be possible to achieve our ambition scenarios at the proposed target dates of 2040, 2045, and 2050 due to the complexity and long lead times associated with some of our supply options.

Additionally, with the supply and demand options required to address deficits, the lost water might not be available at the time given by the prioritisation score which could result in deficits in our plan that cannot be

solved by new water resource or water efficiency options in time for our initial Environmental Destination to be met.

To try and reduce the risk of such unsolvable deficits, we reviewed the availability of new resource schemes in our plan. This allowed us to identify the most beneficial timing for the licence change to occur. For example, if we know that a catchment-wide solution, such as a water recycling plant, is to be constructed, a delay in licence change by a few years can help reduce the need for temporary, extra short-term solutions.

Whilst waiting for such schemes to be constructed and licence changes to occur, we have planned through a WINEP scheme in some operational catchments to implement interim ecological resilience mitigation measures such as river enhancement to prevent deterioration of the water body until licence changes can be delivered.

The viability and design of these interim ecological resilience schemes will be considered as part of our formal WINEP options appraisal process, to ensure that these solutions themselves result in environmental improvements.

5.2.1 Profiling the timing of reductions in the medium to long term for the regional strategy

We reviewed earliest availability of new resource schemes in the Emerging Regional Plan by WRSE for each WRZ and determined the yield profile for the 1:100 Dry Year Annual Average (DYAA) and 1:500 DYAA return periods for each of the environmental scenarios (BAU+, Central and Alternative).

To adjust the profile, we changed the date at which the Environmental Destination was achieved for each source to reflect the final year of the AMP period, e.g. if a new regional bulk transfer scheme was available in 2042 then the end date for the profile was 2045. We noted the assumptions for the change and amended the profile across each of the Environmental Destination scenarios. The schemes were then assigned against their associated sources to determine when they would first take effect for each of the different scenarios in both planning periods.

5.3 Potential abstraction reductions based on Environmental Destination scenarios

5.3.1 Summary for our Central and Alternative scenarios

A comprehensive summary Environmental Destination profiles is presented in Appendix C and shown in Table 16. These include time series of source potential licence reductions under different scenarios, key metrics about licence volumes, licence cap, operational catchment, DO, summary of rational for the different scenarios and brief detail of the ongoing WINEP or other environmental investigations.

Crucially, the 1:500 DO reductions under our ambitious scenarios go much further than those required under a licence reduction to ‘recent actual’ to prevent deterioration under all scenarios. These will therefore not only prevent deterioration but aim to actively deliver flow and water balance improvements in our WRZs.

It is worth noting that where WRZs show similar or identical reductions across scenarios, it is either because the policy decisions align, or where our best available information for our local scenarios (Central and Alternative) is not yet robust enough to justify a departure from BAU+ and/or Enhanced. This is particularly the case in our Eastern area (consisting of KME, KMW, KTZ and SHZ) where we are still undertaking a large number of WINEP investigations to understand our potential abstraction impacts. Until those investigations conclude, we do not have sufficient evidence to suggest alternative reductions or flow targets. Generally, we have greater confidence in the volume of reductions required for our Central and Western areas as there has been a longer history of investigation and impact assessment through mature groundwater modelling

developed over a number of AMP cycles (e.g. through RSA, Habitats Directive or WFD 'No Deterioration' investigations).

Table 16: Summary of abstraction reductions proposed in our four Environmental Destination scenarios and their mapping to 'High, 'Medium' and 'Low' adaptive planning scenarios.

WRZ	Licences (Ml/d)	WINEP ' No Deterioration' recent actual' (Ml/d)	Future predicted (Ml/d)	Reduction in DYAA Deployable Output (1-in-500 year drought) by 2050 (Ml/d)			
				BAU+	Enhanced	Central	Alternative
HKZ	8.70	5.40	1.12	-4.63	-4.63	-4.16	-4.16
HAZ	25.51	18.44	14.55	-8.59	-11.61	-12.40	-15.54
HRZ	18.68	6.90	6.14	-3.45	-3.45	-3.45	-3.45
HWZ	23.85	17.32	16.44	-6.68	-6.68	-12.80	-22.71
HSE	118.02	80.00	61.21	0.00	0.00	0.00	-20.49
HSW	80.00	52.70	52.56	0.00	0.00	0.00	0.00
IOW	57.23	24.30	25.78	-10.25	-11.02	-8.06	-14.25
SNZ	121.00	79.70	63.75	-6.41	-6.8	-6.76	-8.23
SBZ	111.25	89.00	68.93	-25.27	-39.44	-6.48	-20.99
SWZ	64.67	50.40	37.69	-7.86	-17.87	-7.86	-19.72
KME	88.73	74.44	54.84	-48.14	-48.51	-20.27	-48.51
KMW	297.27	102.36	104.64	-20.63	-22.42	-3.31	-22.70
KTZ	94.57	45.50	40.06	-23.01	-29.56	-11.94	-29.56
SHZ	59.08	24.25	24.54	-1.56	-1.56	-1.56	-1.56
Western area total	**331.99**	**205.06**	**177.8**	**-33.6**	**-34.37**	**-37.85**	**-77.58**
Central area total	**296.92**	**219.1**	**170.37**	**-39.54**	**-64.11**	**-21.1**	**-48.94**
Eastern area total	**539.65**	**246.55**	**224.08**	**-93.34**	**-102.05**	**-37.08**	**-102.33**
Total	1168.56	670.71	572.25	-166.48	-200.53	-96.03	-228.85

Legend	'Low' Environmental Destination Adaptive Planning Scenario	'Medium' Environmental Destination Adaptive Planning Scenario	'High' Environmental Destination Adaptive Planning Scenario

5.3.2 Change in reductions over time

To ensure that we are taking appropriate action when required, we have prioritised our licence reductions based on environmental need and likely delivery timelines from our current WINEP. In designing these profiles, we have assumed the following:

- In our Central scenario, River Itchen catchment reductions occur between 2030 to 2035 as a linear profile reflecting AMP9 delivery following conclusion of our AMP6/AMP7 WINEP studies.
- For the additional River Itchen reductions in the Alternative scenario up to and including cessation of abstraction, we have assumed this applies as a linear profile over and above the Central scenario with the final destination being achieved by 2050.
- A step change (licence revocation) is applied to our River Medway source in 2030 in line with expected WINEP outcome in 2030.

- To reflect our current 'No Deterioration' WINEP drivers, the vast majority of which conclude in 2027, we have assumed implementation of licence changes from AMP9 via phased reductions between 2030 and 2050. This applies to our SWZ, KMW, KME, KTZ, HRZ and HKZ WRZs.
- For later WINEP 'No Deterioration' studies (e.g. Brighton Chalk) we have assumed AMP10 implementation of licence changes between 2035 and 2050.
- Any reductions in our Alternative scenario over and above our Central scenario occur as a linear profile out to 2050 once the Central scenario has been achieved.
- For any non WINEP reductions, for example changes to Andover, a linear profile is assumed to 2050.

Appendix C includes time series plots of how each of our Environmental Destination Scenarios has been applied to each individual abstraction licence.

5.3.3 Impact of delays to scheme delivery

In our fdWRMP24, we have reflected the delay to three strategic schemes:

- In the WRSE draft Regional Plan and our dWRMP24, we initially projected the Littlehampton recycling scheme to deliver benefits from 01/04/2027 (2027-28). We have now revised the delivery date for this scheme such that the benefit will be first available from 01/04/2030 (i.e. 2030-31).
- We have amended the design of the water transfer to Havant Thicket Reservoir the HWTWRP to minimise disruption to residents and environment in the area. This, along with other environmental factors, means there will be a delay in benefit from the Havant Thicket Reservoir to 2031-32 from 2029-30.
- As the scope of the HWTWRP has matured, we have conducted testing of the delivery schedule, which has enabled a greater understanding of the project. As a result, we have revised the delivery date of this scheme to 2033-34 (i.e. March 2034) with benefit available from 2034-35.

Our Western area is facing a significant water supply deficit. This position is likely to deteriorate further once the confirmed licence changes are applied and could be worse still if further tightening of the Lower Itchen abstraction licence conditions are applied at renewal or a licence renewal is not granted. The HWTWRP represents the preferred long-term strategic water resource scheme for Hampshire. Any licence changes in advance of delivery of the HWTWRP would further worsen our drought resilience and level of service.

This position of deficit has been validated through the investment modelling carried for fdWRMP24. A viable solution and supply-demand balance position could not be achieved with the Environmental Destination profiles set to their original form as in our dWRMP24 when accounting for the delayed delivery of Havant Thicket Reservoir and the HWTWRP.

We also have tested two specific sensitivity scenarios that tested early licence changes to the River Itchen. Neither of these runs was able to fully resolve the supply-demand balance deficits even with full utilisation of drought permits and orders, further underlining the need to develop alternative resources in Hampshire before significant licence reductions can be accommodated. See chapters 8 and 9 of the fdWRMP24 Technical Report for details.

As a result, we have had to delay the implementation of our Environmental Destination in the Western area.

An exception to this is the revocation of the Alresford Licence, which is still planned to occur in 2030-31 under all scenarios. This change is expected as the final outcome of the Candover Stream Habitats Directive WINEP investigation.

In SWZ, we are also facing a challenge due to the delayed delivery of the Littlehampton recycling scheme, and the sustainability challenge to our Pulborough groundwater source. This means that there will be a

greater demand on the water transfer from SWZ to SNZ. Consequently, we have delayed the initial implementation of the licence changes to our SWZ groundwater sources from 2030 to 2034. The proposed profiles for the full set of reductions at a source level are presented in Appendix C.

6 Using adaptive planning for decision making

6.1 Adaptive planning

Our WRMP24 is an adaptive plan that aims to address future uncertainty. This uncertainty arises not just from the magnitude of potential sustainability reductions, but also through the possible impacts of climate change and future population growth across our region. Our plan considers the solutions that might be required across a range of potential futures to address uncertainty.

The adaptive planning approach has been designed for nine future supply-demand balance situations over the different water resource planning scenarios i.e. normal years and well as drought periods of differing severity (1:100, 1:200, 1:500). Each of these nine future situations is influenced by three key components: population growth which impacts demand, climate change and Environmental Destination. Our approach to adaptive planning is outlined in our fdWRMP24 Technical Report.

6.2 Incorporating Environmental Destination in the Adaptive Plan

In the WRSE Emerging Regional Plan, published in early 2021, the adaptive planning approach proposed adopted the 'Central' Environmental Destination scenario as a core pathway up to 2040. Thereafter the plan branched between 'Central', 'Enhanced' and 'Alternative' scenarios reflecting the range of potential supply reductions. It was considered that by 2040, the policy, stakeholder and customer choices which would define the environmental pathway to be followed would be apparent. Any supply or demand options required before that date were considered to be 'no regret' and required under any future scenario.

The timing of decisions and descriptions of Environmental Destination was redefined for our dWRMP24 and the WRSE Regional Plan and this has been retained in our fdWRMP24. Instead of the future Environmental Destination branches being driven by application of different levels of policy, we have now considered three Environmental Destination scenarios; 'High', 'Medium' and 'Low' which reflect the magnitude of supply-demand balance impact. This allows greater flexibility because individual licence changes can be considered and tailored at a source or water body level as appropriate, but the range of uncertainty in terms of supply-demand balance impact is still covered within the three scenarios.

Mapping from the previous environmental scenarios (as described above) is summarised in Table 17. Generally, the 'Low' scenario maps across to our Central scenario in most cases, with the exception of HAZ and HWZ. Based on emerging outcomes from our AMP7 WINEP investigations, we believe larger licence reductions are likely required in these WRZs to meet flow targets than originally assessed under the Environment Agency Enhanced.

Our Enhanced scenario generally maps across to the 'Medium' scenario and our original 'Alternative' scenario maps across to our 'High' scenario. This reflects our view that the Enhanced scenario is likely to achieve all formal legal minimum environmental flow targets, including those for protected sites.

Our adaptive planning situations defined by 'High' (i.e. Alternative) scenario incorporates decisions that maximise environmental benefits but also gives a reasonable worst-case scenario in terms of future supply deficit. This High scenario goes further than the Enhance scenario, which is limited to maintain and improve protected areas only.

Our 'High' scenario explores a reasonable worst case supply situation where we may be required to cease our abstractions that affect (pending investigations to understand these relationships) the most sensitive environmental receptors, specifically focusing on all sources within the River Itchen catchment, and also from our Pulborough source which may affect SSSIs within the Arun Valley SPA, SAC and Ramsar site.

Table 17: Mapping from Central, Enhanced and Alternative scenarios to Low, Medium and High in each WRZ for adaptive planning.

WRZ	New Scenario Mapping		
	Low	Medium	High
HAZ	Enhanced	Central	Alternative
HKZ	Central	Enhanced	Alternative
HRZ	Central	Enhanced	Alternative
HSE	Central	Enhanced	Alternative
HSW	Central	Enhanced	Alternative
HWZ	Enhanced	Central	Alternative
IOW	Central	Enhanced	Alternative
SBZ	Central	Alternative	Enhanced
SWZ	Central	Enhanced	Alternative
KME	Central	Enhanced	Alternative
KMW	Central	Enhanced	Alternative
KTZ	Central	Enhanced	Alternative
SHZ	Central	Enhanced	Alternative
SNZ	Central	Enhanced	Alternative

Table 18 shows the Environmental Destination scenarios in each of the nine supply-demand balance situations.

Table 18: Summary of the adaptive planning branches showing the range of uncertainty and key branching point around our Environmental Destination in 2035.

Root branch (2025-30)	Branching point 1 (2030-35)	Branching point 2 (2035-75)	Supply-demand balance situation
Baseline growth (housing plan), **low** Environmental Destination, **median** climate change impact	**Baseline** growth incorporating Oxford-Cambridge arc, **low** Environmental Destination, **median** climate change impact	**Maximum** growth, **high** Environmental Destination, **high** climate change impact	1
		Baseline growth, **medium** Environmental Destination, **median** climate change impact	2
		Baseline growth, **low** Environmental Destination, **low** climate change impact	3
	Baseline growth, **low** Environmental Destination, **median** climate change impact	**Baseline** growth, **high** Environmental Destination, **high** climate change impact	4
		Baseline growth, **medium** Environmental Destination, **median** climate change impact	5
		Baseline growth, **low** Environmental Destination, **low** climate change impact	6
	ONS18 growth forecast, **low** Environmental Destination, **median** climate change	**ONS18** growth, **high** Environmental Destination, **high** climate change impact	7
		ONS18[16] growth, **medium** Environmental Destination, **median** climate change impact	8
		Minimum growth, **low** Environmental Destination, **low** climate change impact	9

[16] ONS18 = Office of National Statistics 2018-based growth projections

There are several uncertainties that must be investigated before the final policy positions on Environmental Destinations are known. The time taken to undertake these investigations and agree their outcomes with our regulators will be key to deciding when a decision on Environmental Destination can be made. From the work undertaken thus far, there are two potential times when a decision on Environmental Destinations would be made: 2035 and 2040. Across WRSE, we have agreed that the branching point should be set in 2035. We should have concluded the majority of our 'No Deterioration' WINEP investigations by this date (most are due for completion by 2027) and will already be implementing licence reductions.

A summary of the final DO impacts of our 'High', 'Medium' and 'Low' scenarios is provided in Table 19 and summarised by Environment Agency operational catchment in Figure 7. As DO varies with drought severity, the overall range of reductions in abstraction compared to more typical daily ('recent actual') volumes are more clearly illustrated on Figure 8'.

Table 19: Summary of Deployable Output impacts for each Environmental Destination scenario showing mapping of policy based scenarios to DO volume impact based adaptive planning scenarios.

WRZ	1: 500 DYAA DO redcution by 2050 for each branch (Ml/d)		
	Low	Medium	High
HAZ*	-11.61	-12.40	-15.54
HKZ	-4.16	-4.63	-4.16
HRZ	-3.45	-3.45	-3.45
HSE*	0.00	0.00	-20.49
HSW*	0.00	0.00	0.00
HWZ*	-9.41	-12.8	-22.71
IOW	-8.06	-11.02	-14.25
SNZ	-6.76	-6.8	-8.23
SBZ	-6.48	-20.99	-39.44
SWZ	-7.86	-17.87	-19.72
KME	-20.27	-48.51	-48.51
KMW	-3.31	-22.42	-22.70
KTZ	-11.94	-29.56	-29.56
SHZ	-1.56	-1.56	-1.56
Western area total	**-36.69**	**-44.30**	**-80.60**
Central area total	**-21.1**	**-45.66**	**-67.39**
Eastern area total	**-37.08**	**-102.05**	**-102.33**
Total	-94.87	-192.01	-250.32

Legend	Central Scenario	Enhanced Scenario	Alternative Scenario

*Where relevant we have also included reductions to DYCP[17] DO, e.g. under Alternative or where CSMG is applied in Enhanced as we expect that licence reductions would apply year round, including during times of normal operation outside of drought.

[17] DYCP = Dry Year Critical Period

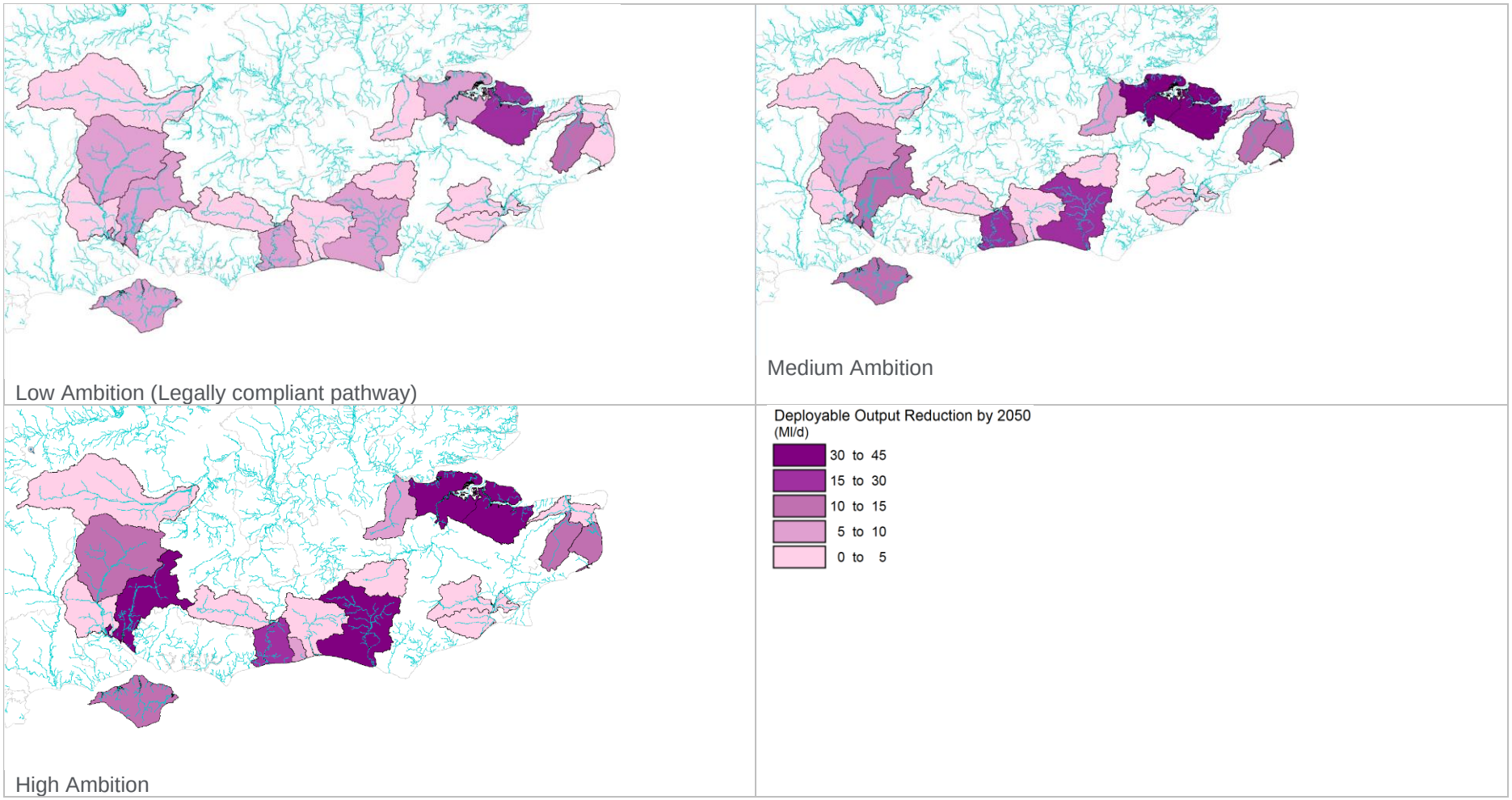

Figure 7: Loss in DO under 1:500 DYAA conditions for each Environmental Destination scenario by catchment.

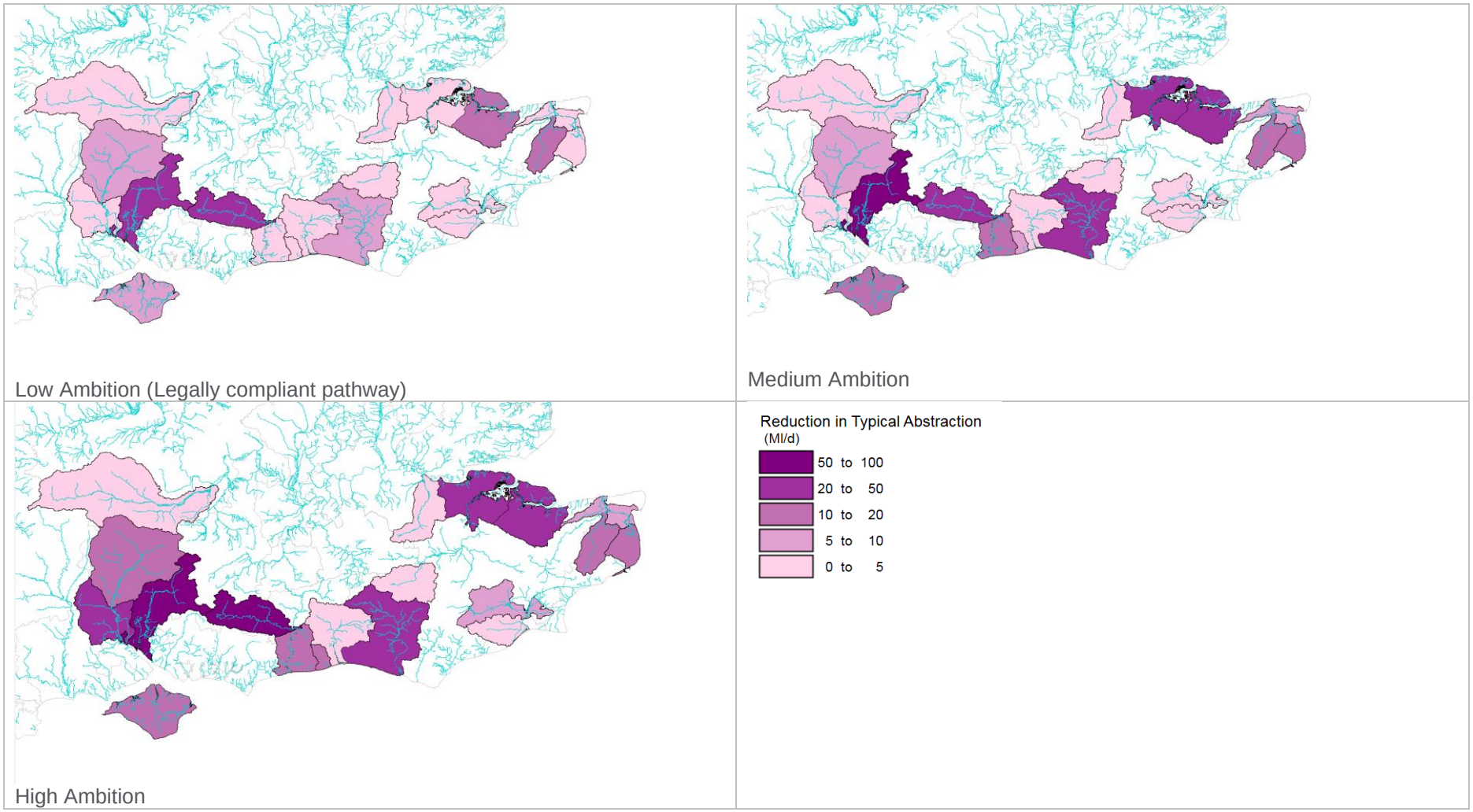

Figure 8: Reduction in typical ('recent actual') abstractions required to achieve each level of Environmental Destination by catchment.

6.3 Monitoring the Adaptive Plan

Annex 21 of our fdWRMP24 sets out our Monitoring Plan that will enable us to track the progress of various metrics in order to determine the future adaptive branch or supply-demand balance situation we are following and the solutions we need to deliver.

Our Monitoring Plan sets out decision points and trigger thresholds at both plan and scheme levels, so that decisions to begin development of options are taken sufficiently far in advance to allow them to be designed, planned, constructed and commissioned in time to ensure that resilient water supplies are maintained (see Figure 9).

Environment Destination	dates	2020	2025	2030	2035	2040	2045	2050
		AMP7	AMP8	AMP9	AMP10	AMP11	AMP12	AMP13
Implementation of already agreed licence reductions from previous WINEP investigations								
Licence change to River Test to alter HOF	2019							
Licence reduction & new monthly quantities for Newport and Lukely Brook (IOW)	2020							
Licence reduction & new monthly quantities for Andover (potential for more in future)	2027							
WINEP delivers River Enhancement Schemes during AMP7								
Adur and Ouse, Lewes Winterbourne Stream - completed	2023							
Isle of Wight, Lukely Brook, with physical enhancements to Plaish Meadows due to be completed	2023							
Upper Test, River Anton due to be completed	2024							
WINEP implements catchment schemes to support river interim ecological resilience in AMP 8	2025 – 2030							
Outcomes from WINEP investigations for 'No Deterioration' due	2024 - 2027							
WINEP continues with phased priority (new programme from 2022 for AMP7 and AMP8) includes CSMG targets, Habitats Directive, WFD drivers	2023 - 2030							
WFD licence capping to prevent deterioration applied from 2030 (AMP9), unless overriding conditions related to security of supply	2030 onwards							
The extent of the environmental destination for each WRZ and individual sources may go further and depending on circumstances may be a greater impact on DO than the limits set by ND licence capping in 2030 (AMP9). In some locations a profile may have been set to delay the reduction of licence capping and/or other associated reductions to maintain security of supply in the short-term, whilst a regional schemes become available. (This is the reprofiling of delivery dates to align with earliest availability of schemes.)	2030 onwards							
Adaptive Planning - core planning pathway (unless site specific requires sooner)	present to 2035							
Adaptive Planning - decisions for which branch to follow after 2035 (if not earlier)	2024-2027 onwards							
High Priority operational catchments to achieve environmental targets by 2040 *	2040 onwards							
Medium Priority operational catchments to achieve environmental targets by 2045 *	2045 onwards							
Low Priority operational catchments to achieve environmental targets by 2050 *	2050 onwards							

* unless a regional scheme available within a few years preventing short interim solutions.

Figure 9: Outline of key milestones on timeline of Environmental Destination.

7 Environmental Destination and our Best Value Plan

Our WRMP24 is intended to be a Best Value Plan that aims to deliver wider benefits to society and the environment. It takes account of a wide range of factors, alongside economic cost, in identifying the preferred water resource programme (see the fdWRMP24 Technical Report for more details).

It is important to note that DO reductions at individual operational supply sources cannot be directly linked to specific schemes as part of our Best Value Plan in a simple linear way. Instead, the WRSE Regional Plan finds best value solutions at a regional level to address WRZ level deficits across the nine different adaptive pathways or supply-demand balance situations.

Some schemes are only required under a particular planning scenario and/or a few supply-demand balance situations, while other schemes might be needed in all circumstances, although the size and timing of utilisation may differ between planning scenarios and supply-demand balance situations.

7.1 Environmental Destination investigations and delivery

We have developed our Environmental Destination to incorporate previous AMP WINEP outcomes and already agreed to changes to a number of abstraction licences and operational activities.

For WFD ‘No Deterioration’ licence reductions, we have already undertaken a detailed review of our sources, to assess ‘recent actual’ abstraction rates and the capacity or need to increase abstractions driven by future increase in demand. The results of the review have been used to help identify the sources that may pose a possible future deterioration risk and may require licence reductions pending the outcome of the WINEP investigation, as well as the sources that need further investigations to gather evidence before a decision on reducing DO can be made.

The ongoing WINEP investigations will provide important technical supporting evidence as part of the WFD ‘No Deterioration’ assessments of individual sources to inform future licence reductions. The outcomes from these investigations will be available between 2025 and 2030. In most cases, we expect licence changes and interim ecological resilience, river enhancement measures to be introduced as part of mitigation measures.

The water body and operational catchment priority classifications (High, Medium and Low) give a proposed timescale for when a solution needs to be implemented in each WRZ.

As mentioned earlier, we undertook a scoring exercise for each water body, along with the Environment Agency, taking into account aspects of each operation catchment. This led to an amalgamation of water body scores to give a prioritisation score to each catchment, which has been fed into the new AMP8 WINEP to ensure monitoring, investigations and options appraisals are planned accordingly.

Using the AMP8 WINEP (submitted in 2022 and approved in 2023) individual schemes are related to WRZs and hence the three operational areas (Western, Central and Eastern). The schemes to address deficits are also presented at an area level.

7.2 Meeting environmental targets by 2050

Table 20summarises the licence reductions we are proposing at a water body and Operational catchment scale.

Table 20: Summary table of proposed licence reductions for Low, Medium and High scenarios in comparison with water body and operational catchment targets set by the National Framework and reviewed by local Environment Agency teams at operational catchment level .

Water Body and (Operational Catchment)	National Framework 2050 EFI Surplus/Deficit		Local EA Review of Operational Catchment needs (Ml/d)		Low					Medium					High					Comment
	BAU at Full Licence	Enhanced at Full Licence	BAU	Enhanced	2030-31	2035-36	2040-41	2045-46	2050-51	2030-31	2035-36	2040-41	2045-46	2050-51	2030-31	2035-36	2040-41	2045-46	2050-51	
Anton - Upper (Test Upper and Middle)	-7.24	-7.24	-8	-8	-3.02	-3.02	-10.21	-10.21	-10.21	-3.02	-3.02	-11.00	-11.00	-11.00	-3.02	-3.02	-11.00	-11.00	-11.00	Confirmed Licence cap already confirmed for source in Catchment from 2027. Reductions are for later full EFI recovery following recent WINEP investigation and options appraisal review.
AP16, River Test Total AP [Great and Little] (Test Lower)	-74.78	-76.24			0.00	-27.30	-27.30	-27.30	-27.30	0.00	-27.30	-27.30	-27.30	-27.30	0.00	-50.00	-50.00	-50.00	-50.00	Licence Cap applied from 2035-36. Abstraction already regulated by HoF with additional reduction in 2027 (shows change from 2027 licence). CSMG impacts applied under the 'High' Scenario
Arun (U/S Pallingham) (Arun Upper)	0.90	0.53	-15	-21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Catchment in Surplus, no EFI driver. Local area review primarily focused on impacts to Arun Valley SSSI and SAC/SPA/Ramsar sites, this may be predominantly impacted by Pulborough Groundwater abstraction rather than the River Arun abstraction and for this review are considered under the 'Western Rother'. Our assumption is for now that the River Arun abstraction licence will be renewed under similar to existing terms.
Black Ditch (W Sussex) (Arun Lower)	-11.11	-11.11			0.00	-10.90	-10.90	-10.90	-10.90	-8.69	-10.95	-11.13	-11.31	-11.49	-8.69	-12.50	-14.17	-14.65	-15.14	WFD licence caps in place from 2033-34. Reductions shown on daily limits for Littlehampton, Patching, Long Furlong A. Total Worthing Block Group reductions up to -35Ml/d (including EFI recovery for Black Ditch and Teville stream by 2045-46)
Bourne Rivulet (Test Upper and Middle)	0.09	0.09			-2.01	-2.01	-2.01	-2.01	-2.01	-2.01	-2.01	-2.01	-2.01	-2.01	-2.01	-2.01	-2.01	-2.01	-2.01	Catchment in Surplus, WFD licence caps applied
Rye	-0.53	0.52	0	0	-7.33	-7.33	-7.33	-7.33	-7.33	-7.33	-7.33	-7.33	-7.33	-7.33	-7.33	-7.33	-7.33	-7.33	-7.33	Not Part of a River WB catchment, No EFI (GWB only) WFD licence caps in place from 2030-31
Brighton Chalk Block (Ouse Upper, Adur Upper)	Not a River Water Body	Not a River Water Body			-29.82	-31.41	-33.21	-33.71	-34.00	-32.17	-39.70	-47.32	-47.82	-48.11	-36.23	-47.82	-60.00	-63.32	-65.26	No EFI (GWB only) WFD licence caps in place from 2030-31. Reduction in Brighton Group licence shown, Group licence includes sources with EFI recovery on Lewes Winterbourne (by 2045-46)
South Arundel Trib [R.Arun] (Arun Lower)	-3.22	-3.22			0.00	-34.93	-36.72	-36.72	-36.72	0.00	-36.10	-38.46	-38.46	-38.46	0.00	-35.41	-37.43	-37.43	-37.43	WFD licence caps in place from 2033-34. Reductions shown on daily limits for Littlehampton, Patching, Long Furlong A. Total Worthing Block Group reductions up to -35Ml/d (including EFI recovery for Black Ditch, South Arundel Tributary and Teville stream by 2045-46)
Candover Brook (Itchen)	-2.42	-2.42			-4.55	-4.55	-4.55	-4.55	-4.55	-4.55	-4.55	-4.55	-4.55	-4.55	-4.55	-4.55	-4.55	-4.55	-4.55	Alresford Licence to revoked in 2030 following outcome of WINEP investigations. Local EA reductions included for Itchen Operational Catchment
Caul Bourne (IoW Rivers)	-1.48	-1.48	-13.5	-13.5	-0.67	-0.84	-0.84	-0.84	-0.84	-0.67	-0.99	-1.15	-1.15	-1.15	-0.67	-1.32	-1.64	-1.64	-1.64	Local area view is at operational catchment level and includes Lukely Brook, Caul Bourne, Eastern Yar and Medina
Chichester Chalk (Arun and Western Streams)	Not a River Water Body	Not a River Water Body			0.00	-4.00	-4.00	-4.00	-4.00	-1.74	-4.00	-4.00	-4.13	-4.73	-1.74	-4.00	-4.00	-4.00	-4.00	Not Part of a River WB catchment, No EFI (GWB only) WFD licence caps in place from 2033-34. Reductions shown on daily limits for Arundel and Madehurst, Total Worthing Block Group reductions up to -35Ml/d (including EFI recovery for Black Ditch and Teville stream by 2045-46)
Chilt (Arun Lower)	-1.27	-1.27			-3.41	-3.41	-3.41	-3.41	-3.41	-3.41	-3.41	-3.41	-3.41	-3.41	-3.41	-3.41	-3.41	-3.41	-3.41	Licence cap applied from 2030-31, would be effective revocation of West Chiltington Groundwater Source.
East Kent Chalk Little Stour and Near Canterbury, North and South Streams)	Not a River Water Body	Not a River Water Body	0	0	-3.64	-3.64	-3.64	-3.64	-3.64	-4.28	-4.92	-5.56	-6.20	-6.84	-4.28	-4.92	-5.56	-6.20	-6.84	No EFI (GWB only) WFD licence caps in place to prevent deterioration from 2030-31
Eastern Yar (Lower) (IoW Rivers)	0.00	0.00	-13.5	-13.5	-11.91	-12.35	-12.35	-12.35	-12.35	-11.91	-12.35	-12.35	-12.35	-12.35	-11.91	-14.32	-14.32	-14.32	-14.32	Local area view is at operational catchment level and includes Lukely Brook, Caul Bourne, Eastern Yar and Medina

Water Body and (Operational Catchment)	National Framework 2050 EFI Surplus/Deficit		Local EA Review of Operational Catchment needs (Ml/d)		Low					Medium					High					Comment
	BAU at Full Licence	Enhanced at Full Licence	BAU	Enhanced	2030-31	2035-36	2040-41	2045-46	2050-51	2030-31	2035-36	2040-41	2045-46	2050-51	2030-31	2035-36	2040-41	2045-46	2050-51	
Enborne (Source to downstream A34) (Kennet and Trib)	0.46	0.33	-5	-15	7.00	8.50	8.50	8.50	8.50	7.00	8.50	8.50	8.80	8.80	7.00	8.50	8.50	8.50	8.50	Local area view is at operational catchment (Kennet) level and includes numerous additional Water Bodies outside SWS supply area. Values shown are for reductions in Shown Water bodies only as part of overall catchment reductions.
Ferring Rife (Arun Lower)	-1.81	-1.81			0.00	-1.90	-1.90	-1.90	-1.90	-0.80	-3.28	-4.52	-5.76	-7.00	-0.80	-2.10	-2.75	-3.40	-4.04	WFD licence caps in place from 2033-34. Reductions shown on daily limit for Stanhope Lodge. Total Worthing Block Group reductions up to -35Ml/d (including EFI recovery for Black Ditch and Teville stream by 2045-46)
Haslingbourne Stream (Rother Western)	-0.93	-1.24			-2.49	-2.49	-2.49	-2.49	-2.49	-2.49	-2.49	-2.49	-2.49	-2.49	-2.49	-2.49	-2.49	-2.49	-2.49	
Itchen (Itchen)	-7.31	-7.99	-25	-55	0.00	-69.58	-81.90	-81.90	-81.90	0.00	-79.95	-99.89	-99.89	-99.89	0.00	-104.16	-136.20	-136.20	-136.20	Proposed reductions under 'High'/Enhanced include outcomes from CSMG WINEP. Includes Lower Itchen and Winchester Sources
Kent Greensand Middle (Medway Midlle)	Not a River Water Body	Not a River Water Body	0	0	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	No EFI (GWB only) WFD licence cap in place to prevent deterioration from 2030-31
Near Basingstoke	-0.94	-0.94	-5	-15	0.00	-1.78	-2.00	-2.66	-2.66	0.00	-1.78	-2.12	-2.83	-2.83	0.00	-1.78	-2.00	-2.66	-2.66	Local area view is at operational catchment (Kennet) level and includes numerous additional Water Bodies outside SWS supply area. Values shown are for reductions in Southern Water Licences in Kingsclere Brook Water body as part of overall catchment reductions.
Lod (Rother Western)	-0.85	-0.57			-0.54	-0.54	-0.62	-0.82	-0.82	-0.54	-0.54	-0.62	-0.82	-0.82	-0.54	-0.66	-0.99	-1.32	-1.32	
Lower Rother (Rother Levels)	3.88	3.88	0	0	-3.31	-3.31	-3.31	-3.31	-3.31	-3.31	-3.31	-3.31	-3.31	-3.31	-3.31	-3.31	-3.31	-8.19	-13.63	Catchment in Surplus, EFI compliant. Licence Caps in 2030-31 to prevent deterioration for WFD (limited DO impact)
Lukely Brook (IoW Rivers)	0.56	0.56	-13.5	-13.5	0.00	0.00	-7.99	-7.99	-7.99	0.00	0.00	-11.43	-11.43	-11.43	0.00	0.00	-12.20	-12.20	-12.20	Local area view is at operational catchment level and includes Lukely Brook, Caul Bourne, Eastern Yar and Medina. Licence caps already applied to sources in Catchment in 2021. Reductions are for full EFI recovery following recent WINEP investigation and options appraisal review.
Medina (IoW Rivers)	0.38	1.05	-13.5	-13.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Local area view is at operational catchment level and includes Lukely Brook, Caul Bourne, Eastern Yar and Medina
Medway at Weir Wood (Medway Upper)	1.68	1.43	0	0	-16.40	-16.40	-16.40	-16.40	-16.40	-16.40	-16.40	-16.40	-16.40	-16.40	-16.40	-16.40	-16.68	-17.64	-18.61	Catchment in Surplus, WFD licence cap in place from 2030-31, additional reduction under high
Mid Medway from Eden Confluence to Yalding (Medway Middle)	2.88	-1.56	-3	-21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Proposed Reductions do not affect Southern Water Sources. EA note that 'Significant PWS reservoirs (3) and abstraction operations dominate the abstraction profiles within the Medway catchment but these are appropriately conditioned. ... NEP implementation work has been completed on the River Bewl/Teise in the form of River Restoration and altered operational releases from Bewl Reservoir to mitigate the impacts of large augmentation releases from Bewl Reservoir, this large strategic public water supply operation has a dominating influence on all downstream catchments to the freshwater limit at Allington Lock, Maidstone.'
Middle and Lower Darent (Darent)	-0.21	-0.23	-75	-80	-2.63	-2.63	-2.63	-2.63	-2.63	-2.93	-4.23	-5.53	-6.83	-6.83	-2.93	-4.23	-5.53	-6.83	-6.83	We only operate a single source (Longfield) within this water body with an annual licence equivalent of 6.825Ml/d/ Data show only potential licence reductions at our Longfield source which includes licence capping in 2030 under all scenarios and full revocation by 2045-46 under the 'High' scenario. Significant other public water supply abstractions are present in the wider operational catchment and large reductions at these other sources will be required to meet operational catchment targets set by Local EA.

Water Body and (Operational Catchment)	National Framework 2050 EFI Surplus/Deficit		Local EA Review of Operational Catchment needs (Ml/d)		Low					Medium					High					Comment
	BAU at Full Licence	Enhanced at Full Licence	BAU	Enhanced	2030-31	2035-36	2040-41	2045-46	2050-51	2030-31	2035-36	2040-41	2045-46	2050-51	2030-31	2035-36	2040-41	2045-46	2050-51	
Monkton and Ramsgate Marshes (Stour Marshes)	-1.27	-1.42	0	-1	-10.81	-10.81	-10.81	-10.81	-10.81	-10.81	-10.81	-10.81	-10.81	-11.21	-10.81	-10.81	-10.81	-10.81	-11.21	Includes Licence Caps in 2030-31 to prevent deterioration for WFD
North and South Streams at Northbourne (North and South Streams)	-12.75	-13.52	0	-10	-10.72	-10.72	-10.72	-10.72	-10.72	-13.07	-18.65	-24.36	-24.36	-24.36	-13.07	-18.65	-24.36	-24.36	-24.36	Licence caps applied from 2030-31
North Kent Medway Chalk (Medway Lower)	Not a River Water Body	Not a River Water Body	-1	-3	-31.50	-31.50	-31.50	-31.50	-31.50	-35.13	-39.33	-44.12	-49.43	-54.88	-35.49	-40.05	-45.20	-50.87	-56.68	No EFI (GWB only) WFD licence caps in place from 2030-31. Shows total reduction for Chatham and Northfleet Group Licences, including uncertainty allowance for potential impact on North Kent Marshes sites
North Kent Swale Chalk (White Drain and Lakes)	Not a River Water Body	Not a River Water Body	0	0	-21.36	-24.08	-26.80	-29.52	-32.24	-23.86	-29.84	-37.35	-44.95	-52.55	-23.86	-29.84	-37.35	-44.95	-52.55	No EFI (GWB only) WFD licence caps in place from 2030-31. Shows total reduction for Faversham and Sittingbourne Licences, includes Selling (which impacts the White Drain). including uncertainty allowance for potential impact on North Kent Marshes SSSI
Test - Bourne Rivulet to conf Dever (Test Upper and Middle)	2.55	10.93	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Catchment in Surplus
Test - conf Anton to conf Dun (Test Upper and Middle)	19.42	-0.47	0	0	-3.50	-3.50	-3.50	-3.50	-3.50	-3.50	-3.50	-3.50	-3.50	-3.50	-3.50	-3.50	-3.50	-3.50	-3.50	Catchment in Surplus, WFD licence caps applied but could be deferred to 2035-36 if resilience scheme is required.
Test - conf Dever to conf Anton (Test Upper and Middle)	19.29	19.29	0	0	0.00	-61.21	-80.00	-77.97	0.00	24.65	36.97	36.97	36.97	0.00	34.38	51.56	51.56	51.56	0.00	Catchment in Surplus, WFD licence caps applied
Test - conf Dun to Tadburn Lake (Test Upper and Middle)	8.28	7.73	0	0	0.00	-8.28	-8.28	-8.28	-8.28	-27.35	-8.28	-8.28	-8.28	-8.28	0.00	-8.28	-8.28	-8.28	-8.28	Catchment in Surplus, WFD licence cap applied in 2035-46
Test (Upper) (Test Upper and Middle)	20.14	11.76			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-2.24	-3.29	-3.29	-3.29	Catchment in Surplus, WFD licence caps applied. Local EA view for operational catchment based primarily on EFI targets for the River Anton (Water body listed separately). Some CSMG impacts possible. These have been included under 'high' scenario for Overton and Whitchurch
Teville Stream (Arun Lower)	-11.64	-11.64			0.00	-23.80	-23.83	-23.83	-23.83	0.00	-27.08	-30.05	-31.70	-31.70	0.00	-28.25	-31.31	-33.51	-33.51	WFD licence caps in place from 2033-34. Reductions shown on daily limits for Worthing, East Worthing, Sompting, Northinig Worthing. Total Worthing Block Group Licence reductions up to -30Ml/d on Annual Limit (including EFI recovery for Black Ditch, South Arundel Tributary and Teville stream by 2045-46)
Thanet Chalk (Thanet)	Not a River Water Body	Not a River Water Body	0	0	-2.04	-2.04	-2.04	-2.04	-2.04	-2.04	-2.04	-2.24	-2.99	-3.74	-2.04	-2.04	-2.24	-2.99	-3.74	No EFI (GWB only) WFD licence caps in place to prevent deterioration from 2030-31
Western Rother (Rother Western)	6.89	-1.01	-30	-51	-73.19	-78.46	-83.79	-89.13	-89.13	-73.76	-79.60	-85.51	-91.41	-91.41	-79.03	-90.28	-101.53	-112.78	-112.78	Includes allowance reductions from Pulborough Surface and Groundwater to ensure designated wetland habitats are protected. Both licences are completely revoked under the 'High' scenario'. Note effectively these are a group licence with common Minimum Residual Flow condition and total daily volume (70Ml/d) but both have different annual limits.
Western Rother Durford (Rother Western)	-0.80	1.01			-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	Catchment in Surplus, WFD licence cap in place from 2030-31, additional reduction under high
White Drain (White Drain and LakeS)	-7.03	-7.57	-7	-8	-11.12	-13.84	-16.56	-19.28	-22.00	-11.12	-13.84	-16.56	-19.28	-22.00	-11.12	-13.84	-16.56	-19.28	-22.00	Shows daily licence impact on Selling (total reduction for whole Faversham Group licence is -16 to -31Ml/d by 2050-51 (included under reductions for Medway Swale Chalk)
Near Canterbury and Little Stour (Little Stour and Near Canterbury)	-22.18	-25.21	-21	-26	-13.54	-16.26	-20.60	-23.08	-25.55	-13.54	-17.26	-22.10	-25.08	-28.05	-13.54	-17.26	-22.10	-25.08	-28.05	Licence Caps in place from 2030-31 to prevent deterioration under WFD. EFI targets met by 2045-46
Winterbourne Steam at Lewes (Upper Ouse)	-8.82	-9.36	0	-7	-39.51	-40.90	-42.41	-42.41	-42.41	-41.86	-49.19	-56.52	-56.52	-56.52	-43.80	-53.07	-62.34	-62.34	-62.34	WFD licence caps in place from 2030-31. Reduction in Brighton Group licence shown, Group licence includes sources with EFI recovery on Lewes Winterbourne (by 2045-46)

Water Body and (Operational Catchment)	National Framework 2050 EFI Surplus/Deficit		Local EA Review of Operational Catchment needs (Ml/d)		Low					Medium					High					Comment
	BAU at Full Licence	Enhanced at Full Licence	BAU	Enhanced	2030-31	2035-36	2040-41	2045-46	2050-51	2030-31	2035-36	2040-41	2045-46	2050-51	2030-31	2035-36	2040-41	2045-46	2050-51	
Worthing Chalk Block (Arun Lower)	Not a River Water Body	Not a River Water Body			0.00	-10.76	-12.58	-12.58	-12.58	53.53	-16.64	-23.40	-26.60	-28.62	53.53	-17.49	-24.89	-28.22	-29.35	WFD licence caps in place from 2033-34. Reductions shown on daily limits for Littlehampton, Patching, Long Furlong A. Total Worthing Block Group reductions up to -30Ml/d (including EFI recovery for Black Ditch, South Arundel Tributary and Teville stream by 2045-46)
Wroxall Stream (IoW Rivers)	0.33	0.11	-13.5	-13.5	-3.29	-3.29	-3.29	-3.29	-3.29	-3.29	-3.29	-3.29	-3.29	-3.29	-3.29	-3.29	-3.29	-3.29	-3.29	Local area view is at operational catchment level and includes Lukely Brook, Caul Bourne, Eastern Yar and Medina

Although out full Environmental Destination profile run through to 2050-51 in the many cases the environmental flow targets identified by the National Framework Assessment[18] are achieved much earlier. These reflect the following proposed steps:

- Application of licence caps to prevent deterioration under the WFD. These are applied from 2030-31 everywhere except SWZ and Hampshire (see Section 3.2).
- Following Licence caps we have applied progressive reduction in licence quantities to achieve EFI targets based on catchment prioritisation (Section 5.2).

7.3 Ensuring security of supply

7.3.1 Selected preferred options

The preferred schemes along with their earliest utilisation under each planning scenario and supply-demand situation are discussed in our fdWRMP24 Technical Report and given in Annex 15

From 2035, individual WRZs will start to have their own adaptive pathway for Environmental Destination. For each of our three operational areas, we can show how the 'High', 'Medium' and 'Low' Environmental Destination scenarios will impact available DO.

When developing our supply forecast, we used the option design dates to find when potential supply schemes could first become available. We then adjusted the target delivery dates for operational catchment when large regional schemes would be first available in the short term. This creates a profile of supply reductions to be made in the short-term. Changes to priority dates for some operational catchments were made to avoid the risk of unsolvable supply-demand balance deficits. This attempt at profiling the timing of reductions was to help support development of a viable Best Value Plan without deficits.

[18] Environment Agency, 2020, Surplus Deficit information for National framework Environmental scenarios - Business as Usual 2050 and Enhanced 2050

8 Timelines and Environmental Destination for Pulborough and River Itchen

In previous sections, we have set out how the main three component parts of our Environmental Destination combine and contribute to each other:

- WINEP and water resources
- Environmental scenarios
- Adaptive planning

The sections below present an overview of the dominant issues influencing the future attainment of sustainable abstractions at our Pulborough groundwater source and our sources in the River Itchen.

8.1 Pulborough and Arun Valley

There is uncertainty regarding the outcome of the ongoing investigation into the impact of the Pulborough groundwater licence on SSSIs in the Arun Valley. At present, there are no confirmed sustainability reductions for our Pulborough groundwater licence, and we expect that any appropriate mitigations will be determined through the ongoing sustainability study which will conclude by Summer 2025.

The magnitude of any future licence changes is therefore uncertain and could feasibly range from little to no change to full revocation of the groundwater licence. To reflect this uncertainty, we have addressed the potential range of sustainability reductions as part of our Environmental Destination and sensitivity testing.

In line with agreed WRSE policy and guidance and under all environmental scenarios, we have applied licence caps at proposed 'recent actual' rates from 2030:

- Pulborough groundwater would be capped at 13Ml/d (daily equivalent of the annual licence)
- Pulborough surface water licence would be capped at 47.8Ml/d (daily equivalent of the annual licence)

These proposed 'recent actual' rates have been determined based on our review of recent actual abstraction patterns, accounting for source outage across the latest RBMP cycles. They align with the proposed screening rates we shared with Environment Agency as part of our Phase 1 'No Deterioration' review (Section 3).

These rates have not yet been formally agreed with the Environment Agency, but the screening baseline abstraction rates have been discussed with Solent and South Downs, and Kent and South London Environmental Agency area technical teams, based on our consideration of the latest available data. The final agreed 'recent actuals' will be determined and agreed through the ongoing WINEP 'No Deterioration' studies. They represent the best available data we currently have to inform our WRMP24.

During our assessments, we have identified that whilst it may prevent or reduce risk of deterioration, the licence reductions in isolation may not achieve environmental targets (e.g. EFI or enhanced targets for protected sites). Therefore, we devised our Environmental Destination scenarios to assess a range of potential changes to abstractions beyond licence capping:

- Under the 'BAU+' scenario, Pulborough groundwater licence is further capped at a daily equivalent of the annual licence of 9.9Ml/d and Pulborough surface water licence at 17.55Ml/d.
- Under the 'Enhanced' scenario (equivalent to the regional 'Medium' scenario for SNZ) Pulborough groundwater licence is capped at 7.66Ml/d and Pulborough surface water licence at 13.16Ml/d.

- Under our 'Central' scenario (the regional 'Low' scenario) Pulborough groundwater is capped at the same sustainability reduction as assumed in our WRMP19, which reduces the daily equivalent of the annual limit to 5.55Ml/d and was our assessment of the requirement to meet EFI at that time. Pulborough surface water is limited to the BAU+ rate of 17.55Ml/d.
- Under our 'Alternative' scenario (the regional 'High' scenario), we have proposed revoking both Pulborough groundwater and surface water licences entirely. This goes beyond flow targets but was assumed as a reasonable worst case given current uncertainties around the potential adverse effects on the SSSI wetlands.

As with licence capping, these reductions begin from 2030 and gradually step up each five-year AMP period to be achieved fully by 2045. Glidepaths for each licence reduction are shown in Figure 10.

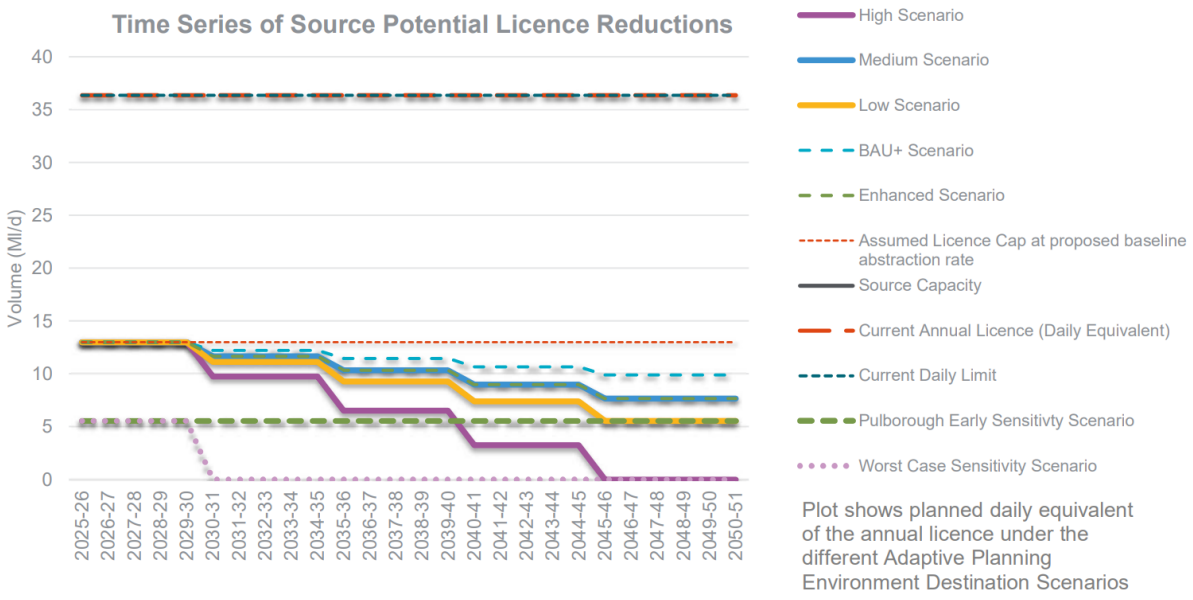

Figure 10: Glidepath of possible, but unconfirmed, Pulborough licence reductions under our Environmental Destination scenarios.

Due to the strategic nature of the Pulborough source, the potential supply-demand balance deficits linked with Environmental Destination scenarios, limited availability of alternative solutions and the lead time required to build alternative solutions, large step changes in DO cannot be accommodated early in the planning period. Our working assumption is therefore that we would likely need to defer licence changes in full until long-term solutions become available and that we will need to provide mitigation such as habitat enhancements in the interim period. This approach broadly follows the working model we used for the recent River Anton WINEP investigation, and deferred licence change at our Andover groundwater source.

The Environmental Destination is the single biggest driver of schemes across the whole of our plan. Given the nature of the investment modelling, the benefit of any one scheme cannot be directly linked to a specific licence change. However, the strategic nature of the Pulborough source means that these licence changes are likely to be a significant factor in the selection of major schemes in the Central area, such as River Arun desalination option, River Adur Offline Reservoir and the additional transfers into SNZ.

In addition to the main Environmental Destination scenarios, we have also tested two further sensitivity scenarios around the Pulborough groundwater licence.

- Bringing the 'Central' scenario forward such that the daily equivalent of the annual licence for Pulborough groundwater is reduced to 5.55Ml/d from 2025.

- Bringing the 'Central' scenario forward such that the daily equivalent of the annual licence for Pulborough groundwater is reduced to 5.55Ml/d from 2025 and then fully revoked from 2031.

The results of these additional sensitivity scenarios show that these licence changes could be accommodated. See fdWRMP24 Technical Report for details.

The future of the Pulborough groundwater licence remains uncertain whilst the environmental sustainability investigation is ongoing. Through our Environmental Destination scenarios and sensitivity testing, we have explored a range of potential futures which account for different levels of licence change. If through the investigation it is concluded that there is no adverse impact from the groundwater abstraction, we may not need to change the licence at all, but we have not reflected this outcome in our current plan as doing so would be a risk to the supply-demand balance, should a licence change occur.

By including what we consider to be a plausible range of licence changes, both in magnitude and timescale, we are letting the investment model select the alternative options available to meet the potential supply-demand balance deficits resulting from these changes. This has shown that the greatest risk is likely to be in the short term, particularly when licence changes occur early in the planning period when there are limited options that can be developed quickly enough to compensate for the loss of supply.

We will continue to work with the Environment Agency, Natural England and other catchment stakeholders to establish if there are impacts of groundwater abstraction on the SSSIs in the Arun Valley. If adverse impacts are confirmed, these will be addressed and a suite of mitigation measures will be implemented in AMP8 through the WINEP. Once the impacts are known, we will incorporate any potential licence changes into our annual review process and we may switch our strategy to an alternative adaptive pathway.

8.2 River Itchen sources

Our Environmental Destination is designed to support and enable the iconic River Itchen chalk stream to attain an ecologically resilient future. Our fdWRMP24 shows that the sustainable levels of abstraction can be achieved by the mid to late 2030s through the delivery of SROs and a reprofiling of our local catchment abstraction licenses.

We have revised the delivery dates for two major schemes in the Western area since the publication of our dWRMP24.

- Havant Thicket Reservoir is delayed to first provided benefit from 2031-32 instead of 2029-30.
- The HWTWRP will first provide benefit from 2034-35 instead of 2030-31.

Our WINEP investigations in previous AMPs have identified that changes to our current abstraction regime are required in the River Itchen catchment. Reductions have already been implemented at some sources, with further changes likely required following the outcomes of the AMP7 WINEP investigations.

Additionally our AMP8 WINEP programme includes interim ecological resilience mitigation schemes to help support ecological resilience if required. The outcomes from the investigations are due in 2025 and will support evidence-based decision making and help inform the AMP8 interim mitigation schemes to be implemented.

Following the public Inquiry in March 2018 and entering into the operating agreement under Section 20 of the Water Resources Act 1991 with the Environment Agency (Section 20 Agreement) and the need to maintain the HoF conditions on the River Test under our abstraction licence, we face the risk of supply-demand balance deficit even under mild drought conditions.

There have been a number of changes to the preferred schemes in our WRMP19 that were aimed to address the deficit in the Western area.

- The West Southampton Coast desalination option to provide up to 75Ml/d has been replaced by HWTWRP to provide up to 90Ml/d.
- The planned 20Ml/d bulk import from South West Water (from the River Avon) was ruled out in 2021 as South West Water could no longer guarantee the supply due to 'No Deterioration' and EFI risks to the River Avon.
- An additional 9Ml/d bulk supply from Portsmouth Water was ruled out in 2023 as the new groundwater boreholes drilled by Portsmouth Water to enable the transfer, could not deliver the required yield.
- The first year of benefit from Havant Thicket Reservoir has been delayed from 2029-30 to 2031-32 due to further planning considerations for the transfer pipeline, and other environmental factors. This component of the Havant Thicket Reservoir scheme will enable Portsmouth Water to provide up to 21Ml/d to HSE.
- The first year of benefit from HWTWRP has changed from 2030-31 to 2034-35.

Investment model runs accommodating these delays indicate there are no solutions to address the supply-demand balance deficit in the short term and drought permits and orders are needed in the short to medium term (see fdWRMP24 Technical Report). As a result, any early licence changes to meet our Environmental Destination have had to be delayed. Any short-term reductions to licences or operational conditions applied will further intensify the reliance on drought permits and orders. As a result the implementation of nearly all licence changes has been put back with the exception of change to Alresford (see Table 9).

As a result of the delays to new supply schemes and transfers that would have eliminated the supply-demand balance deficit by 2030, any earlier licence changes will further exacerbate the supply-demand balance deficits. We have explored options to offset some of the reliance on drought permits and orders (see Section 7 in the fdWRMP24 Technical Report and Annex 20).

A way to address the deficit and associated security of supply issue in the short term is to continue reliance on drought permits and orders during droughts until 2034-35 when HWTWRP becomes available. The process agreed by the Environment Agency and Southern Water by which the company will apply for drought permits and orders in Hampshire is set out in the agreement we signed with the Environment Agency under Section 20 of the Water Resources Act 1991. The agreement was signed in 2018 and is due to expire in 2030. We will therefore need to discuss any implications of our extended timelines with regard to the Section 20 Agreement with our regulators. Annex 20 includes more detail on this including the potential resilience options which seek to minimise the level of reliance on these drought options.

8.2.1 Supporting ecology resilience of chalk streams through nature-based solutions

We aim to provide further nature-based solutions to support ecological resilience in the River Itchen SAC and SSSI. Our ongoing WINEP investigations, due to conclude in 2025, will provide more evidence and data to help design appropriate in-river and wetland improvements to help with habitat and aquatic environment recovery.

By using a phased approach, the interim ecological improvements can provide ecological resilience before the long-term solutions are operational. The WINEP investigations help inform the other local pressures on chalk stream and wetland habitats, that can be addressed through the interim ecological improvements, such as:

- Removing historical empowerments such as weirs.
- Restoring natural Chalk stream processes from over widening and deepening.
- Improving fish passage.
- Improving public access to the river corridor.

- Flood mitigation concerns associated with removal of built structures.

Interim ecological resilience measures are site specific for each catchment, informed through WINEP options appraisal process, and the agreed ecological objectives.

Examples of ecological resilience measures that we have implemented through our previous and ongoing WINEP catchment schemes for the River Anton (HAZ), Lukely Brook and Plaish Meadows (IOW) and Lewes Winterbourne (SBZ) are:

- Hydromorphological enhancements of river channels - narrowing of the channel, , introduce deflectors and gravel berms re-profiling of river banks and reintroduce back margin habitat.
- Realigning the river to its historic course and meanders.
- Installation of technical fish passages.
- Localised wetland scrapes.
- Riparian management, tree works (to introduce shading in some catchments and daylighting in others).
- Weir and culvert alterations or removal.
- Implementation of a stage zero scheme.

8.2.2 Timeline of Environmental Destination for River Itchen

This section provides an overview of past, ongoing and future work planned to ensure sustainable abstraction from the River Itchen.

AMP6 (2015-20): Previous activities

- 2017: The implementation of Itchen and Test sustainability reductions in 2017 following WINEP investigations.
- 2018: The abstraction Licence changes (via a Section 52 notice) by the Environment Agency resulted in a security of supply issue with a DO reduction of approximately 80Ml/d from the River Itchen. Licence changes included monthly quantities and introduction of HoF for the River Itchen. A Public Inquiry followed which resulted in the Section 20 Agreement in March 2018. The Section 20 Agreement, due to expire in March 2030, recognised the supply risk and put in place an interim abstraction scheme by which the company will apply for drought permits (River Test) and orders (River Test, River Itchen and Candover stream) while long-term alternative supply infrastructure was put in place. At the time of WRMP19, this was the West Southampton Coast Desalination option, with additional transfers from Portsmouth Water (via Havant Thicket Reservoir) and South West Water (from the River Avon).
- 2019: Amendment to licences (Itchen and Test) in March 2019 following the position set out in the Section 20 Agreement.
- 2019: Review of levels of service and amendments of WRZs. For WRMP19, the previous Hampshire South WRZ was split into 4 WRZ's: HWZ, HRZ, HSE and HSW.
- 2020: Completion of the 'No Deterioration' WINEP investigation for Andover resulting in deferred annual licence reduction, and new monthly quantities to be applied in 2027. An interim ecological resilience river enhancement scheme is being implemented in AMP7 which is due for completion by 2025.
- 2020: Licence reductions and new monthly quantities were applied to our Lukely Brook and Newport abstractions in 2020 following our 'No Deterioration' WINEP investigations.

AMP7 (2020-25): Ongoing activities

- Candover Stream - Habitats Directive (AMP7 WINEP): Completes end of March 2025
- Itchen Wetlands - SSSI (AMP7 WINEP): Completes March 2025
- River Itchen (all) and River Test (two) sources - WFD 'No Deterioration' (AMP7 WINEP): Completes March 2025
- CSMG flow targets on the River Itchen and River Test (AMP7 WINEP): Completed Summer 2022
- Ongoing mitigation and monitoring as part of Section 20 Agreement implementation.
- 2021: Joint exercise on **'Prioritising Abstraction Reduction'** to rank water bodies using a scoring system (including Environment Agency scores) to help determine when 'Suggested Horizon for Reductions' of DO to sources could occur in the plan. Operational catchments were given amalgamated priority score and the associated timeframe of 'High' by 2040, 'Medium' by 2045 and 'Low' by 2050 to plan for reduction to supplies and have a scheme in place by that year to address any supply-demand balance deficits. For the Itchen catchment, the initial priority scores gave a high priority timeframe of 2040.
- 2021-23: Development of **Environmental Destination scenarios**. In combination with the Environment Agency and WRSE, Environmental Destination scenarios were developed to explore different potential futures to achieve sustainable abstractions whilst maintaining a high level of drought resilience (1:500 drought). The scenarios have recently been redefined as 'High', 'Medium' and 'Low' to reflect the size of impact on DO. Previous scenarios were known as: BAU, BAU+, Enhanced, Combined, Adapt, Central and Alternative.
- 2022-23: Development of **Adaptive Planning Situations**. Adaptive planning approach has been agreed by the WRSE companies and is based on potential future projections for population growth, climate change and Environmental Destinations. This results in a branching tree with nine supply-demand balance situations. Key dates are set, indicating timing for decision to be made, to allow appropriate branches to be followed based on evidence from monitoring, investigations etc.

  For the Itchen sources, the future Environmental Destination for the core pathway, Central and Alternative could look like:

  Core pathway: Operations continue as planned between 2024 to 2030 (Situation 4).

  Medium: Outcome of sustainability studies by 2027 shows that present groundwater and surface water abstractions can continue without detrimental impact to the SSSIs.

  High: Outcome of sustainability studies shows impact of SSSIs from abstractions and Itchen licences need to be revoked.
- 2022: **dWRMP24** published with consultation and statement of response during Summer 2023.
- 2023: Our SoR to the public consultation on dWRMP24 published on 31 August 2023 which included revised delivery dates for major options including **Havant Thicket Reservoir, HWTWRP and the Littlehampton water recycling scheme**.
- 2025: **Itchen licence renewals** in 2025 for Itchen groundwater, Itchen surface water and Twyford abstraction licenses (all with an expiry date of 31/03/2025). Until the delivery of the long-term strategic solutions for supply (primarily HWTWRP), now due in the 2030s, we will be in supply-demand balance deficit during periods of drought (in the absence of drought permits and orders). Changes to the licences required to address the CSMG flow targets, will cause deficits under 'normal' operational conditions and further exacerbate the existing supply-demand balance deficits under drought.

AMP8 (2025-30) Short-term future

- 2025-30: **AMP8 River Itchen Catchment** – (Winchester, Itchen, Twyford**) interim nature-based solutions planned for AMP8** pending outcome of the AMP7 investigation and options appraisal. Implementation of nature-based solutions will deliver ecological resilience till possible annual licence reductions required, with implementation of licence changes based on WRMP scheme timeline.
- 2025-30: **AMP8 Candover Stream (Alresford)** – **interim nature-based solutions planned for** AMP8, delivering ecological resilience measures to mitigate impacts from groundwater abstraction at Alresford on Candover Stream identified from AMP7 investigation, till revoking of the licence in 2030.
- 2025-27: **Adaptive planning** decision on the extent of future DO reduction where abstractions are shown to be impacting designated sites.
- 2025-30: AMP8 WINEP scheme to prevent possible further impacts from Itchen abstractions on water bodies and designated sites if impacts are identified from AMP7 investigations. If required, **implementation of interim nature-based** solution to deliver ecological resilience and provide mitigation.
- 2020-30: Implementation of agreed compensation and mitigation packaged agreed as part of Itchen licence renewals.

AMP9 (2030-35)

- 2030: **Alresford licence to be revoked**. Alresford ceases abstraction. It has been agreed through the AMP7 WINEP, that abstraction will stop as it cannot meet EFI (or CSMG) flow targets.
- 2030: Any further 'No Deterioration' **licence reductions** target to cap abstraction licences. However, as the River Itchen water body sources are undergoing detailed sustainability studies, including further assessment for 'No Deterioration', if any licence changes are required, they will be informed by the 2025 investigation outcomes and take into account risk to security of supply.
- 2034-35: Utilisation of **HWTWRP.** Itchen licences to be amended with reduced quantities as agreed following AMP7 sustainability investigations outcomes and Itchen licence renewals in 2035.

8.3 River Itchen time-limited licence

The three Southern Water abstraction licences on the Lower River Itchen (Itchen surface water, Itchen groundwater and Twyford groundwater) all expire on 31 March 2025. We are currently working with the Environment Agency and Natural England to renew these licences.

Our Environmental Destination assumes that such changes will be implemented from 2036 onwards to allow strategic solutions to be implemented in advance. In selecting this date, we have considered the revised delivery date for HTWTWRP.

We are currently working with the Environment Agency and Natural England in preparing a HRA. Until new sources such as the HWTWRP and Thames to Southern Transfer are delivered, we are not able to reduce the licence quantity or not renew the River Itchen surface water and Itchen groundwater sources abstraction licences in 2025 to meet the new CSMG flow targets. Consequently, we are preparing for a derogation case for renewing the licences (under the Habitats Regulations), under IROPI with currently no other abstraction sources available. The derogation case includes a package of mitigation and compensatory measures to address the interim impacts of not meeting the CSMG flow targets.

8.3.1 dWRMP24 assumptions for possible Itchen licence changes

Three scenarios for potential changes have been considered; 'Low', 'Medium' and 'High'. The 'Low' scenario is considered internally to be the most likely. The 'Medium' scenario is based on the Environment Agency 'Enhanced' scenario and includes application of CSMG. The timing for application was very uncertain when

we put together the dWRMP24 and the 'High' scenario was based on our reasonable worst-case assumption by 2050, which is the revocation of the Lower Itchen licences.

In developing the three scenarios focused on the River Itchen, the following were considered:

- **Achieving EFI compliance** would likely need the existing HoF condition at Allbrook and Highbridge to be changed. An increase in HoF to 224Ml/d (as proposed in 2010 for World Wildlife Federation)[19] would effectively eliminate any DO during severe drought, but normal year output would be unaffected. However, groundwater modelling (using the Test and Itchen model) suggests that a greater HoF of around 313Ml/d would be potentially required to fully achieve EFI compliance. The Q_{95} natural flow is estimated at around 347Ml/d. A larger HoF would effectively prevent use of the source even in mild droughts. There may be some winter yield and small amount of DO available during normal year.
- **If CSMG were to apply**, the modelling done under the CSMG WINEP suggests flow compliance is achieved only around 40 to 60% of the time. These sources would need to lose up to their full licenced DO volume through the summer/autumn to achieve CSMG compliance. To achieve CSMG the environmental deficit is estimated at between 40-70Ml/d and a relatively complex set of stepped HoFs would be needed to fully meet CSMG standards.

The possible impact of abstractions to the **wider Itchen Wetlands SSSI** is currently unknown as the AMP7 Itchen Wetlands WINEP investigation is ongoing until 2025. If the outcome confirms impacts, reduction in the licence quantities may be needed as part of a suite of mitigation measures.

When such further reductions are applied, in combination with the above-described conditions to meet EFI or CSMG, any remaining yield from our Lower Itchen abstractions is effectively removed under the higher Environmental Destination scenarios. Hence it is a reasonable worst-case assumption that the Itchen groundwater, Itchen surface water and Twyford licences are revoked, and the DO from these sources will need to be replaced with alternative supplies.

Based on the outcome from the Candover Stream Habitats Directive WINEP investigation, we have agreed the **revocation of Alresford licence from 2030** with the Environment Agency and Natural England, as it cannot meet EFI (or CSMG) targets under any conditions. We have included this licence change in all our Environmental Destination scenarios.

Groundwater modelling has shown that the impacted reach of the River Itchen at the **Winchester** groundwater abstraction is presently EFI and CSMG compliant. Therefore, any licence change will likely be because of a licence reduction (estimated at ~13Ml/d) due to the groundwater abstraction impact upon the Itchen Wetlands SSSI. In the absence of data for the Itchen Wetlands, before the WINEP investigation outcomes are available, we have assumed the same magnitude of licence change as in our WRMP19 to 9.9Ml/d. But under a reasonable worst-case scenario (High Environmental Destination) we have assumed that our Winchester source licence could be revoked.

[19] Wilby, R, 2010. An assessment of invertebrate-based target flows for the River Itchen, Hampshire Technical Note prepared on behalf of WWF-UK Rivers on the Edge Technical Support (GB900135)

For our Environmental Destination scenarios, we have considered the renewal of the Itchen licences in 2025 and the expiry of the Section 20 Agreement in March 2030. However, it is likely that we will need to defer DO losses until later in the planning period because of the unsolvable supply-demand balance deficits identified between 2025 and 2030, before the availability of long-term solutions to address the security of supply.

The appropriate assessment as part of the licence renewals will inform the interim compensation and mitigation measures that may be required, until a reduction to DO for the Lower River Itchen sources can be implemented.

8.4 Sensitivity runs

As part of developing our fdWRMP24, we have conducted sensitivity testing for the following Environmental Destination scenarios, specifically focused on the near-term risks of requiring early licence changes associated with:

- uncertain outcomes from the Pulborough sustainability study, and
- additional conditions being imposed during licence renewal for the Lower Itchen sources (Itchen surface water, Itchen groundwater and Twyford)

8.4.1 Pulborough sensitivity testing

Our baseline scenario for Pulborough groundwater licence change assumes a reduction from 13Ml/d to 5.5Ml/d over a 15-year period from 2031 to 2046. We have tested two alternative early licence changes to Pulborough groundwater to test the impact of applying the assumed EFI compliant rate (taken from WRMP19) from 2025, before having conclusive data from the ongoing environmental investigation.

- **Pulborough Early:** In this run, the Pulborough groundwater licence was reduced from 13Ml/d to 5.55Ml/d in 2025.
- **Reasonable Worst Case:** This run involved a reduction in groundwater licence from 13Ml/d to 5.5Ml/d in 2025, followed by full revocation of groundwater abstraction at Pulborough by 2030-31. As per ‘Pulborough Early’ the groundwater DO is reduced from 13Ml/d to 5.55Ml/d in 2025 and with full revocation in 2031.

Both runs achieve supply-demand balance. See fdWRMP24 Technical Report for details. This suggests that we could accommodate some degree of licence reduction before 2031, if required. However, such reductions will impact our level of service, increase reliance on drought permits and orders and will require earlier delivery of some larger supply schemes.

8.4.2 Itchen sensitivity testing

We have tested two alternative early licence changes to the Lower River Itchen abstraction licences:

- **Itchen early HoF:** This tests the impact of introducing the 244Ml/d HoF condition from 2025, as proposed in 2010[20], to the Lower Itchen licences (Itchen groundwater and surface water and Twyford).

[20] Wilby, R, 2010, An assessment of **invertebrate**-based target flows for the River Itchen, Hampshire Technical Note prepared on behalf of WWF-UK Rivers on the Edge Technical Support (GB900135)

This run resulted in unresolved deficits in 1:100 and 1:500 drought scenarios even with full utilisation of the Itchen and Candover drought permits and orders.

- **Itchen early CSMG:** An early application of the Natural England CSMG flow standards to Lower Itchen licences. These reductions to the Itchen groundwater and surface water and Twyford are applied from 2025 and the licences are revoked by 2036.

  This run resulted in unresolved supply-demand deficits under all planning scenarios. Normal year deficits in the supply-demand balance are driven by the reduction in abstraction required by CSMG normal conditions.

The outcome of these sensitivity runs indicates that any early licence change further exacerbates the baseline supply-demand balance deficit and, until major long term supply solutions (HWTWRP and T2ST) are delivered, supply-demand balance cannot be achieved. It confirms that early licence reductions cannot be accommodated. See chapter 7 of fdWRMP24 Technical Report for details.

8.4.3 Sussex Worthing licence capping

As described in Section 3.2.1, we proposed to introduce licence capping in SWZ from 2034. We consider that this date would still be effective at preventing growth in and is consistent with Environment Agency guidance on the prevention of deterioration from priority C sources which would require implementation in AMP9 (2030-35)[21] and by 2036 at the latest[22].

However, in their representations on our September 2023 SoR, the Environment Agency sought further clarification on the reasons for the timing of the licence capping in SWZ. To address this concern, we undertook a sensitivity run to illustrate the impact of bringing forward the introduction of licence caps to 2030.

The result showed that this change can be accommodated. See fdWRMP24 Technical Report for details.

8.5 Romsey groundwater option

The aim of the Romsey groundwater option is to increase the DO of the existing Romsey source. Yields from this groundwater-fed water supply works (WSW) are presently constrained by poor raw water quality including frequent, but intermittent, turbidity issues and long-term rising trends of nitrate. This poses on-going operational risks.

The Environment Agency has acknowledged the efforts we are making to reduce the impact on chalk streams but have noted that this option, which involves increased groundwater output during drought, may be contradictory to those aims.

Romsey WSW routinely operates well below its licenced limit and potential drought DO due to relatively low demand on the source. The existing boreholes and well/adits that supply the works are operating below their full capacity due to water quality issues. This option proposes 3 replacement boreholes to increase DO on site and allow the full licenced limit to be recovered. The final expected yield of the scheme is 13.68Ml/d.

[21] Environment Agency, 2018. Guidance Water Resources investigations into the risk of WFD water body deterioration
[22] Environment Agency, 2024. Preventing water body deterioration due to increased abstraction by water companies. Guidance for AMP8

We acknowledge the Environment Agency's concerns regarding the potential impact of our increased groundwater abstraction on chalk streams. Chalk streams are a valuable and fragile ecosystem, and we are committed to taking steps to protect them.

- The current River Test chalk groundwater body status under the WFD is 'good' for all quantitative classifications including the groundwater balance, dependant surface water body test and groundwater dependant terrestrial ecosystems (GWDTE test).
- The quantities that could be abstracted under this scheme are within the current abstraction licence limits and there are currently no flow thresholds associated with this abstraction licence. This scheme is effectively a recovery of lost DO.

Recent studies to inform the impacts of CSMG flow standards have indicated the adjacent reaches of the River Test meet both CSMG and EFI targets under both 'recent actual' and fully licenced abstraction rates. We are working with the Environment Agency to investigate the risk of deterioration from our Romsey source under the WINEP by 2025. This investigation will help to establish the viability of any increase in abstraction from this scheme, and inform any future licence reductions if required, to ensure that the current water body status is not impacted.

In our current Environmental Destination scenarios, following the assessment of 'recent actual' abstraction rates to ensure that atypical abstraction is removed as part of our WFD no deterioration investigation our current screening 'recent actual' baseline rate is 5.4Ml/d, which might be the required licence reduction at Romsey if a deterioration risk is identified, and licence capping is required as an outcome of the WINEP investigation. The current investment modelling is unable to restrict option choice based on Environmental Destination scenario. If it could, we would exclude this scheme from being selected under the higher Environmental Destination scenarios. However, since the outcome of the 'No Deterioration' investigations is presently unknown, the option is treated as feasible.

The earliest start date for the proposed Romsey groundwater scheme is 2030-31. It can potentially be delivered earlier but we have allowed extra time to conclude the 'No Deterioration' investigations and, if required, make any licence changes in advance of the DO benefit being required to meet our supply-demand balance challenge. If a licence reduction is applied following the 'No Deterioration' investigations, this scheme may no longer be viable and would be removed from our WRMP29.

9 Summary and next steps

9.1 Summary

We have outlined our ambition to achieve sustainable abstraction and determine a long-term Environmental Destination. Our overall aim is to establish long-term sustainable licensing of our sources as soon as possible, so that we can progress supply-demand planning and management on a stable and more certain footing. The route for this will be our series of ongoing WINEP and environmental investigations, including detailed monitoring and modelling to provide a robust evidence base to inform the most appropriate set of long-term licence reductions and mitigations that will deliver considerable environmental benefits alongside those delivered through our Catchment First programme. Through this work, we plan to reduce the uncertainty associated with the range of possible licence reductions considered under our Environmental Destination scenarios. By the time of our WRMP29, the outcome of WINEP investigations will enable us to have greater certainty around the long-term strategic solutions that are still required and the appropriate adaptive planning decision points.

In working towards our goal of achieving sustainable abstraction, we have done the following:

- We have used the ‘actions required to prevent deterioration’ in the guidance to inform our Environmental Destination scenarios. We have applied an initial review of licence capping based on our assessment. Our ongoing work through our extensive ‘No Deterioration’ WINEP will continue to refine and inform licence changes needed to prevent deterioration. We expect these to begin from 2030.
- We have demonstrated our continued regard to the RBMPs and WFD regulations objectives, the delivery of measures through ongoing investigation, monitoring and delivery of solutions via WINEP.
- We have taken account of government and regulator objectives for the environment and highlighted our work associated with vulnerable chalk streams. Our long-term Environmental Destination scenarios propose significant reductions in our chalk groundwater abstractions to support nature recovery and meet environmental flow or other agreed WFD targets.
- We will deliver the regulatory actions required to avoid deterioration and meet targets for protected areas through the continuing development of our WINEP and proposed interim mitigation measures before final delivery of water resource schemes.
- Where needed, we will also support nature recovery through river and habitat enhancement alongside any required reductions to our abstractions.
- We have been ambitious. Through our ‘Alternative’ scenario, we are investigating the solutions that would be required to allow us to stop all abstraction in our most sensitive catchments including the River Itchen and Lower River Rother and Arun to remove any potential risk to designated wetlands.
- We have brought forward many of our WINEP investigations.
- Through the development of the regional and our own specific Environmental Destination scenarios, we are exploring the impact of potential climate change scenarios to 2050 and beyond.
- We have considered the most appropriate timing by reviewing and prioritising the catchments where abstraction reductions are most needed and will have the greatest impact. We have balanced that against our available alternate supply options to ensure supplies remain resilient.

Our ambition will continue to evolve as we shape our final WRMP24 and take account of changes in policy, guidance and the continuing assessment of outcomes from our WINEP investigations.

9.2 Next steps for WRMP29 and beyond

The development of the Environmental Destination will continue to evolve over the next few planning cycles as our environmental investigations conclude and provide more certainty on the magnitude and timing of interventions required to achieve sustainable abstraction.

Further work is underway alongside neighbouring water companies at WRSE level to develop greater consistency in future Environmental Destination scenarios. WRSE have proposed a regional level WINEP investigation as a collaborative exercise to capture water company intelligence and latest WINEP investigations / outputs, so as to identify catchments where a regional scheme approach would deliver the most benefit.

The resulting approach would become part of the AMP9 WINEP delivery. This will need to take account of timelines for individual company WINEP investigations and the outputs available to use at a regional level. This will be achieved by a coordinated approach of the companies WINEP programmes, liaising with the regulators and producing a consistent set of data across the South East, incorporating the reductions from non PWS abstractors.

Key elements of this proposed programme will be:

- Collate the monitoring information, including the online monitoring data, to characterise the issues in each of the catchments. This would be a build on the maps and information WRSE undertook for this plan (see section 5.2). This catchment problem characterisation feeds into a desk top study.
- Identify the extent of geographic areas/catchment proposed within independent company Environmental Destination investigations.
- Verify licenced abstractions in the catchment that are to be used for the catchment work and agree the target flow regime and WFD criteria for the water bodies and the benefit assessment method
- Develop catchment-based tools that facilitate a rapid assessment of the different Environmental Destination profiles and their impact on the catchments flows and flow targets; EFI's, WFD and best value metrics and any cost benefits to help discussions with regulators and catchment partnership teams to facilitate and characterise the challenges the catchment faces and potential interventions.
- Undertake a full review of potential catchment solutions that can be found in the UK or internationally that could be used in the South East of England to improve catchments. From the list agree potential solutions that might work for the specific catchments being investigated. This should also include scenarios such as licence trading quantities of water down the catchment to improve flows in the headwaters.
- Use catchment forums to identify specific catchment and nature based solutions to provide longer term solutions and/or mitigate impacts in the short term until a WRMP intervention can be brought on line.
- Use the catchment based tool and the catchment prioritisation tool to show optimised schedules of the source reductions and catchment solutions that could be implemented to develop a catchment - based approach for improving catchments to meet their future needs under a range of different climate change and growth scenarios.
- Review if there are any increased risks of groundwater flooding from source reductions using groundwater models or other appropriate assessment methods.

This programme of work is expected to commence in 2025 and be completed by 2030 and will directly feed into the Environmental Destination assessments for WRMP29.

Appendix A: Catchment First

Catchment First is Southern Water's commitment to put the well-being of the environment at the centre of the decisions we make and the services we deliver. It represents a shift in focus from relying on traditional engineering solutions, to working collaboratively with partners to create long-term sustainable improvements to the environment on which our business and customers depend.

This shift in approach has been accelerated as a result of two key drivers; the environment and our customers:

Environmental drivers

We need to serve customers under increased water resource pressures, with a growing population, and under a range of future climate change scenarios. The challenge to undertake this whilst not only mitigating our past and present environmental impacts, but also improving the environment in which we operate to help with the current climate and biodiversity crisis. We have strong Environmental Destination, commitments and constraints around carbon neutrality, water neutrality, nutrient neutrality, biodiversity net gain, improving designated sites, and a public responsibility to keep our rivers, coasts and landscape healthy for future generations. Our regulators, the Drinking Water Inspectorate (DWI), Ofwat, Natural England and the Environment Agency expect us to have a strong focus on catchment management too. From 2020 to 2025 our catchment management work will help us meet our regulatory requirements by delivering our Water Industry National Environment Programme (WINEP) and DWI Legal Notices. Moving forwards from 2025, the expectation is that we will deliver more catchment and nature-based solutions, providing wider benefits for the environment and society.

Customer drivers

Our customers are valuing nature more than ever before. There is an increased awareness of the impact of climate change and the resulting extreme weather events on communities, through flooding and dry weather periods. As a result of the COVID-19 pandemic, there has also been an increased appreciation of the natural environment and the role it plays in society's mental and physical wellbeing. The priorities identified by our customers are:

- Be brilliant at the basics: the here and now, focusing on providing safe, reliable water and wastewater.
- Be proactive and focused on the long term: future-proofing now against the challenges ahead, centred on resilience and infrastructure.
- Be environmentally responsible: leaving the environment better than we found it, respecting and valuing nature in assessing solutions, caring for rivers and beaches.
- Be socially responsible: listening to customers, being accountable and transparent.

Catchment First serves all four of these priorities identified. It recognises that our assets and networks do not operate in isolation from the environment, communities or other network operators. Understanding the difference between the cost of a solution, and the value that a solution could provide to the environment and society is fundamental to our approach, putting natural and social capital at the front and centre of the way we make decisions.

This is a fundamental shift from WRMP19, at which point the key customer insight was 'to protect and improve the environment, doing no harm is the absolute minimum'. Now, at WRMP24, the focus has shifted to 'protect and restore the environment and habitats, damage is not tolerated at any level'. Customers want to see us doing better, and we need to do better to ensure a sustainable supply into the future.

The key principles underpinning our Catchment First programme are also aligned with our WRMP24 aims and include:

- **Improving environmental resilience**: A healthy and resilient environment is fundamental to our ability to supply customers into the future. This goes beyond mitigation of potential impacts and seeks to proactively improve the health of the water environment so that it is then more resilient to natural pressures (such as climate change, droughts, floods) and to man-made pressures from catchment activities (including abstraction, wastewater discharges, farming etc). Alongside ensuring compliance through engineered solutions, we can work in parallel to improve the natural environment to help ensure supply solutions are sustainable longer term. Examples of this include:
  - Engaging with farmers, and others, to reduce catchment sources of nitrate (e.g. nitrate fertilisers or urban uses of fertilisers) and prevent long-term deterioration in the quality of underground sources. This would be in parallel to further treatment (or additional blending) to ensure drinking water sources are maintained in the short to medium term.
  - Engaging with farmers to promote best practice for pesticide and herbicide use, while monitoring concentrations in the rivers to make sure concentrations do not overwhelm existing treatment processes, thereby improving the catchment and protecting customer sources.
  - Mapping natural capital assets in the catchment and understanding how they could be improved to solve key water quality issues whilst improving and building habitats, thereby enhancing biodiversity, increasing resilience to floods and droughts and providing increased public value. By embedding natural and social capital into optioneering assessments, we are better recognising the ***value*** of a solution, rather than just evaluating the cost of a solution. Such Best Value solutions should then be delivered either instead of engineered solutions, or alongside engineered solutions to achieve compliance in the short to medium term and to provide environmental and asset resilience into the future under a changing climate and regulatory landscape.
- **Reduced embedded carbon and emissions**: Delivering our net zero plan, incorporating carbon costs into decisions, delivering offsetting over and above reductions.
- **Outcome Focus:** Clear targets for Environmental Net Gain (ENG) and Biodiversity Net Gain (BNG). Clear and consistent monitoring to support evidence of environment outcome delivery and to feed into Natural Capital and Environment Social Governance (ESG) reporting.
- **Transparent evidence base**: Developing an integrated monitoring plan for catchments and consistent ways of working.
- **Collaborative Planning & Delivery:** Co-identification, co-development, co-funding, and co-delivery of the environmental issues and potential solutions with stakeholders and catchment partners. Working with Non-Governmental Organisations (NGO)s to provide the best outcomes for customers and environment.

Our Catchment First programme reflects the environmental and customer priorities (Figure A1), and closely links to key strategic plans, the Drainage and Wastewater Management Plans (DWMPs) and the Water Resources Management Plans (WRMPs).

Our key strategic Catchment First projects aligned with WRMP to protect water resources include:

- **Sustainable abstraction and mitigation programme:** In AMP7 we undertook a number of investigations to determine if our abstractions were having an impact on nearby waterbodies or wetlands. Where abstractions may potentially be impacting ecology in nearby chalk streams or wetland habitats, schemes focused on implementing enhancements to make the habitats more

resilient to variations in water level / stream flow regimes have been included for delivery in AMP8. Any changes to abstraction licences in agreement with the Environment Agency will be integrated into our Environmental Destination scenarios.

- **Groundwater nitrate reduction programme:** understanding the risk of nutrient concentrations (specifically nitrate) in groundwater sources and the resulting risk to drinking water compliance and source sustainability in the future. Implementing catchment schemes, working with agriculture and other land users, to ensure the resilience of the sources and assets in six key project areas: Hampshire, Worthing, Brighton, North Kent, Thanet North and Thanet South, (Figure A2:) collectively covering approximately 46 groundwater sources stated in AMP7 and continuing in AMP8.
- **Surface water catchment resilience programme** – understanding the nature of the river catchments and the risks to raw water quality at key abstractions, working with farmers, agronomists and catchment stakeholders to mitigate upstream water quality pressures whilst providing wider environmental outcomes for example for natural capital, carbon, flooding, soil health and sediment erosion. Key focus areas in AMP7 and into AMP8 are the Western Rother and River Arun catchments in Sussex, the River Beult sub-catchment to the River Medway in Kent, and the Eastern Yar catchment on the Isle of Wight (Figure A).
- **Integrated Catchment Management –** the focus of our AMP8 programme is that of collaboration. We are working with the Catchment Partnerships to codevelop catchment scale management plans from source to sea. The priority areas for these integrated plans are the Test and Itchen (Hampshire), the Eastern Yar (Isle of Wight), the Western Rother and Arun (Sussex) and the Medway (Kent). The plans incorporate both water quality and quantity improvements.

More detail on these catchment programmes is provided below, including what we have focused on to date, how we propose to expand in the future, and how we will work with local partners to deliver lasting wider benefits.

Figure A1: Our key Catchment First projects.

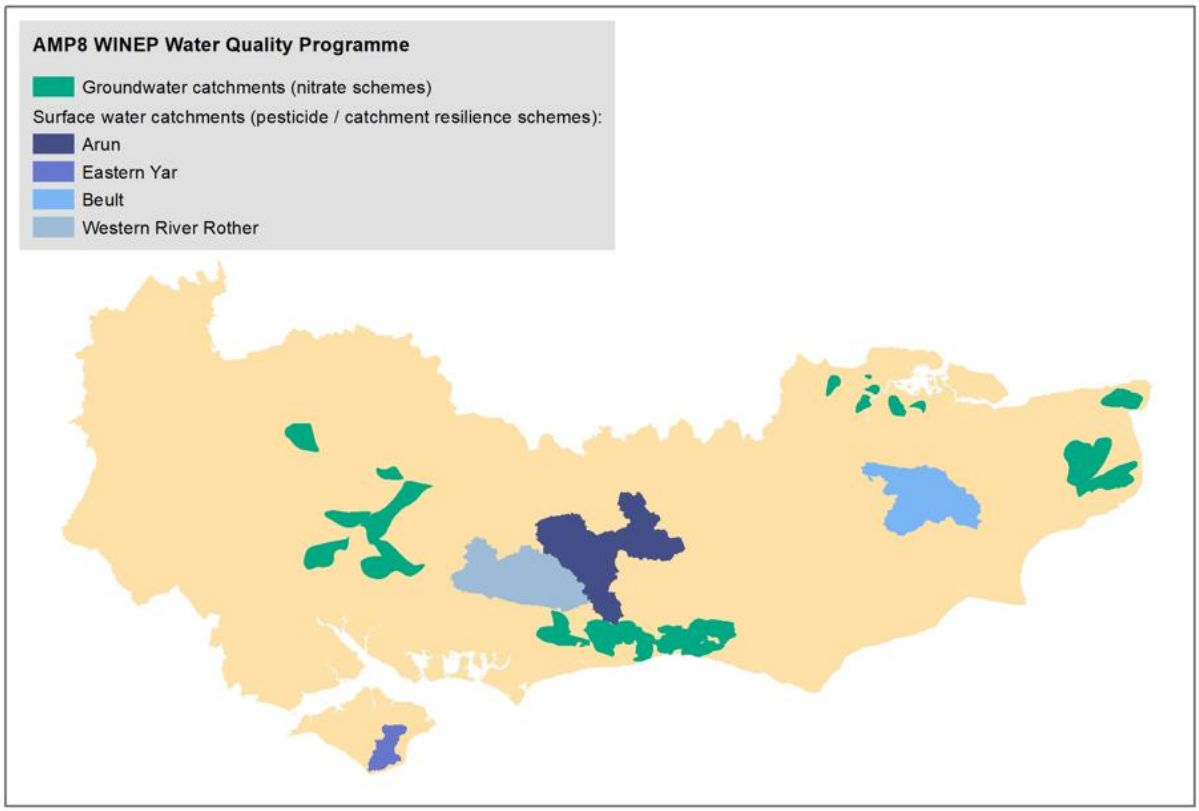

Figure A2: Our key catchments which form part of our water quality programmes for surface water and groundwater.

Groundwater sources nitrate mitigation projects

We are taking a twin track approach to manage water quality alongside treatment (including blending), with a specific focus on agricultural nitrate risk to groundwater sources. In some catchments, catchment programmes run in parallel to the installation of new nitrate removal plants, and in others, it is as an early alternative to treatment, aimed at reducing seasonal peaks of nitrate pollution seen in the raw water monitoring and groundwater models. Overall, our aim is to work in the catchment to reduce nitrate leaching to the aquifer, to either delay or negate the need for costly nitrate removal treatment facilities in the future, and to extend the life of existing assets. In doing so, we are working in a more sustainable way, addressing the longer-term underlying causes of groundwater pollution by focusing on crop rotations, soil health and efficient nutrient fertiliser usage, whilst in the short and medium term also ensuring compliant drinking water sources for customers. This approach also enables us to build close relationships with landowners and managers who have significant control over the quality of water we subsequently end up treating, which is critical if we are to prevent pollution, ensure compliance, and deliver lasting outcomes for the environment and society. We are working with a range of delivery partnerships across the groundwater programme, including close working with several farmer clusters across Hampshire, Sussex, Kent and the IOW, engaging directly with farmers, contractors, agronomists and also via larger scale collaborations such as The Aquifer Partnership.

Moving forwards into AMP8, we will be expanding our catchments within the existing groundwater programme and maintaining our focus on engaging farmers and promoting best practice in nutrient management. We will be further enhancing our focus on delivery of wider environmental outcomes for water quality and environment. This includes expanding our mitigation measures to include principles of regenerative agriculture and soil health, carbon sequestration, biodiversity, water efficiency and source resilience. We are also embedding groundwater source protection into the forward plans for the DWMP,

ensuring that there is a plan for understanding and mitigating the risk posed to drinking water sources from our own wastewater assets. The delivery mechanism for the latter sits within the delivery of DWMP.

River catchment sources water quality protection

Similar to the groundwater programme, but in a river catchment setting, we are working with farmers, agronomists and catchment partners to understand the risk from a range of pesticides and herbicides, and undertaking mitigation action via farmer engagement, trials and source control measures. The issue with many agricultural pollutants is that they are highly seasonal; pests are influenced by seasonality, and as such the use of chemicals and subsequently the concentrations of pesticides and herbicides seen in raw water sources are also seasonal. These peaks can be a challenge to treat, especially where multiple pesticides are seen in high concentrations and at the same time of year, driven by seasonal usage and weather driven run off events. When the turbidity of the river increases (as driven by rainfall) it can become harder to treat water efficiently. This situation is exacerbated with the effects of climate change and widespread decline in soil health. The river catchment programme is therefore vital to ensure that the treatment challenge does not continue to worsen in the future.

We are monitoring for pesticides (along with a range of other pollutants) in the catchments upstream of all our surface water abstractions, analysing the data and engaging with land managers upstream on any pesticide water quality issues as they emerge. Alongside this ongoing activity, we are also collaborating with landowners, farmers and other partners in a more focused way in two critical river catchments for water supply – the River Beult (River Medway system in Kent) and the Western River Rother & Arun catchment (in Sussex). Our task is to bring landowners and managers together, share data to contextualise the issues, and work together to find a solution. We are actively engaging on sustainable pesticide use, alternative approaches to weed control, pathway disruption methods, and measures to build soil structure, carbon and infiltration capacity to make soils more resilient to pests and surface water run-off.

Moving forwards, we are further enhancing the pesticide projects with a focus on working with natural capital to make the catchment more resilient. We are taking a natural capital mapping approach to better understand the condition and function of the catchment and its natural assets and applying methods and tools to target interventions to provide multiple resource benefits whilst making space for nature. This focuses on working closely with catchment partners and landowners to develop pilot projects that will test how we integrate objectives across for example water quality, water resource, natural environment and flooding, to achieve multiple outcomes for society and the environment.

This programme is focused in the Western Rother and Arun, and in the River Beult catchments, and will run in parallel to the pesticide source control projects from AMP7. In combination with engagement, advice and source control, the natural capital resilience approach will help mitigate the impact of climate change, reduce flood risk and improve water quality and resource availability. We will be working with local partners, stakeholders and landowners to implement pilot projects that include habitat enhancement, natural flood management and catchment management approaches to achieve both environmental sustainability and resource resilience.

Water resources river enhancement

As well as undertaking catchment management to protect water quality, we are also undertaking extensive investigations and mitigation activities to help ensure our abstractions, and their impact on the environment (critically chalk streams and associated wetlands), is sustainable. This includes complex environmental monitoring and scenario modelling exercises to understand the potential impacts, and then enhancement work to make the river more resilient. One example of where we are doing this is on the River Anton near Andover, where we are working with catchment partners to deliver river enhancements.

Our key focus for 2023 – 2025

We have made good progress building our Catchment First programme so far in AMP7; however. more needs to be done. Between 2023 and 2025 our focus is on:

- Delivering our existing WRMP and WINEP AMP7 commitments, including wider roll out of mitigation measures with farmers to reduce nitrate in groundwaters and pesticides in surface waters. We are also continuing our investigations into the impacts of our abstractions on the environment.
- We will be gathering lessons learned to date from our programme trials, moving forwards, focussing on what has worked well, and what has had limited success.
- We are improving how we understand and value a healthy, resilient environment as a critical part of the asset base and the potential of our activities in the future to not only better mitigate our impacts but also to improve environment and public value. This means continuing our natural capital mapping, and our catchment resilience pilots in the River Beult (River Medway) and Western Rother catchments. These projects provide information on the use of natural capital in decision-making, appropriate solutions, and beneficiaries.
- Continuing from AMP7, we will be further strengthening our partnerships with other delivery organisations such as the Rivers Trust, Wildlife Trusts, farmers and others to help co-develop and co-deliver solutions in the future.

We will continue to embed catchment and environment principles into the fundamental building blocks of PR24, so that engineering solutions are considered alongside environmental improvements in our optioneering processes. We are also embedding this theme into our corporate decision-making process.

Summary

Our business is rapidly shifting to one focused not just on preventing pollution, achieving compliance, and building our reputation but in addition to this, one that puts the customer's views clearly in the frame in decision-making. Our customers – including our future customers – support this approach.

As such, catchment is embedded in key strategic plans and delivery mechanisms such as WRSE, WRMP and DWMP. Our evolving Environment Strategy also builds on this by embedding catchment and nature-based solutions across broader business processes.

New government policies strongly reflect the current climate and biodiversity crises. It is also a rapidly evolving landscape in terms of agricultural subsidies, with the focus moving forwards being on 'public money for public goods'.

We are already well aligned with these shifts, having developed our catchment strategy and delivery approaches to focus on working in partnerships with agricultural groups, agronomists and directly with farmers to mitigate key water quality risks whilst focusing on natural capital and catchment resilience. Our mitigation measures have focused on delivering wider benefits such as carbon sequestration, biodiversity and flood resilience, alongside water quality and water resource benefits.

Moving forwards, we are building more on this approach. Our catchment resilience pilots developed in 2019-20 have placed us well to know how to use natural capital in best value decision-making, how to work with farmers to understand how our soil health programme fits with emerging carbon markets, and how to identify and integrate other funders, including the supply chain, in blended financing approaches. We will be further expanding the catchment resilience approach into the future – an approach that is not only aligned with our regulatory requirements now via the new WINEP but is also a more progressive approach to engagement and delivery and one which provides multiple benefits for the environment, the local economy and for social capital.

Key to all this is communication and engagement – with the agricultural sector, with catchment and environment groups, and with our customers. The Catchment First programme provides fantastic opportunities to help us achieve compliance, prevent pollution and enhance the environment, alongside improving the confidence of our customers and communities, through additional opportunities for education and participation.

Our catchment schemes

The table below summarises the 71 distinct catchment schemes we have included in the WRSE regional plan and our PR24 Business Plan as part of our catchment management strategy. Delivery of many of these schemes directly aligns with our existing defined WINEP investigations and we expect the WINEP to be primary route through which our Catchment First Strategy is delivered.

Option Name	Option type	Option description	Option Name
Adur and Ouse	Nitrate groundwater agricultural catchment management - Brighton Chalk Block sources	Knowledge exchange, education and agricultural activity	Agricultural catchment management approaches to reduce nitrate leaching to groundwater. Targeted agricultural measures in specific areas include: Farm Capital Grant Scheme (to support various large capital items aimed at reducing nitrate leaching issues); general advice delivery and specialist nutrient management planning / testing services. In addition to direct benefits for water quality in the long term, the scheme also delivers wider benefits under the categories of: Environment / Social (supporting the farming community); Resilience (making the SWS sources more resilient into the future, with the measures aimed at reducing raw water nitrate fluctuations and water quality deterioration), Collaboration (working with landowners and catchment stakeholders to develop and implement catchment mitigation measures) and Pilot Scheme Opportunities through implementing trials.
Adur and Ouse	Nitrate groundwater urban catchment management - Brighton sources	Integrated catchment management	Urban catchment management approaches in three targeted catchments to reduce nitrate leaching to groundwater sources. Collaborative approach with The Aquifer Partnership. Measures currently being defined.
Adur and Ouse	Nitrate groundwater agricultural catchment management - Worthing Chalk Block sources	Knowledge Exchange, Education and Agricultural Activity	Agricultural catchment management approaches to reduce nitrate leaching to groundwater. Targeted agricultural measures in specific areas include: Farm Capital Grant Scheme (to support various large capital items aimed at reducing nitrate leaching issues); general advice delivery and specialist nutrient management planning / testing services. In addition to direct benefits for water quality in the long term, the scheme also delivers wider benefits under the categories of: Environment / Social (supporting the farming community); Resilience (making the SWS sources more resilient into the future, with the measures aimed at reducing raw water nitrate fluctuations and water quality deterioration), Collaboration (working with landowners and catchment stakeholders to develop and implement catchment mitigation measures) and Pilot Scheme Opportunities through implementing trials.
Adur and Ouse	Catchment Compliance Programme	Integrated catchment management	Programme of investigations and mitigation to understand and proactively mitigate water quality hazards in drinking water catchments, before hazards present as water quality risks. Key focus of this is about resilience and ensuring compliance, by working with landowners and ‘prevention is better than cure’ approaches. Mitigation can vary from simple engagement and awareness raising, baseline compliance reinforcement, to providing support to farmers via provision of funding for capital items via SWS Farm Capital Grant Scheme.
Adur and Ouse	Multipollutant, whole farm approaches in key strategic areas	Integrated catchment management	Whole farm audits and mitigations plans
Adur and Ouse	Lewis Winterbourne Enhancements	River Restoration	Implementation in AMP7 of in-river enhancements
Arun and Western Streams	Pesticide Catchment Management - Western Rother	Pesticide reduction	Agricultural catchment management approaches to prevent deterioration of raw water quality for pesticides in the Western River Rother. Specifically targeting propyzamide.
Arun and Western Streams	Catchment Compliance Programme	Integrated catchment management	Programme of investigations and mitigation to understand and proactively mitigate water quality hazards in drinking water catchments, before hazards present as water quality risks. Key focus of this is about resilience and ensuring compliance, by working with landowners and ‘prevention is better than cure’ approaches. Mitigation can vary from simple engagement and awareness raising, baseline compliance reinforcement, to providing support to farmers via provision of funding for capital items via SWS Farm Capital Grant Scheme.
Arun and Western Streams	Integrated Catchment Water Quality and Water Efficiency Programme	Integrated catchment management	Programme of on-farm water efficiency measures to alleviate water resource and water quality pressures in a more integrated way in key catchments. Pilots for AMP8. Western Rother and River Beult. Measures to be looked at include a range of on-yard infrastructure improvements.

Option Name	Option type	Option description	Option Name
Arun and Western Streams	Regenerative agriculture programme - Surface waters	Integrated catchment management	In surface water catchments where Southern Water has water quality drivers for drinking water (e.g. in the W. Rother, Beult, Arun and Eastern Rother for example) where we have pesticide drivers primarily driven by agriculture, and part of the root causes around pesticide use is 1) soil health and lack of resilience to pests and 2) soil structure and lack of stability, providing an easy run off pathway of sediment and adhered pesticides and other substances to watercourse. This project would have different elements to it, 1) Research and trials 2) Engagement and education and 3) Support measures & monitoring. This would be a long term project with long term goals, aimed at addressing root causes of the water quality issues i.e. fixing soil health as a way of lowering inputs of chemicals and stabilising the soils, lowering run off, and increasing water retention in the catchment. It's time horizon fits well with WRMP.
Arun and Western Streams	Multipollutant, whole farm approaches in key strategic areas	Integrated catchment management	Whole farm audits and mitigations plans
Arun and Western Streams	Natural Flood Management Pilot	Natural water retention measures (including NFM and wetland creation)	Collaborative Pilot on the Western Rother
Arun and Western Streams	River Restoration in the Arun and Western Streams Catchment	River Restoration	Removal of structures to reduce water impoundment.
Arun and Western Streams	Floodplain enhancement in the Arun and Western stream catchment	Integrated catchment management	Floodplain enhancement to reduce sedimentation and improve water quality.
Arun and Western Streams	Floodplain enhancement and tree planting scheme	Terrestrial habitat creation/ management	Floodplain enhancement and tree planting to reduce erosion and sedimentation.
Arun and Western Streams	INNS investigation scheme	Other (please add to additional info)	Extensive issues with INNS.
Arun and Western Streams	Flood plain meadows investigation scheme	Integrated catchment management	Project investigating creation of floodplain meadows to buffer river and increase biodiversity. Additional incentives (PES) needed.
Arun and Western Streams	Arun Valley Restoration	Natural water retention measures (including NFM and wetland creation)	SSSI condition – 25 YEP target designated site condition. Arun Valley SAC (also a SPA, Ramsar and 3 SSSIs) is at risk of being in unfavourable condition and features being impacted from water supply issues - long-term abstraction of groundwater. Restoring site condition and improving its resilience to climate change will require greater connection to groundwater particularly in hot dry weather.
Arun and Western Streams	Arun Valley nature based solutions	Nutrient and sediment reduction	SSSI condition – 25 YEP target designated site condition. Arun Valley SAC (also a SPA, Ramsar and 3 SSSIs) is at risk of freshwater squeeze due to saline intrusion - climate change. Leaving more water upstream to enable creation of habitat upstream. Addressing water quality and water supply issues (abstraction and barriers to floodplain below the designated sites); habitat creation/restoration, and - creating opportunities for climate change adaptation, improving clean freshwater availability and also creating natural flood risk management.
Arun and Western Streams	Arun Valley habitat creation	Natural water retention measures (including NFM and wetland creation)	Arun Valley SAC - 25 YEP target designated site condition target. At risk of freshwater squeeze due to saline intrusion. Habitat creation/restoration by leaving more water upstream. Addressing water quality and water supply issues (abstraction and barriers to floodplain below the designated sites).

Option Name	Option type	Option description	Option Name
Arun and Western Streams	By-pass of weir	River restoration	By-pass of weir to increase flow and reduce INNS infestation.
Arun and Western Streams	Removal of weir	River restoration	Removal of weir will increase fish passage and renaturalise flow. Will open 12km of river to fish.
Cuckmere and Pevensey Levels	Arlington Reservoir habitat creation scheme	Natural water retention measures (including NFM and wetland creation)	Arlington Reservoir has potential implications on the biodiversity and hydrology of the surrounding area. Opportunities for habitat creation and biodiversity net gain, and this should be a priority (and will likely be required for mitigation).
Isle of Wight	Catchment Compliance Programme	Integrated catchment management	Programme of investigations and mitigation to understand and proactively mitigate water quality hazards in drinking water catchments, before hazards present as water quality risks. Key focus of this is about resilience and ensuring compliance, by working with landowners and 'prevention is better than cure' approaches. Mitigation can vary from simple engagement and awareness raising, baseline compliance reinforcement, to providing support to farmers via provision of funding for capital items via SWS Farm Capital Grant Scheme.
Isle of Wight	Multipollutant, whole farm approaches in key strategic areas	Integrated catchment management	Whole farm audits and mitigations plans
Isle of Wight	Plaish Meadows / Lukley Brook enhancements	River Restoration	Implementation in AMP7 of wetland and in-river enhancements
Isle of Wight	Wroxalls Stream soil conservation scheme	Knowledge Exchange, Education and Agricultural Activity	Activities identified in the Wroxall Stream catchment, a tributary of the Eastern Yar, that suffers from high rates of soil loss due to the nature of the ground. A project has been developed
Isle of Wight	Isle of Wight Natural Flood Management Scheme	Natural water retention measures (including NFM and wetland creation)	Opportunity for NFM that requires match funding for delivery
Isle of Wight	River Restoration in the Isle of Wight	River restoration	Opportunities for river enhancement that can improve low flow resilience. May require match funding
Kennet and tributaries	Near Basingstoke enhancements	River Restoration	Pending the outcome of the AMP7 WFD WR Flow investigation of Near Basingstoke, there might be the opportunity to provide localised enhancements, mitigating possible marginal impacts from groundwater abstraction
Medway	Pesticide Catchment Management - River Beult (sub catchment to River Medway)	Pesticide reduction	Agricultural catchment management approaches to prevent deterioration of raw water quality for pesticides in the River Beult. Specifically targeting propyzamide and carbetamide.
Medway	Pesticide Catchment Management - Metaldehyde programme	Pesticide reduction	Agricultural catchment management - engagement and product substitution to remove metaldehyde use from targeted hotspots
Medway	Catchment Compliance Programme	Integrated catchment management	Programme of investigations and mitigation to understand and proactively mitigate water quality hazards in drinking water catchments, before hazards present as water quality risks. Key focus of this is about resilience and ensuring compliance, by working with landowners and 'prevention is better than cure' approaches. Mitigation can vary from simple engagement and awareness raising, baseline compliance reinforcement, to providing support to farmers via provision of funding for capital items via SWS Farm Capital Grant Scheme.
Medway	Integrated Catchment Water Quality and Water Efficiency Programme	Integrated catchment management	Programme of on-farm water efficiency measures to alleviate water resource and water quality pressures in a more integrated way in key catchments. Pilots for AMP8. Western Rother and River Beult. Measures to be looked at include a range of on-yard infrastructure improvements.

Option Name	Option type	Option description	Option Name
Medway	Regenerative agriculture programme - Surface waters	Integrated catchment management	In surface water catchments where Southern Water has water quality drivers for drinking water (e.g. in the W. Rother, Beult, Arun and Eastern Rother for example) where we have pesticide drivers primarily driven by agriculture, and part of the root causes around pesticide use is 1) soil health and lack of resilience to pests and 2) soil structure and lack of stability, providing an easy run off pathway of sediment and adhered pesticides and other substances to watercourse. This project would have different elements to it, 1) Research and trials 2) Engagement and education and 3) Support measures & monitoring. This would be a long term project with long term goals, aimed at addressing root causes of the water quality issues i.e. fixing soil health as a way of lowering inputs of chemicals and stabilising the soils, lowering run off, and increasing water retention in the catchment. It's time horizon fits well with WRMP.
Medway	Multipollutant, whole farm approaches in key strategic areas	Integrated catchment management	Whole farm audits and mitigations plans
Medway	Rain water harvesting in the Medway catchment	Natural water retention measures (including NFM and wetland creation)	Rain water harvesting to support agriculture, to reduce demand for mains supply and thus facilitate abstraction reductions required to protect the environment.
Medway	Burton Mill Pond nature based solutions	Nutrient and sediment reduction	The Burton Mill Pond unit is in unfavourable declining condition partly due to water quality issues in the surrounding catchment; diffuse and point pollution. Opportunity for nature based solution/ biodiversity net gain –habitat restoration/creation and water quality improvements; creation of wetlands as well as WwTW upgrades which may have additional benefits including carbon sequestration, biodiversity, nutrient capture (a reduction of Phosphorus, Nitrogen), urban cooling, flood risk mitigation, improved infiltration and storage of water for resources to the site and catchment area.
New Forest	Catchment Compliance Programme	Integrated catchment management	Programme of investigations and mitigation to understand and proactively mitigate water quality hazards in drinking water catchments, before hazards present as water quality risks. Key focus of this is about resilience and ensuring compliance, by working with landowners and 'prevention is better than cure' approaches. Mitigation can vary from simple engagement and awareness raising, baseline compliance reinforcement, to providing support to farmers via provision of funding for capital items via SWS Farm Capital Grant Scheme.
New Forest	Multipollutant, whole farm approaches in key strategic areas	Integrated catchment management	Whole farm audits and mitigations plans
New Forest	Sowley Pond SSSI diffuse pollution scheme	Nutrient and sediment reduction	SSSI condition – 25 YEP target designated site condition. Sowley Pond SSSI is currently unfavourable, measures underway include tackling diffuse pollution
New Forest	Catchment Partnership catchment plan	Knowledge Exchange, Education and Agricultural Activity	Opportunity - The Catchment Partnership hosted by National Park Authority and Freshwater Habitats Trust prepared a stakeholder catchment plan to identify issues and opportunities within NF catchment
New Forest	New Forest Land Advice services	Knowledge Exchange, Education and Agricultural Activity	Series of training events run by New Forest Land Advice Service. Topics have included nutrients and pesticides. Opportunities to increase/expand.
North Kent	White Drain Enhancements	River Restoration	Pending the outcome of the AMP7 WFD 'No Deterioration' for White Drain, there might be the opportunity to provide localised in-river enhancements, mitigating possible marginal impacts from groundwater abstractions
Rother	Dungeness SSSI habitat management	Terrestrial habitat creation/ management	SSSI condition –25 YEP target designated site condition. Dungeness SSSI (also a SPA, proposed Ramsar site, SAC & AONB) -features (e.g. shingle, intertidal habitats, bird) are at risk partly due to coastal squeeze/barriers to coastal processes. Habitat creation/restoration and realignment of existing infrastructure should be looked at in a Shoreline Management Plan (SMP) to enable the

Option Name	Option type	Option description	Option Name
			habitat to move inland/upland where agreed with sea level rise -creating opportunities for climate change adaptation and natural flood risk management.
Rother	Dungeness nature based solutions	Flow augmentation and licensing	Dungeness SSSI (also a SPA, proposed Ramsar site, SAC & AONB) is at risk of being in unfavourable condition, features and watercourses within the catchment (flow and water availability) being impacted from water supply issues -abstractions and water company drought options. Protecting site and watercourse condition, improving resilience to climate change will require solutions that remove reliance on the drought options and sustainable abstraction particularly in hot dry weather.
Stour	Nitrate Groundwater agricultural catchment management - North Kent Medway Chalk Block sources	Knowledge Exchange, Education and Agricultural Activity	Agricultural catchment management approaches to reduce nitrate leaching to groundwater. Targeted agricultural measures in specific areas include: Farm Capital Grant Scheme (to support various large capital items aimed at reducing nitrate leaching issues); general advice delivery and specialist nutrient management planning / testing services. In addition to direct benefits for water quality in the long term, the scheme also delivers wider benefits under the categories of: Environment / Social (supporting the farming community); Resilience (making the SWS sources more resilient into the future, with the measures aimed at reducing raw water nitrate fluctuations and water quality deterioration), Collaboration (working with landowners and catchment stakeholders to develop and implement catchment mitigation measures) and Pilot Scheme Opportunities through implementing trials.
Stour	Nitrate Groundwater agricultural catchment management - Thanet Chalk Block sources	Knowledge Exchange, Education and Agricultural Activity	Agricultural catchment management approaches to reduce nitrate leaching to groundwater. Targeted agricultural measures in specific areas include: Farm Capital Grant Scheme (to support various large capital items aimed at reducing nitrate leaching issues); general advice delivery and specialist nutrient management planning / testing services. In addition to direct benefits for water quality in the long term, the scheme also delivers wider benefits under the categories of: Environment / Social (supporting the farming community); Resilience (making the SWS sources more resilient into the future, with the measures aimed at reducing raw water nitrate fluctuations and water quality deterioration), Collaboration (working with landowners and catchment stakeholders to develop and implement catchment mitigation measures) and Pilot Scheme Opportunities through implementing trials.
Stour	Nitrate Groundwater Urban catchment management - North Kent sources	Integrated catchment management	Urban catchment management approaches in targeted catchments to reduce nitrate leaching to groundwater sources.
Stour	Catchment Compliance Programme	Integrated catchment management	Programme of investigations and mitigation to understand and proactively mitigate water quality hazards in drinking water catchments, before hazards present as water quality risks. Key focus of this is about resilience and ensuring compliance, by working with landowners and 'prevention is better than cure' approaches. Mitigation can vary from simple engagement and awareness raising, baseline compliance reinforcement, to providing support to farmers via provision of funding for capital items via SWS Farm Capital Grant Scheme.
Stour	Multipollutant, whole farm approaches in key strategic areas	Integrated catchment management	Whole farm audits and mitigations plans
Stour	North and South Streams Enhancements	River Restoration	Pending the outcome of the AMP7 WFD 'No Deterioration' for North and South Streams, there might be the opportunity to provide localised in-river enhancements, mitigating possible marginal impacts from groundwater abstractions
Stour	Stodmarsh nutrient management scheme	Nutrient and sediment reduction	The Lampen stream is the main tributary feeding Stodmarsh NNR. Stodmarsh suffering high nitrates/ phosphates. Stream missing WFD Good target due to macrophytes/ invertebrates and fish. Low flow issues.

Option Name	Option type	Option description	Option Name
Stour	River Near Canterbury habitat enhancement project	River Restoration	The River Near Canterbury is 'POOR' in WFD. Habitat enhancements have already been planned but need funding.
Stour	PROWATER project implementation in the Stour catchment	Integrated catchment management	Incentivising uptake of land management and habitat restoration on farmland to protect recharge quality and improve resilience to drought and flooding, building on PROWATER project
Test and Itchen	Nitrate Groundwater agricultural catchment management - Hampshire Chalk Block sources	Knowledge Exchange, Education and Agricultural Activity	Agricultural catchment management approaches to reduce nitrate leaching to groundwater. Targeted agricultural measures in specific areas include: Farm Capital Grant Scheme (to support various large capital items aimed at reducing nitrate leaching issues); general advice delivery and specialist nutrient management planning / testing services. In addition to direct benefits for water quality in the long term, the scheme also delivers wider benefits under the categories of: Environment / Social (supporting the farming community); Resilience (making the SWS sources more resilient into the future, with the measures aimed at reducing raw water nitrate fluctuations and water quality deterioration), Collaboration (working with landowners and catchment stakeholders to develop and implement catchment mitigation measures) and Pilot Scheme Opportunities through implementing trials.
Test and Itchen	Catchment Compliance Programme	Integrated catchment management	Programme of investigations and mitigation to understand and proactively mitigate water quality hazards in drinking water catchments, before hazards present as water quality risks. Key focus of this is about resilience and ensuring compliance, by working with landowners and 'prevention is better than cure' approaches. Mitigation can vary from simple engagement and awareness raising, baseline compliance reinforcement, to providing support to farmers via provision of funding for capital items via SWS Farm Capital Grant Scheme.
Test and Itchen	Multipollutant, whole farm approaches in key strategic areas	Integrated catchment management	Whole farm audits and mitigations plans
Test and Itchen	Itchen Wetland Enhancement	River Restoration	Pending the outcome of the AMP7 HD Itchen Wetlands Investigation, there might be the opportunity to provide localised wetland enhancements, mitigating possible marginal impacts from groundwater abstractions
Test and Itchen	Anton River Enhancement	River Restoration	Implementation in AMP7 of in-river enhancements
Test and Itchen	Test and Itchen schools education programme	Knowledge Exchange, Education and Agricultural Activity	Schools education programme on watercress and chalk rivers. Run in partnership with the Vitacress Conservation Trust and Hampshire & Isle of Wight Wildlife Trust
Test and Itchen	Test and Itchen Catchment green space engagement	Knowledge Exchange, Education and Agricultural Activity	Increasing inner city communities' engagement with their local green space and river can deliver multiple benefits. Supporting education and engagement in the community will be key.
Test and Itchen	Test and Itchen Natural Flood Management Scheme (1)	Natural water retention measures (including NFM and wetland creation)	working with natural processes to reduce flood risk (use of NFM techniques) will help reduce downstream flood risk and provide volunteering and engagement opps for the local community
Test and Itchen	Test and Itchen Natural Flood Management Scheme (2)	Natural water retention measures (including NFM and wetland creation)	Using NFM measures can help reduce flood risk d/s, whilst also offering opportunities for the local volunteers to be involved in the works
Test and Itchen	Blackwater river restoration scheme	River Restoration	Easement of in-channel barriers to fish migration and natural processes are required throughout the Blackwater, a key salmonid spawning tributary. Opps mapping and restoration assessment has been done
Test and Itchen	Anton River Restoration scheme	River Restoration	River restoration would benefit numerous reaches of the Anton and increase low flow resilience to overwide reaches of the channel. An assessment of restoration opps has been completed

Option Name	Option type	Option description	Option Name
Test and Itchen	Bourne Rivulet as part of the Watercress and Winterbourne project	Other (please add to additional info)	Numerous projects and opportunities identified for the Pillhill Brook as part of the Watercress & Winterbournes Project - see Hants Isle of Wight Wildlife Trust W&W project website
Test and Itchen	Candover Brook as part of the Watercress and Winterbourne Project	Other (please add to additional info)	Numerous projects and opportunities identified for the Candover Brook as part of the Watercress & Winterbournes Project - see Hants Isle of Wight Wildlife Trust W&W project website
Test and Itchen	Cherlton Stream as part of the Watercress and Winterbourne project	Other (please add to additional info)	Numerous projects and opportunities identified for Cherlton Stream as part of the Watercress & Winterbournes Project - see Hants Isle of Wight Wildlife Trust W&W project website
Test and Itchen	Philhill Brook watercress and winterbourne project	Other (please add to additional info)	Numerous projects and opportunities identified for the Pillhill Brook as part of the Watercress & Winterbournes Project - see Hants Isle of Wight Wildlife Trust W&W project website
Test and Itchen	River Arle as part of the Watercress and Winterbourne project	Other (please add to additional info)	Numerous projects and opportunities identified for the River Arle as part of the Watercress & Winterbournes Project - see Hants Isle of Wight Wildlife Trust W&W project website
Test and Itchen	Upper Anton as part of the Watercress and Winterbourne Project	Other (please add to additional info)	Numerous projects and opportunities identified for the Upper Anton as part of the Watercress & Winterbournes Project - see Hants Isle of Wight Wildlife Trust W&W project website
Test and Itchen	Upper Test as part of the Watercress and Winterbourne Project	Other (please add to additional info)	Numerous projects and opportunities identified for the Upper Test as part of the Watercress & Winterbournes Project - see Hants Isle of Wight Wildlife Trust W&W project website
Test and Itchen	Integrated constructed wetlands in the Test and Itchen Catchment	Other (please add to additional info)	Integrated constructed wetland to remove sediment, nutrients (mainly P) and potential of pesticides. Plus diffuse pollution from surrounding landuse. Subject to planning & permit
Test and Itchen	Renaturalising of Monks Brook	River restoration	Much of the Monks Brook is heavily modified, e.g. realignment and bed armouring. Opportunities to address issues have been assessed. River and floodplain restoration can deliver multi benefits

Appendix B: WRSE Technical Note and Method Statement

WRSE Environmental Destination Technical Note, Version D

WRSE Method Statement: Environmental Destination, Post-consultation version January

Appendix C: Environmental Destination Profiles

See separate document.

Appendix D: Context around the development of regional (WRSE) and company environmental ambition scenarios

This appendix presents some additional details around the development of the environmental ambition scenarios described in section 5 of this annex.

To work collaboratively at a regional (WRSE) level on the regional resilience plan and for our own Environmental Destination, some scenarios were developed further to those initially used by the Environment Agency (Section 5.1.1) to represent a range of Environmental Destination scenarios for the South East region. These were:

- **BAU+** based on the Environment Agency BAU scenario but goes further to include the uneconomic water bodies (those water bodies identified by RSA options appraisal cost-benefit assessments), where reducing abstraction would imply a significant investment.
- **Enhanced** which is the same as the original Environment Agency Enhanced scenario.

To derive the DO and licence impacts for the scenarios, future predicted abstractions and licence quantities were compared to environmental flow targets using impact factors contained within the Environment Agencies Catchment Abstraction Management System (CAMS) ledgers.

The degree of licence reduction was determined by the amount of abstraction required to achieve EFI and/or CSMG flow targets in water bodies affected by that abstraction, based on the abstraction sensitivity band (ASB) (see below). The process for the development of these scenarios is described fully in WRSE documents[23,24], which are included in Appendix B.

[23] WRSE, 2022. Environmental Destination Technical Note, Version D, 100412624-011-SSTNB-01D
[24] WRSE, 2022. Method Statement: Environmental Destination, Post-consultation version January 2022

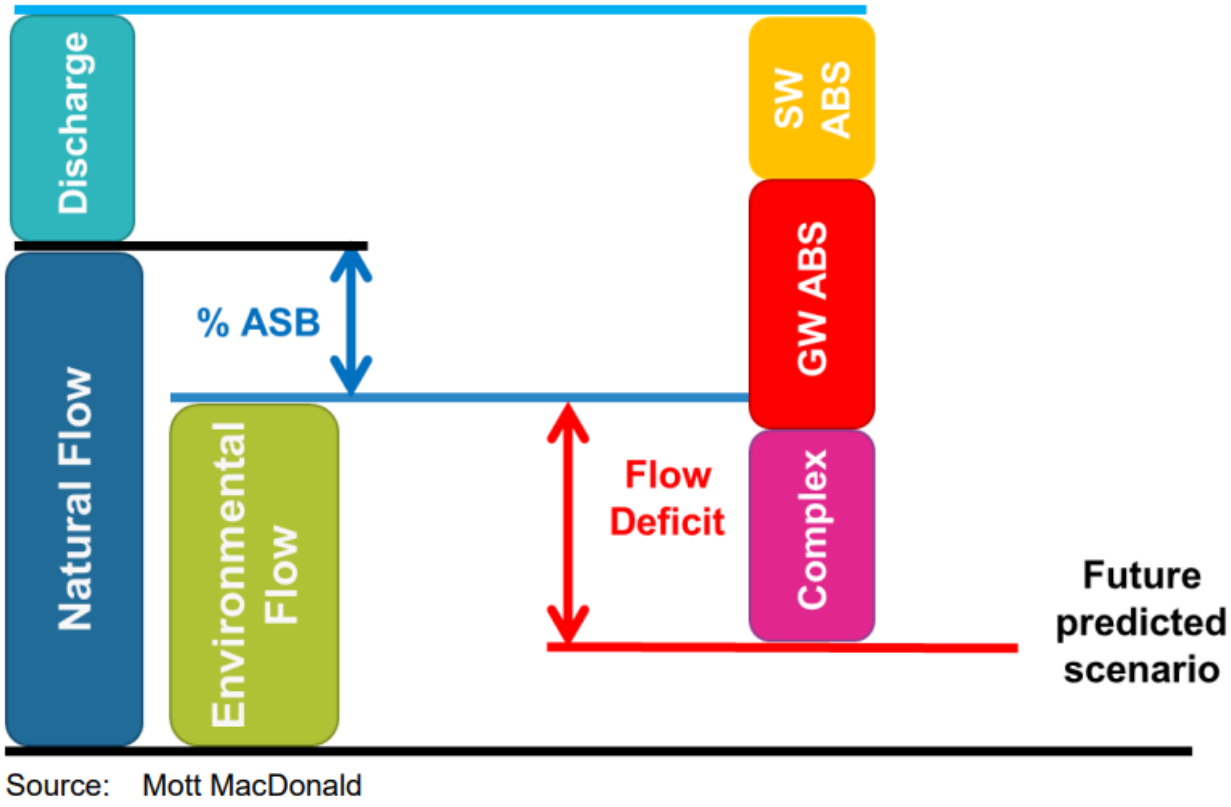

Figure D1: Derivation of the reductions required for the BAU+ and Enhanced scenario. The predicted volume for future natural flow and discharge in each water body were compared with the future predicted abstractions for surface water (SW ABS), groundwater (GW ABS) and complex factors such as reservoir releases and augmentation. The difference between that volume and the required environmental flow, based on the Abstraction Sensitivity Band (ASB), described the flow deficit that needed to be recovered through licence and abstraction reductions.

Whilst developing the Emerging Regional Plan, WRSE identified that large supply-demand deficits being introduced in our Central area (SNZ, SWZ and SBZ), were partly because of the Environmental Destination scenarios (under BAU+ and Enhanced) as set out in WRSE assessments. At this stage, we undertook a further review of the BAU+ and Enhanced scenarios for our SBZ and SWZ WRZs.

We had previously raised concerns with the Environment Agency that an EFI based reduction was not appropriate in wholly groundwater-dominated SBZ and SWZ WRZs because a large number of sources do not have significant impacts on surface water bodies (especially within the Brighton urban area) and large reductions in licence were being driven by ‘relief channel’ impacts, which are used by the Environment Agency to represent different hydrological settings in water bodies but are not necessarily appropriate for determining flow based targets.

In autumn 2021 we agreed with the Environment Agency that EFI based targets should not be used for these groundwater bodies and instead we would consider other WFD groundwater body tests.

We also identified that the initial supply-demand balance modelling for the BAU+ and Enhanced scenarios had erroneously been applying proposed reductions from ‘future predicted’ abstraction as DO impacts, rather reductions relative to baseline DO. This had the following effects:

- Where future predicted abstraction was less than DO, the required DO reduction to meet flow targets was being underestimated as the flow deficit difference was assumed to be smaller than necessary to meet flow targets.
- Where future predicted abstraction was greater than DO, the required DO reduction to meet flow targets was being overestimated as the flow deficit difference was assumed to be greater than required to meet flow targets.[25]

We subsequently revised the original BAU+ and Enhanced scenarios as presented in the Emerging Regional Plan following these findings and proposed an updated set of reductions under both scenarios to the Environment Agency based on the following:

- We corrected all reductions to be relative to variable DO, rather than future predicted abstraction so that the reductions were not over- or underestimated and correctly accounted for changes in DO at different drought severity.
- We kept EFI based targets for all abstractions affecting non 'relief channel' surface water bodies in our Central Area, for example the Lewes Winterbourne.
- We applied licence reductions at our proposed 'recent actual' rates arising from our AMP6 and AMP7 WINEP 'No Deterioration' studies.
- For the Enhanced scenario, we also capped licences at 'future predicted' (or EFI for Lewes Winterbourne) rates, recognising this is a further 33Ml/d reduction from current recent actual.

In addition to the BAU+ and Enhanced scenarios, which were based wholly or in part on the original Environment Agency scenarios, we also considered two further scenarios originally referred to in the WRSE Emerging Regional Plan as our '**Central' and 'Alternative' scenarios**. We designed these scenarios through consultation and local refinement with the Environment Agency and are based on the following assumptions:

- Correction of all reductions to be relative to baseline DO for appropriate consideration in supply-demand balance modelling rather than relative to future predicted abstraction.
- Inclusion of the latest progress and emerging outcomes from our live WINEP.
- Our 'No Deterioration' baseline abstraction assessment from our AMP6/AMP7 'No Deterioration' studies (to include effects of licence reductions to prevent deterioration).
- Our understanding of environmental impacts from previous modelling and observational studies.
- Discussions with local area Environment Agency staff.

For our '**Central scenario**', we developed a pragmatic approach based on emerging outcomes from our current, largely 'No Deterioration' WINEP studies, considering known and planned for likely changes to sources. This scenario was originally based on BAU+, addressing our company specific understanding. It included effects like 'recent actual' licence reductions, emerging outcomes from WINEP, and outcomes from a review of listed sources to remove non-operational mothballed sources that no longer exist.

For our '**Alternative scenario'** we developed what we considered to be a best-case scenario in terms of maximising environmental benefit but a reasonable worst-case scenario in terms of future supply

[25] WRSE, 2022, Environmental Destination Technical Note, Version D, 100412624-011-SSTNB-01D

deficit. This scenario is based on the approach used in the Enhanced scenario that maintains and improves protected areas, but goes further to seek maximum environmental benefit by assuming some of our chalk sources are no longer viable for abstraction. In effect, under this scenario, we proposed to cease abstraction from all sources within River Itchen catchment and would also cease abstraction from our Pulborough source. This scenario was used as a stress test for the system to understand the long-term implications of sustainable abstractions and determine the scale of regional solutions required to address the deficit, such as desalination plants, water recycling schemes and large-scale company transfers.

More information about the way these scenarios were matched to WRSE's current High, Medium and Low scenarios are available in Section 6 of this annex.