WRMP 2019 Technical Document:

Sustainable Abstraction

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This is a technical report that supports our WRMP submission.

Anglian Water is committed to achieving sustainable levels of abstraction. This report provides an overview of our approach to sustainable abstraction in the 2019 WRMP, including our obligations under the Water Industry National Environment Programme (WINEP) and Water Framework Directive (WFD).

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Executive summary

Anglian Water is committed to achieving sustainable levels of abstraction through a combination of demand management, low environmental impact water resource supply-side options, and mitigation options. This work will support our 'flourishing environment' outcome for customers and the environment.

We have successfully delivered schemes to reduce the impact of abstraction through AMP3, AMP4, and AMP5. This progress has continued through AMP6 with three sustainability reduction schemes on track for delivery, including a major scheme to relocate the point of abstraction on the River Wensum in Norwich.

PR14 National Environment Plan (NEP) AMP6 obligations relating to sustainable abstraction have been met or are on track for completion by the agreed dates.

We have complied with the relevant provisions of the Water Resource Planning Guidelines and Price Review 2019 (PR19) guidance to formulate the technical approach and business plan for sustainable abstraction. In addition, extensive discussion and collaboration with the Environment Agency has been effective.

The technical components of the AMP7 Water Industry National Environment Plan (WINEP) relating to sustainable abstraction are documented, including a significant programme of mitigation options.

The Water Resources Management Plan (WRMP) includes the supply-side options identified in response to sustainability reductions, including the allowance for cessation of abstraction from our groundwater source near Catfield Fen in 2021. We continue to work with the Environment Agency and Natural England on solutions for the wider Ants Broads and Marshes Site of Special Scientific Interest, and will implement any required solutions in AMP8.

We are collaborating with the Environment Agency to balance the environmental needs of the Northern Chalk with material groundwater flooding and water quality risks. Whilst we have agreed to an overall sustainability change (abstraction licence change), the outputs of the partnership project will inform the distribution of the sustainability change across the Northern Chalk groundwater sources. In the meantime, we have planned for the sustainability changes outlined in the WINEP.

The impact of the Water Framework Directive 'No Deterioration' requirements on our supply forecast has been assessed. We have committed to maintaining all groundwater abstractions at a recent abstraction rates where reasonably practicable, ahead of formal licence changes which are expected from 2022 onwards for many time-limited licences and in AMP8 for many permanent licences. In our supply forecast, we have assessed the impact of sustainability changes on all groundwater sources in 2022, and our WRMP 2019 outlines how we will meet this challenge.

Our approach to ensuring that our abstraction and operations will not cause an increase in risk of spread of Invasive and Non-Native Species is documented, as well as our plan to meet Fish and Eel regulations.

1. Introduction

1.1 The Water Resources Management Plan

Our WRMP submission is comprised of several reports, as set out in the diagram below. The main submission is supported by technical documents that explain our methodologies and provide the detailed results of our analysis. This technical document explains our approach to sustainable abstraction.

Figure 1.1: WRMP 2019

1.2 Overview

Table 1.1: EA checklist actions addressed in this section

Number	Action
1	You have considered and taken into account links between your WRMP and River Basin Management Plans.
107	Your proposals support WFD obligations and RBMP objectives in relation to sustainable abstraction.

We recognise that all of our abstractions must be environmentally sustainable. Where current abstractions have the potential to cause environmental problems or risk, we have addressed the issue through the AMP3, AMP4, AMP5, and AMP6 National Environment Programmes (NEPs). Sustainable abstraction will also continue to be addressed in the AMP7 Water Industry National Environment Programme (WINEP) and beyond.

This is driven by the Water Framework Directive 2000 (WFD), the Habitats Directive 1992, the Wildlife and Countryside Act 1981, and River Basin Management Plans (RBMPs) to address potential hydrological impacts upon water-bodies and water dependant ecosystems.

The RBMPs were last published by the Environment Agency in 2015 and set out waterbody objectives that seek to improve the water environment. The RBMPs are currently based on a 2015 baseline from which objectives are set, generally to a 2021 or 2027 target date. The 2015 RBMP classifications also represent a baseline from which deterioration cannot take place.

Abstraction must also be sustainable in relation to potential impacts upon fish and eels under WFD and the Eels (England and Wales) Regulations 2009. The risk of spread of invasive and non-native species, for example via raw water transfers, must also be reduced or mitigated.

1.2.1 Our Commitment to the Environment

To ensure that our business is sustainable in the long term, we are committed to enhance the natural environment. This includes ensuring that our abstractions are sustainable. We will continue to work with the Environment Agency and Natural England to meet RBMP objectives and the Habitats Directive in order to achieve sustainable abstraction, and ensure that WFD 'no deterioration' requirements are met.

This supports our 'flourishing environment' outcome, which is one of ten outcomes developed in our AMP6 Business Plan designed to address issues that matter most to our customers.

1.2.2 This Document

This document outlines how we will meet our sustainable abstraction objectives in the Water Resources Management Plan (WRMP) 2019.

It is critical that abstraction for public water supply is environmentally sustainable, in order to provide an enhanced environment for our customers. Our legal obligations in terms of sustainable abstraction must be carefully managed to ensure that the security of water supply is not compromised.

This document:

- Describes how we are supporting and compliant with
  - River Basin Management Plan (RBMP) objectives
  - Water Framework Directive 2000 (WFD) objectives including 'No Deterioration'
  - The Habitats Directive 1992
  - The Wildlife and Countryside Act 1981
  - Eels (England and Wales) Regulations 2009
  - European Invasive Alien Species Regulations 2014
  - The GB Non Native Species Strategy 2015
- Outlines how we have carried out PR14 NEP Water Resources requirements during AMP6 including options appraisals and sustainability reductions
- Outlines how we will deal with future sustainability changes (abstraction licence changes), and
- Details the water resources mitigation measures required under the PR19 WINEP.

2. PR14 NEP Schemes

In PR14, we agreed to a number of NEP obligations required for delivery in AMP6.

These included three river restoration schemes (Skitter Beck, Laceby Beck, River Nar) and two fish entrainment mitigation schemes (Cadney and Covenham intakes) which are being implemented according to the March 2020 deadline agreed with the Environment Agency. A further river support solution for Geldeston Meadows is being delivered collaboratively with Essex and Suffolk Water to the same deadline.

Two schemes for the River Gwash and Caudle Springs were also included. The River Gwash scheme is an Adaptive Management scheme which will continue into AMP7. The Caudle Springs monitoring scheme is ongoing and will be completed by March 2020.

Three sustainability reduction schemes were included for Coston Fen, the River Wensum, and the North Norfolk Coast, all of which are due for implementation by the agreed March 2019 completion date and described below.

A further three confirmed sustainability reductions were identified for implementation in AMP7 for the River Lark, the River Nar, and Catfield Fen. More detail can be found in Section 3.

The PR14 NEP also outlined 25 water-bodies and designated sites where current abstractions were judged to be causing, or had the potential of causing, environmental issues. In AMP6 we carried out investigations and options appraisals to determine how to address these issues, according to the December 2017 deadline set by the Environment Agency. The outcome of the options appraisals is outlined in Section 4.

2.1 Coston Fen

The Habitats Directive Review of Consents required an assessment into the impacts of our abstraction on Coston Fen Site of Special Scientific Interest. We agreed with the Environment Agency to invest (~£2m) in the relocation of our duty abstraction to a new replacement source, and the closure of a second source. We remain on target for completion by the March 2019 obligation date.

2.2 River Wensum

In order to address Habitats Directive Review of Consents requirements, we are implementing a large scale scheme for our River Wensum abstraction. We assessed a range of feasible supply-side options in our WRMP 2015, and the preferred solution was to refurbish an existing intake and transfer water to the existing bankside storage. During the planning process, additional pre-treatment at the intake was identified as a requirement to reduce the risk for our customers, removing the requirement for the transfer scheme. This represents a significant investment (~£37m), but one that is environmentally sustainable and offers best value to our customers. The Environment Agency has confirmed support for this option and we remain committed to deliver the solution by March 2019.

2.3 North Norfolk Coast

Under the Habitats Directive Review of Consents, we reviewed our Hunstanton sources in relation to the North Norfolk Coast Special Area of Conservation. We will invest (~£2m) in a pipeline scheme to transfer surplus water into the area, to be implemented by March 2019. In the meantime, we have accepted an interim licence variation to ensure compliance with the Habitats Directive.

3. WFD No Deterioration

Table 3.1: EA checklist actions addressed in this section

Number	Action
104	You have checked that licenced volumes are sustainable and that their use will not cause deterioration.
109	You have determined that all existing abstractions (including any planned increases to abstracted volumes with current licence limits, and any time limited licences) are compliant with RBMP objectives and any other legally binding environmental objectives.
110	You have liaised with the Environment Agency and / or Natural Resources Wales to determine if you have any abstractions from water bodies that are at risk of deterioration.
111	You have reviewed potential mitigation measures for any water-bodies at risk and put into place plans to manage the risk of deterioration, or where deterioration has occurred because of your actions, you have put in place plans to restore the waterbody.
202	You have explained where there are any uncertainties related to non-replacement of time-limited licences
260	You have described how the impact of changes to the operation of existing sources and / or the impacts of new sources on WFD water body status has been established, and that you have rejected sources that might cause deterioration or prevent the achievement of good status.

The WFD requires the prevention of deterioration of surface water and groundwater body status from the Environment Agency's 2015 RBMP classifications. As such, we are obligated to ensure that deterioration of the environment does not occur as a result of abstraction for public water supply.

In order to address this, and through collaboration with the Environment Agency, we assessed our abstractions and the risk they pose to water-bodies based on future predicted growth. We agreed a prioritised programme of investigations into the risk of deterioration as per Environment Agency guidance[1] and planned to investigate all higher priority and time limited licences in AMP7 in preparation for AMP8 sustainability changes. This was reflected in the WINEP and fed into our Adaptive Plan in the Draft WRMP 2019.

However, we recognise that we have a duty to ensure that deterioration of the environment does not occur in the meantime. As such, we have committed to maintaining all of our groundwater abstractions below recent historical abstraction rates, where reasonably practicable, in order eliminate the risk of deterioration. This is ahead of formal licence changes which are expected from 2022 onwards for many time-limited licences and in AMP8 for many permanent licences. In order to address this change and take account of the uncertainties surrounding future abstraction licence volumes, we have assessed the impact of sustainability changes on all groundwater sources in 2022 in our supply forecast, and this is reflected in our WRMP 2019.

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

[1] *Environment Agency, Feb 2017, PR19 Driver Guidance: Water Resources (Hydrological Regime), Page 2*

3.1 Time Limited Licences

It has been the Environment Agency's policy in the Anglian region since 1990 to time-limit new licences and licence variations authorising increased abstraction. The Water Act 2003 subsequently made it law to include a time-limit on all new, full and transfer abstraction licences. The use of time- limited licences allows the Environment Agency to deal with environmental uncertainty whilst ensuring that supplies are used efficiently to meet the needs of the public, business and the environment

As a result, time limits apply in whole or in part to approximately half of our abstraction licences. During AMP6 we have applied to renew 108 licences and have included robust supporting evidence to satisfy the Environment Agency's 'three tests for renewal'. In the majority of cases, the Environment Agency have agreed to renew groundwater licences on the same terms on a short term basis to early AMP7 in order to allow time for the planning and implementation of schemes needed to maintain public water supply. Some licences, such as those associated with the Northern Chalk and the River Slea, have been renewed to 2019, but the licence changes are expected to be upfront permitted for implementation in 2022.

In order to remove the risk of deterioration in the meantime, we are managing growth via demand management and will not increase abstraction above the maximum peak annual quantity abstracted between 2005 and 2015. This period of abstraction has been defined by the Environment Agency as it represents the abstraction conditions that occurred in the years running up to the 2015 RBMP baseline waterbody classifications, and is known as 'Recent Actual'. We will report compliance at our annual performance meetings with the Environment Agency and Ofwat.

3.2 Permanent Licences

Although not subject to renewal dates, WFD No Deterioration also applies to permanent licences and we are required to ensure that abstraction from these sources does not cause environmental deterioration. As described above, we will be monitoring abstraction at all groundwater sources to ensure that annual abstraction remains below Recent Actual volumes and are expecting formal licence changes at any sources thought to be posing a risk of deterioration in AMP8. As such, we have assumed sustainability changes to Recent Actual for all groundwater sources in 2022, regardless of whether or not they are time limited.

3.3 Abstraction Incentive Mechanism

In order to go further to protect the environment, we use the Abstraction Incentive Mechanism (AIM). This is a performance commitment to further reduce abstraction near environmentally sensitive sites at times of particularly low flow and is outlined in our PR19 Business Plan.

A significant proportion of our customers (73%) consider AIM to be of high or medium importance and as a result we will increase the number of sites included in AIM for AMP7. This will provide addition environmental protection for the River Nar, Bumpstead Brook, and the River Glen. The River Wensum will no longer be included in AIM due to the implementation of a sustainability scheme in 2019 (see section 2.2).

We expect that the delivery of sustainable abstraction schemes in AMP7, as per section 4, will remove the need for AIM at all sites following their completion.

4. Option Selection

The PR14 NEP outlined 25 water-bodies and designated sites where current abstractions were judged to be causing, or had the potential of causing, environmental issues according to RBMP classifications and objectives, and where the Environment Agency had determined that implementing a catchment wide bundle of measures to reach those objectives was cost beneficial at a catchment scale (excluding the River Tiffey which is not subject to cost benefit).

In early AMP6 we carried out options appraisals to determine how to address these issues. These were completed according to the December 2017 deadline, set by the Environment Agency in order to ensure that we can include the outcome of the options appraisals in our WRMP.

We have looked at options to reduce or mitigate the potential effects of abstraction on low flows, groundwater bodies, and water dependant terrestrial ecosystems. Options appraisals have been completed in line with Environment Agency scoping plans, and options have been selected following detailed multi-criteria analysis, cost- benefit assessment, and discussion with the Environment Agency. These options, including any associated sustainability changes, will be implemented in AMP7.

We have also confirmed the solutions for the three sustainability changes previously identified for implementation in AMP7 for the River Lark, the River Nar, and Catfield Fen.

4.1 Options Appraisals Approach

Table 4.1: EA checklist actions addressed in this section

Number	Action
108	You have determined if changes to your abstractions are required to meet RBMP objectives, and you have discussed the scope of changes with the Environment Agency or Natural Resources Wales as part of WINEP for PR19.
245	You have worked with the Environment Agency or Natural Resources Wales to understand the cost effectiveness of solutions that are driven by changes to existing abstraction licences.
246	You explain how any solution driven by changes to existing abstraction licences meets the objectives of the Habitats Directive, Wildlife and Countryside Act and Water Framework Directive and prevents any deterioration of water-bodies.
247	You have considered whether measures needed to meet sustainability and environmental objectives (e.g. Habitats Directive, Wildlife and Countryside Act, and Water Framework Directive) are cost-effective and cost-beneficial, and are supported by customers.
248	You have explained how cost has been evaluated (where costs include non-monetised costs) and that the benefit outweighs the cost, the option is not disproportionately costly and has the lowest overall costs even when accounting for the need for customer support.

We have carried out PR14 Options Appraisals according to the Environment Agency scoping plans for each scheme. Environment Agency liaison was key throughout the options appraisal process in order to provide an outcome that both met environmental objectives, and minimised the impact upon the security of public water supply.

Following a review and update of groundwater models, baseline modelling was carried out in order to confirm waterbody flow deficits. Site walkovers were also carried out to obtain local information and review river restoration options.

We produced a long list of options for each scheme based on the requirements outlined in the scoping documents, plus WFD 'no deterioration' requirements. Long lists were shared with the Environment Agency for comment.

We carried out Multi Criteria Analysis on the long list of options, whereby options were scored according to:

- Feasibility and risk (15% weighting)
- Performance against WFD objectives (65% weighting), and
- Wider socio-environmental considerations, including ecosystem services (20% weighting)

The highest scoring options, and those preferred by the Environment Agency, were carried through to a short list. The option to switch abstraction off (source closure) was included in all short lists to provide a baseline comparison. Other short listed options included sustainability changes and mitigation options such as river restoration and river support. Short lists were shared with the Environment Agency for review.

Cost Benefit Analysis was carried out on all short listed options, whereby capital, operational and maintenance costs were compared against environmental benefits using the National Water Environment Benefits Survey (NWEBS). Note that this is separate to the catchment wide cost benefit analysis carried out by the Environment Agency when setting the RBMP objectives.

Final solutions were selected according to:

- Comments from the Environment Agency
- Outcome in terms of RBMPs, local objectives, and ecological benefits
- Impact upon deployable output
- Cost benefit and cost effectiveness, and
- Fulfilment of WFD 'no deterioration', including the wider scale impacts of river support schemes

Final options included a significant number of both sustainability changes and mitigation options.

NEP Options Appraisal reports have been made available to the Environment Agency according to the December 2017 deadline. The reports include technical notes describing the Multi Criteria Analysis and Cost Benefit Analysis processes, and information and evidence for the selected options.

We have also selected the final options for the River Nar, River Lark, and Catfield Fen. The options appraisal completed in AMP5 for the River Lark was reviewed and the options were compared to supply side solutions. A recirculation mitigation scheme was selected as the best option for our customers. Operational supply side options to allow for the closure of our source at Catfield Fen were reviewed during the AMP, and the solution is currently being implemented. For the Nar, we have accepted a sustainability change at our groundwater source, and full closure of our surface water source, and this has fed into our supply forecast.

The selected options have been assessed for climate change vulnerability. A small number of groundwater locations used for river support are considered to have low vulnerability to climate change, with an impact of below 1Ml/d in 2080. When scaled back to the planning period, this impact is negligible. All other locations and options are not considered vulnerable to climate change.

4.2 Customer Support

We carried out an extensive programme of customer engagement as outlined in the WRMP 2019 including engagement surrounding environmental impact.

Customers are supportive of our plans to reduce the negative impact on the environment, including where we are working with the Environment Agency to reduce the amount of water abstracted. For example, customers who took part in the online community regarded these plans as 'indisputably positive'[1].

The customers with whom we discussed the mitigation options were supportive of them in principle[2]. They felt that, compared with supply-side alternatives, these options were more cost-effective and would involve less disruption to people and the environment.

We also had a clear message that cost should be a key consideration in our decision making. Many of our customers are feeling under financial pressure and are very concerned about money in general.

[1] *Sophie Ahmad, 2017, Customer Research and Engagement Synthesis report v1-12, Page 107*

[2] *The NEP mitigation options were discussed with a small number of customers at the focus groups that discussed the results of the water resources stated preference survey. See ICS and Eftec, 2017, 'Anglian Water, Water Resources Second Stage Research, Stated Preference Report v2', Page 111*

4.3 Future Exports

Our neighbouring water companies have also been assessing the impact of sustainable abstraction upon their water resources. Given the limited options for them to develop new resources, there is a potential that they may seek an export from Anglian Water.

We have been working closely with our neighbouring companies to understand this need. With particular reference to Affinity Water (East), we have allowed for a variation to the water sharing agreement under the Ardleigh Reservoir Order.

4.4 Selected Options

Table 4.2: EA checklist actions addressed in this section

Number	Action
112	You have completed all investigations and options appraisals in your PR14 water industry NEP for AMP6 by the agreed dates and included any options to manage sustainability changes in your plan.
116	You have liaised with the Environment Agency or Natural Resources Wales to determine the likely impact of sustainability measures on abstraction licences and agreed a mutually acceptable timescale for the implementation of new licence conditions.

We have identified a significant number of sustainability changes as a result of the AMP6 options appraisals. The sustainability changes have fed into our supply forecast.

We also agreed to a number of mitigation options where they provide a more cost effective solution to environmental issues rather than (or as well as) a sustainability change. In order to fulfil our WFD 'No Deterioration' requirements, sustainability changes still apply in addition to the mitigation measure in the majority of cases.

All sustainability changes and mitigation options will be implemented in AMP7 according to the timescales agreed with the Environment Agency and set out in WINEP.

4.4.1 Sustainability Changes

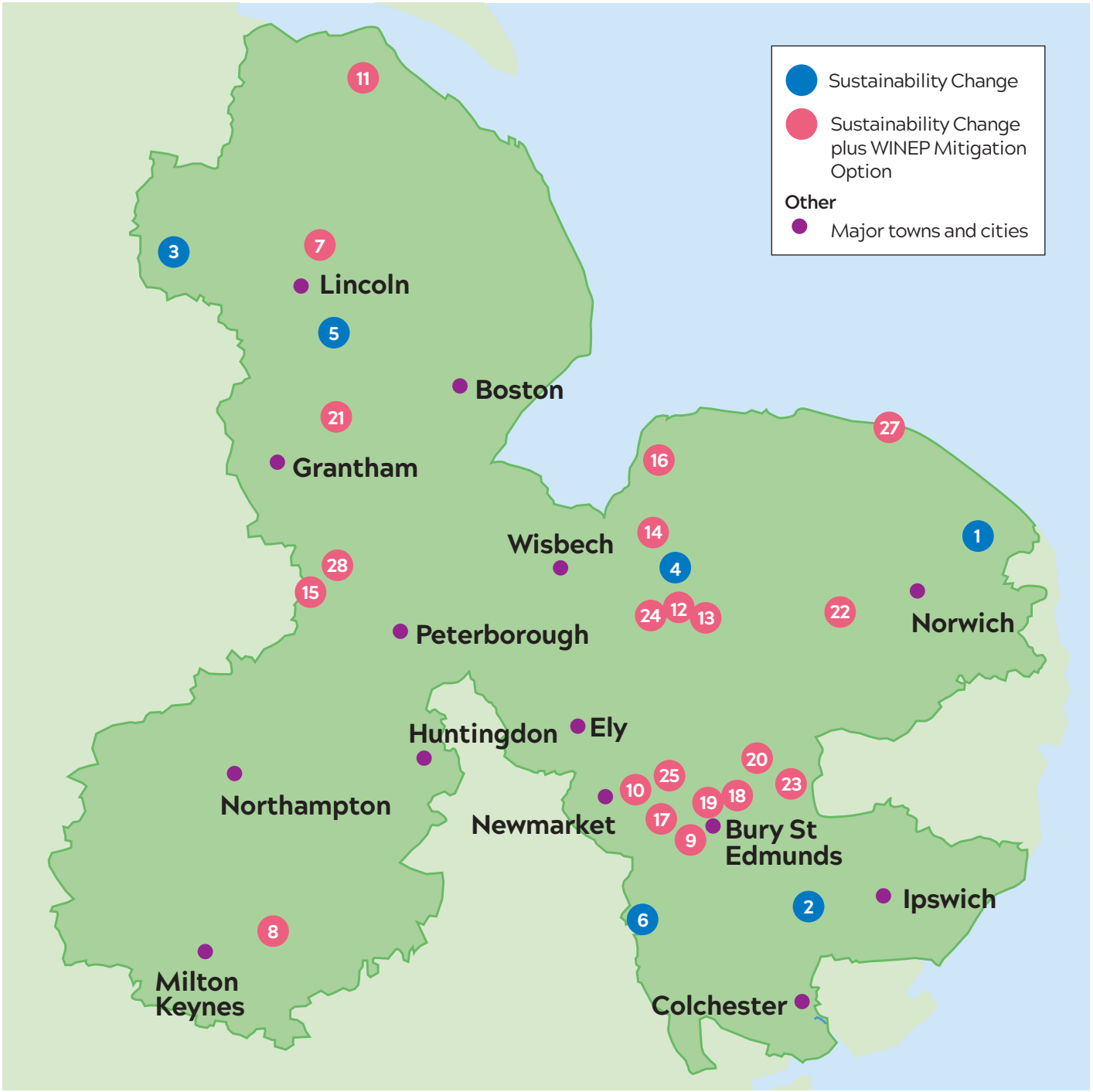
For some schemes, we have agreed to a sustainability change (without a mitigation option). The schemes are detailed summarised below in Table 4.3 and shown in Figure 2. Where sustainability changes lead to an impact upon supply forecast, they become a sustainability reduction and a supply-side option has been developed where this causes a deficit. The supply forecast and the supply-side options are detailed in the Supporting Technical Documents: Supply Forecast and Supply-Side Option Development respectively.

Table 4.3: WINEP sustainability changes

Water Resource Zone	Scheme name	Current WINEP Timescale
Happisburgh	Catfield Fen*	2021
East Suffolk	River Brett	2021
Central Lincs and Nottinghamshire	River Idle and River Poulter	2024
South Fenland	River Nar	2025
Central Lincs	Witham Limestone	2024
Bury-Haverhill	Bumpstead Brook	2024

** We have also made a further commitment to mitigate impact that two additional groundwater abstractions may be having in the wider Ant Broads and Marshes.*

Figure 1.2: WINEP sustainability changes and mitigation options location map



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

4.4.1.1 Catfield Fen and the Ant Broads and Marshes

The Environment Agency confirmed that abstraction from our groundwater source presents a risk to features of European interest at Catfield Fen, on the Ant Broads and Marshes Site of Special Scientific Interest (SSSI). Following discussion and investigation, it has been agreed with the Environment Agency and Natural England that we will close our Ludham source in the first year of AMP7 under the Habitats Directive driver.

We continue to work with the Environment Agency and Natural England, as well as other abstractors and stakeholders, to investigate the impacts of abstraction upon the wider Ant Broads and Marshes SSSI. As a result we have committed to delivering a further scheme in the vicinity of Catfield Fen, closing two additional groundwater sources to mitigate the impact that our abstractions may be having in the area.

4.4.1.2 River Brett

The impact of our abstraction sources upon the River Brett is subject to ongoing investigation. We are currently working collaboratively with the Environment Agency, Affinity Water, and Northumbrian Water (Essex and Suffolk Water) to investigate the issue, and will complete a full investigation and options appraisal by March 2021. Implementation of the solution, which is likely to include measures such as flow support, river restoration, and sustainability changes, is required in 2024. In the WRMP 2019, we have planned for the worst case sustainability change which includes the closure of one source and a sustainability change at a second source in 2024.

4.4.1.3 River Idle and River Poulter

Following investigations, the Environment Agency concluded that our groundwater abstractions are having an impact on flow in the River Poulter and River Idle. Our options appraisal found that a sustainability change was the cost beneficial solution to help recover the flows in the two water-bodies.

4.4.1.4 River Nar

In AMP5, the impact of our surface and groundwater abstraction sources was modelled against the conservation flow objectives for the River Nar. The assessment required a significant sustainability change to address the impacts of our abstraction upon the River Nar, to take place in AMP7. This includes the closure of our Marham surface water abstraction and a significant sustainability change at our groundwater source. As agreed with the Environment Agency and Natural England, we are also implementing an interim measure comprising of river restoration during AMP6.

4.4.1.5 Witham Limestone

The Witham Limestone has been assessed by the Environment Agency as a seriously damaged aquifer due to the ecological status of the surface water-bodies on the Limestone. As required by the Environment Agency, our options appraisal focused on the impact of our abstraction on the Scopwick Beck. Associated abstraction licences will be reduced to reflect recent abstraction rates.

4.4.1.6 Bumpstead Brook

The Environment Agency confirmed that abstraction from our source impacts upon the Bumpstead Brook waterbody. In our WRMP 2019 we planned a mitigation option to relocate the source. However, due to uncertainties over feasibility, we have planned to close our abstraction source and implement a supply side solution.

4.4.2 Mitigation Options

All mitigation options will be implemented in AMP7 according to the timescales agreed with the Environment Agency and set out in WINEP. The selected NEP mitigation options include:

- River support
- River restoration
- Recirculation
- Adaptive management
- Pond support

Mitigation options will mostly be delivered in parallel with related sustainability changes, although the sustainability changes will be implemented earlier in the AMP. Details of the mitigation options are outlined below in Table 6 and shown in Figure 1.2.

Table 4.4 WINEP mitigation options

Water Resource Zone (WRZ)	Mitigation Option	Option Description	Implementation Date	Total Capex (£k)	Total Opex (£k)
Central Lincs	Barlings Eau river support	River support to Welton Beck and Hackthorn Beck during periods of low flow. River restoration may be required in AMP8 on the Hackthorn Beck	Dec-24	1059	81
Ruthamford South	Broughton Brook river support and river restoration	River support to the Broughton Brook during periods of low flow and river restoration.	Dec-24	1558	253
Bury-Haverhill, Ely, Newmarket	Cavenham Stream river restoration	River restoration on the perennial head of the Cavenham Stream. River restoration may be required in AMP8	Dec-24	0	749
Ely, Newmarket	Lee Brook river restoration	River restoration on the perennial head of the Lee Brook	Dec-24	0	234
Central Lincs, East Lincs	Northern Chalk river support	River support to the Kirmington and Brocklesby arms of the Skitter Beck, the Team Gate Drain, Laceby Beck, and Barrow Beck during periods of low flow	Dec-24	2915	159
Norfolk Rural North, South Fenland	Old Carr river restoration	River restoration on the Old Carr Stream. Flow improvement may be required in AMP8	Dec-24	0	155
Norfolk Rural North, South Fenland	Gadder river restoration	River restoration on the River Gadder	Dec-24	0	392
North Fenland	Gaywood river restoration	River restoration on the River Gaywood	Dec-24	0	561
Ruthamford North	Gwash adaptive management	Continuation of the AMP6 adaptive management scheme which is likely to involve further river restoration work in AMP7 and a change in the Rutland compensation flow licence condition	Dec-24	0	562
North Fenland	Heacham river restoration	River restoration on the River Heacham	Dec-24	0	389
Ely, Newmarket	Kennett-Lee river support and river restoration	River support and river restoration on the perennial reach of the River Kennett-Lee	Dec-24	1711	539
Bury-Haverhill	River Lark recirculation	Recirculation of water on the Lark from downstream of Fornham All Saints WRC, to upstream of Abbey Gardens	Mar-25	4265	80

WRZ(s)	Mitigation Option	Option Description	Implementation Date	Total Capex (£k)	Total Opex (£k)
Bury-Haverhill	Linnet recirculation and river restoration	Recirculation of water from downstream of Fornham All Saints WRC, to the Linnet, upstream of the Lark	Dec-24	1302	478
Ixworth	Sapiston river restoration and river support	River restoration and support on the River Sapiston	Dec-24	448	943
Bourne, East Lincs, South Lincs	Slea river support	River support to the new River Slea during periods of low flow	Dec-24	955	106
Norfolk Rural North	Tiffey river support	River support to the River Tifffey (Dyke Beck, Hackford Watercourse, and/or Bays River) during periods of low flow.	Dec-24	2575	110
Ixworth	Stowlangtoft river restoration and support	River restoration and support on the Stowlangtoft Stream.	Dec-24	950	613
Norfolk Rural North, South Fenland	Stringside river restoration	River restoration on the Stringside Stream. River support may be required in AMP8	Dec-24	0	420
Bury-Haverhill, Ely, Newmarket	Tuddenham river restoration	River restoration on the Tuddenham Stream	Dec-24	0	720
Bourne	Glen river support and river restoration	River support to the East Glen during periods of low flow. River restoration on the East Glen and the lower West Glen	Dec-24	442	1184
North Norfolk Coast	West Runton Common: Spring Pond support and mains connection	Top up Spring Pond during periods of low water level and provide a mains connection	Mar-25	567	61

4.4.1 Barlings Eau

Environment Agency investigations have confirmed that our abstraction is having an impact on the Barlings Eau, primarily upon the Welton Beck and Nettleham Beck. Following a detailed options appraisal process, we have agreed with the Environment Agency to implement a river support scheme to support low flows on both becks. The ecological impact of this scheme will be monitored to see whether or not a further measure, comprising of river restoration, will be required in AMP8. The abstraction licences associated with the Barlings Eau will be reduced to reflect recent abstraction rates for public water supply.

4.4.2 Broughton Brook

Environment Agency investigations concluded that our abstraction is causing low flows in the Broughton Brook, impacting upon ecology. We will implement a river support scheme to support low flows in the brook, as agreed with the Environment Agency. The associated abstraction licences will be reduced to reflect recent abstraction rates for public water supply.

4.4.3 Cavenham Stream and Tuddenham Stream

Environment Agency investigations indicate that there is a risk that our abstraction is having an impact

upon flow and ecology in the Cavenham Stream and Tuddenham Stream. We have agreed with the Environment Agency to carry out river restoration on both streams. Ecological monitoring of the Cavenham scheme will inform whether or not a flow recovery measure will be required in AMP8. The abstraction licences associated with the Cavenham and Tuddenham Streams will be reduced to reflect recent abstraction rates.

4.4.4 Lee Brook

Our abstraction has an impact on the flows in the seriously damaged Lee Brook waterbody. We were required by the Environment Agency to assess options to ensure that further deterioration of flows within the brook is prevented. As such, associated abstraction licences will be reduced to reflect recent abstraction rates and we will carry out river restoration.

4.4.5 Northern Chalk

In AMP5 we agreed to a phased approach with the Environment Agency towards implementing a solution for the Northern Chalk, focused on the Skitter Beck and Laceby Beck. In AMP6 we are implementing a river restoration scheme on both becks. A further options appraisal in AMP6 has led to the agreement for river support to the two becks, as well as potentially a further beck on the Northern Chalk, the Barrow Beck. Overall abstraction from the Northern Chalk will be reduced to reflect recent abstraction rates.

It is important that the environmental needs of the Northern Chalk are balanced with groundwater flooding risks as well as public water supply constraints caused by changing water quality trends. A partnership working group has been set up with the Environment Agency to investigate the three issues and determine the most sustainable future abstraction management strategy. As such, whilst we have planned for licences to be reduced according to each individual source's recent abstraction rates, the distribution of abstraction between sources may change following the outputs of the working group which are expected in 2019. This is essential in order to avoid putting customers at risk of flooding or supply interruptions.

4.4.6 Old Carr Stream, River Gadder, and Stringside Stream

Environment Agency investigation suggests that our abstraction impacts upon the flow in the Lower Wissey tributaries; the Old Carr Stream, River Gadder, and the Stringside Stream. We have agreed with the Environment Agency to carry out river restoration on all three water-bodies. The associated abstraction licences will be reduced to reflect recent abstraction rates. The ecological impact of the Old Carr Stream and Stringside Stream schemes will be monitored in order to inform whether or not river support will be required in AMP8.

4.4.7 River Gaywood

Our abstraction is suspected by the Environment Agency to be impacting upon flow in the River Gaywood. We have agreed to carry out river restoration in order to improve the resilience of ecology to low flows.

4.4.8 River Gwash

An adaptive management plan is being implemented across AMP6 and AMP7 for the River Gwash in order to address the currently suppressed flow variation caused by the licence conditions surrounding the compensation requirement from Rutland Reservoir. A new licence condition and river restoration scheme trial is being carried out in AMP6 in partnership with the Environment Agency and the Wild Trout Trust. The results of the trial will be used to confirm the implementation requirements in AMP7. It is likely that the licence condition will become a permanent change, and that further river restoration will be carried out.

4.4.9 River Heacham

There is evidence that the ecology in the River Heacham is vulnerable in periods of low flow due to sediment in the river. We have agreed to carry out river restoration in order to improve the resilience of ecology to low flows.

4.4.10 River Kennett-Lee

Our abstraction is suspected by the Environment Agency to be impacting upon flows in the River Kennett-Lee. In AMP7, we will carry out river restoration on the perennial reach of the river. Flow recovery will also be carried out, either via river support or through support from a local transfer scheme. The associated abstraction licences will be reduced to reflect recent abstraction rates for public water supply.

4.4.11 River Lark

Following investigations in AMP3, the Environment Agency determined that our groundwater abstractions in and around Bury St Edmunds were likely to be having an impact on flow in the River Lark. In AMP5 we carried out an options appraisal and agreed with the Environment Agency that we need to implement a solution in order to allow for a change to the Hands Off Flow condition on the licence. Further

options appraisal in AMP6 has identified the best option for delivery in AMP7 to be a recirculation scheme based on the re-use of effluent in Bury St Edmunds, to increase the flow through the town and at Abbey Gardens.

4.4.12 River Linnet

Environment Agency investigations show that our abstraction is likely to be having an impact upon flow and ecology in the River Linnet. We have agreed to carry out flow support to the perennial reach of the river via a diversion of the Lark recirculation scheme. In order to support the ecology in the river in response to the additional flow, we will also carry out river restoration. The associated abstraction licences will be reduced to reflect recent abstraction rates for public water supply.

4.4.13 River Sapiston and the Stowlangtoft Stream

Our abstraction is suspected by the Environment Agency to be impacting upon flow in the River Sapiston and the Stowlangtoft Stream. As agreed with the Environment Agency, we will implement river support and carry out river restoration on both water-bodies. The associated abstraction licences will be reduced to reflect recent abstraction rates for public water supply.

4.4.14 River Slea

Environment Agency investigations concluded that our abstraction is having an impact upon flows in the River Slea. We will implement a river support scheme to provide additional water during periods of low flow. The associated abstraction licences will be reduced to reflect recent abstraction rates for public water supply.

4.4.15 River Tiffey

Environment Agency evidence suggests that our abstraction is impacting upon flows in the River Tiffey. As guided by the Environment Agency, the options appraisal focused on the Dyke Beck, Bays River, and Hackford Watercourse sections of the River Tiffey waterbody. We have agreed to implement a river support scheme in AMP7. We are currently in discussion as to which tributary to provide support to in order to maximise ecological benefit, although it is likely to be the Hackford Watercourse. The abstraction licences associated with the Tiffey will be reduced to reflect recent abstraction rates for public water supply.

4.4.16 West and East Glen

Our abstraction has been shown to impact upon flow in the East Glen and West Glen. Since there is already a river support scheme on the West Glen via the Gwash to Glen transfer, we have agreed to carry out river restoration in order to improve the resilience of the ecology to low flows. We will also implement a river support scheme and river restoration scheme on the East Glen, as agreed with the Environment Agency. Associated abstraction licences will be reduced to reflect recent abstraction rates for public water supply.

4.4.17 West Runton Common

Under the Review of Consents, we moved our Sheringham abstraction away from the Beeston Regis Common SSSI. As part of this relocation, we drilled and commissioned a new source near West Runton. However, operation of the source has identified a potential connection between the shallow and deep aquifer which may be leading to impacts upon surface water features and a well at West Runton Common. We have addressed a local derogation issue and will provide support to Spring Pond during periods of low level.

4.5 Impact on Supply Forecast

The impact of the AMP7 sustainable abstraction schemes upon deployable output is explained in more detail in the WRMP 2019 summary document, and the ‘WRMP 2019 Technical Document: Supply Forecast’.

Supply-side options to maintain a supply-demand balance are set out in the ‘WRMP 2019 Technical Document: Supply-Side Option Development’.

5. Forward Look

5.1 Investigations and Options Appraisals

The AMP7 WINEP lists a number of water-bodies under the WFD and Habitats Directive drivers for investigation and options appraisal that are not related to WFD No Deterioration. Water-bodies that will be investigated and options appraised by the 2022 obligation date are the:

- Gipping (downstream of Stowmarket) and Somersham Watercourse
- Glaven
- North Essex Chalk
- River Colne
- Skerne Magnesium Limestone
- Stiffkey
- Stour (Wixoe-Lamarsh)
- Waveney and East Suffolk Chalk and Crag
- River Wensum, Blackwater Wendling Beck, Blackwater Drain, Wendling Beck, Wensum upstream Norwich, River Wensum, Hellesdon Special Area of Conservation (SAC), and Foulsham Tributary
- Witton Run

A further investigation and options appraisal will also be completed to its earlier 2021 obligation date:

- River Brett at confluence with Stour.

Any required sustainability changes or mitigation measures will be identified via the options appraisal process and inform WRMP 2024 for implementation in AMP8.

The AMP7 WINEP also lists a significant number of further water-bodies for investigation and options appraisal that are related to WFD No Deterioration. As discussed in section 3, it has become clear since WINEP was published that the abstractions listed under the WFD No Deterioration driver are likely to require sustainability changes in 2022. We have, therefore, planned for sustainability changes rather than investigations and options appraisals where the investigation and options appraisal would have been related to No Deterioration.

5.2 AMP8 Mitigation Schemes

As outlined in section 3 and 4, there are a small number of cases where further mitigation options may be required in AMP8 depending on the level of environmental improvement achieved by the AMP7 WINEP mitigation options. These relate to the Cavenham Stream, Stringside Stream, and Old Carr Stream. Where this is the case, we will implement AMP7 solutions early in the AMP to allow time for the collection and review of post implementation monitoring data in order to determine the requirement for additional AMP8 schemes.

5.3 Ants Broads and Marshes

In order to help restore sustainable abstraction near Catfield Fen, we have committed to the closure of our groundwater source in 2021.

We have also committed to delivering a further scheme in AMP7 to close two additional groundwater sources to mitigate impact that our abstractions may be having in the wider Ant Broads and Marshes.

6. Invasive and non-native species

Table 6.1: EA checklist actions addressed in this section

Number	Action
114	You have considered whether/how any current or future abstractions or operations might cause the spread of INNS and have determined measures to reduce the risk of this. You have liaised with the Environment Agency and/or Natural Resources Wales to discuss the risk of INNS and reflected the outcomes of this in your plan.
115	For water companies in England, you have reflected the February 2017 position statement and its principles in your plan.

The Environment Agency Invasive and Non Native Species (INNS) position statement(1) outlines the importance of the delivery of the European Invasive Alien Species Regulation, and the GB Non Native Species Strategy.

We have assessed all supply-side options to understand the risks of spreading Invasive Non Native Species (INNS) through the transfer of raw water, and will apply mitigation measures to reduce the risk where required. We have also agreed a programme of investigations with the Environment Agency to review our current abstractions and operations. These investigations will be carried out in AMP7 as per the WINEP.

6.1 Supply Side Options

We have assessed all supply-side options to understand the risks of spreading Invasive Non Native Species (INNS) through the transfer of water. As per the Environment Agency position statement, the assessment focused on the potential pathways for the transfer of INNS where new options:

- Create a hydrological connection between locations not already connected, and
- Where new schemes provides a pathway between locations that have an existing hydrological connection.

Where required, robust mitigation, such as treatment, that is completely effective for the removal of all INNS life stages has been designed into the options. However, our Best Value Plan does not include the transfer of any raw water and hence the risk of spread of INNS is low.

More details regarding the INNS assessment of supply side options can be found in the 'Supporting Technical Document: Supply-Side Option Development'.

6.2 Current Operations

As well as ensuring that our supply-side options do not increase the risk of INNS spread, we must also ensure that the risk from our current operations are understood and managed. We have agreed a programme of investigations via the WINEP with the Environment Agency, to investigate our existing raw water transfers as well as other business operations. These will be carried out in AMP7 in accordance to Environment Agency guidance and will not impact upon the supply forecast.

7. Fish and Eel Passage

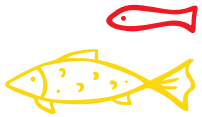


Table 7.1: EA checklist actions addressed in this section

Number	Action
113	You have considered any regulator measures to improve fish/eel passage or water quality and accounted for likely impact on supply forecasts

In AMP6 we are delivering an extensive programme to work towards meeting the Eels (England and Wales) Regulations 2009. After discussion with the Environment Agency, we have agreed a further programme of work to be delivered in AMP7 in line with guidance. There is not expected to be any impact on the supply forecast from eel passage works.

There is no requirement from the Environment Agency for any further fish passage schemes in AMP7 in our region.

8. Article 4.7

Table 8.1: EA checklist actions addressed in this section

Number	Action
119	Where changes to abstraction licences or new options threaten security of supply and there are no alternatives, you have considered and prepared evidence for exemption under Article 4.7 of the WFD.

There are no cases where we have needed to consider exemption under Article 4.7 of the WFD.

Cover photo shows Rutland Water

Rutland Water is a reservoir in Rutland, England, east of the county town, Oakham. It is filled by pumping from the River Nene and River Welland and provides water to the East Midlands. It is one of the largest artificial lakes in Europe.

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