MOTT MACDONALD

Anglian Water - Water Resources Management Plan

Strategic Environmental Assessment - Environmental Report
Main Report

December 2019

Anglian Water Services Ltd

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Contents

Abbreviations

AA	Appropriate Assessment
AMP	Asset Management Plan
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
BVP	Best Value Plan
CAMS	Catchment Abstraction Management Strategy
CEMP	Construction Environmental Management Plan
CFMP	Catchment Flood Management Plan
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CTMP	Construction Traffic Management Plan
DCLG	Department for Communities and Local Government
Defra	Department for Environment, Food and Rural Affairs
EBSD	Economics of Balancing Supply and Demand
EC	European Commission
EIA	Environmental Impact Assessment
ESA	Ecosystem Services Assessment
EU	European Union
GEP	Good Ecological Potential
GES	Good Ecological Status
GHG	Greenhouse Gas
GIS	Geographic Information System
HER	Historic Environment Record
HRA	Habitats Regulations Assessment
IMD	Index of Multiple Deprivation
INNS	Invasive Non-Native Species
km	Kilometres
LA	Local Authority
LCA	Landscape Character Appraisal
LCP	Least Cost Plan
LNR	Local Nature Reserve
LSE	Likely Significant Effects
LSOA	Lower Super Output Area
LT	Long-term

m	Metres
MCZ	Marine Conservation Zone
MPA	Marine Protection Zone
MT	Medium-term
NEP	National Environment Programme
NERC	Natural Environment and Rural Communities
NNR	National Nature Reserve
NO_2	Nitrogen Dioxide
ODPM	Office of the Deputy Prime Minister
PPP	Policies, Plans, Programmes
PRoW	Public Right of Way
RBD	River Basin District
RBMP	River Basin Management Plan
RIGS	Regionally Important Geological Site
RSS	Regional Spatial Strategy
RZ	Resource Zone
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SO_2	Sulphur Dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
ST	Short-term
ToLS	Test of Likely Significance
UK	United Kingdom
UKWIR	United Kingdom Water Industry Research
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WFD	Water Framework Directive
WRMP	Water Resource Management Plan
WRP	Water Resource Planning
WR	Water Reservoir
WRZ	Water Resource Zone
WTW	Water Treatment Works

Glossary

Baseline	A description of the present and future state of an area, in the absence of any development, taking into account changes resulting from natural events and from other human activities
Consultation Body	An authority which because of its environmental responsibilities is likely to be concerned by the effects of implementing plans and programmes and must be consulted under the SEA Directive. The Consultation Bodies designated in the SEA Regulations are Natural England, Historic England (formerly English Heritage) and the Environment Agency
Climate Change Adaptation	Involves adjustments to natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities
Climate Change Mitigation	Involves taking action to reduce the impact of human activity on the climate system, primarily through reducing greenhouse gas emissions
Ecosystem Services	Our health and wellbeing depends upon the services provided by ecosystems and their components: water, soil, nutrients, and organisms. Therefore, ecosystem services are the processes by which the environment produces resources utilised by humans such as clean air, water, food, and materials.
Green Infrastructure	Green Infrastructure is a strategically planned and delivered network of high-quality green spaces and other environmental features. It should be designed and managed as a multifunctional resource capable of delivering a wide range of environmental and quality of life benefits for local communities. Green Infrastructure includes parks, open spaces, playing fields, woodlands, allotments, and private gardens.
Indicator	A measure of variables over time, often used to measure achievement of objectives
Mitigation Measures	Refers to measures to avoid, reduce or offset significant adverse effects
Objective	A statement of what is intended, specifying the desired direction of change in trends
Scoping	The process of deciding the scope and level of detail of a SEA, including the sustainability effects and options which need to be considered, the assessment methods to be used, and the structure and contents of the Environmental Report
SEA Directive	European Directive 2001/42/EC ‘on the assessment of the effects of certain plans and programmes on the environment’. Transposed into UK law via The Environmental Assessment of Plans and Programmes Regulations 2004

Strategic Environmental Assessment	Generic term used internationally to describe environmental assessment as applied to policies, plans and programmes. In this report, 'SEA' is used to refer to the type of environmental assessment required under the SEA Directive
SEA Framework	This is the objectives and criteria developed for the project
SEA Objectives	These are specific objectives that have been developed for this project. They are also part of the SEA Framework, against which the project objectives and design have been tested for the purposes of this SEA

Non-Technical Summary

Introduction

Anglian Water is required to prepare and publish a Water Resources Management Plan (WRMP). The purpose of a WRMP is to set out a 25-year strategy for managing water supply and demand. When developing a WRMP water companies must follow the Water Resource Planning Guidelines ('WRP Guidelines'). The WRP Guidelines state that a Strategic Environmental Assessment (SEA) is required where new water supply options are needed.[1]

The objective of a SEA, according to Article I of the European Union Directive 2001/42/EC, more commonly known as the SEA Directive, is:

> 'to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans with a view to promoting sustainable development'[2].

In order to do this, the SEA Directive requires plans and programmes (such as the WRMP) to undergo environmental assessment, and suggests that among other factors human health, population and water should be considered as criteria.

Integrating the Environment into WRMP

The Department for Environment, Food and Rural Affairs' (Defra) Guiding Principles set out the government objective 'to deliver secure, reliable, sustainable and affordable supplies of water, value nature in decision-making and connect people with the environment'[3]. They encourage water companies to act as 'leaders' and 'stewards' of the natural environment, to use the WRMP process as an opportunity to connect communities to their local environment and to reflect the value of the environment in decision making by using environmental valuation approaches (natural capital and ecosystem services)[4].

Defra's Guiding Principles state: 'We expect you to thoroughly investigate and report on environmental and social costs and benefits.' In response, Anglian Water has developed a framework for assessing environmental and social costs and benefits and incorporating them into the WRMP development. This includes:

- Qualitative appraisal through the:
  - SEA
  - Habitats Regulations Assessment (HRA)
  - Ecosystem Services Assessment (ESA)
  - Water Framework Directive (WFD) assessment

1 EA, NRW, Defra and Ofwat, 2016, "Final Water Resources Planning Guideline", Page 10

2 The SEA Directive does not define what is meant by Sustainable Development. However, the Government SEA Guidance "A Practical Guide to the SEA Directive" (September 2005) sets out what "promotion of sustainability development" means in the UK context. The guidance references the UK Sustainable Development Framework "Our Future – difference paths" (2005) which states "The goal of sustainable development is to enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life, without comprising the quality of life for future generations. For the UK Government that goal will be pursued in an integrated way through a sustainable, innovative, and productive economy that delivers high levels of employment; and a just society that promotes social inclusion, sustainable communities, and personal well-being. This will be done in ways that protect and enhance the physical and natural environment and use resource and energy as efficiently as possible." This definition is reflected in the document 'Mainstreaming sustainable development – The Government's vision and what this means in practice' (Defra, February 2011) which sets out the vision of "stimulating economic growth and tacking the deficit, maximising wellbeing and protecting our environment, without negatively impacting on the ability of future generations to do the same".

3 Defra, May 2016 "Guiding Principles for Water Resource Planning", Page 1

4 Defra, May 2016 "Guiding Principles for Water Resource Planning", Page 4

- Monetised appraisal through customer stated preference surveys

The HRA, ESA, and WFD assessment are presented in separate reports but the results have fed into the SEA by providing evidence for SEA objectives on water quality and ecology.

WRMP

The overall aim of the Anglian Water WRMP is to develop a system of supply that is reliable, affordable, and sustainable. This includes meeting customer and government expectations and complying with all statutory obligations.

Anglian Water has adopted a planning approach that uses least-cost optimisation as well as broader criteria to develop a Best Value Plan (Preferred Plan) which takes account of 'best value' decision making criteria:

- Cost to build and operate the plan
- Adaptability and flexibility of the plan to cope with uncertain future needs
- Alignment to the Water Resource East regional strategy
- Resilience of the plan to severe and extreme drought and other hazards, and the residual risks
- Deliverability of the plan with timescales needed to manage risks
- Alignment to customer preferences
- Environmental and social impacts of the plan, including net environmental benefit

Demand management is a priority for Anglian Water. In developing the WRMP, Anglian Water has first considered what risk could be offset from demand management, before seeking to develop supply-side options. Despite the ambitious demand management strategy, the scale of the challenge is such that carefully targeted investment in supply- side capacity is still required. The supply-side options considered for inclusion in the WRMP have been developed following industry and regulator guidance.

The Preferred Plan provides the best value for customers in the long term. The strategy:

- Prioritises demand management, which aligns with customers' expectations
- Recognises the environmental benefits of demand management, such as offsetting treatment and pumping costs and carbon
- Challenges Anglian Water and its customers to push the boundaries of what is achievable, with respect to levels of future consumption
- Maximises the use of existing resources before developing new ones
- Provides future flexibility over the location and type of new resource inputs
- Delivers significant additional resilience across the region both to drought and non-drought events (e.g. freeze-thaw)
- Delivers environmental benefits, by reducing abstraction from the environment and ensuring no deterioration in the ecological status of water bodies in the region

The Draft WRMP was published for consultation in March 2018, allowing interested stakeholders and customers to review and comment upon the proposals. The feedback received from the consultation process played a significant role in shaping the WRMP.

The SEA Process

A SEA is required for the Anglian Water WRMP under the SEA Directive and the Environmental Assessment of Plans and Programmes Regulations 2004, which requires an assessment of the effects of certain plans and programmes on the environment.

The SEA also works to inform the decision-making process through the identification and assessment of significant and cumulative effects a plan or programme may have on the environment. The SEA process is conducted at a strategic level and enables consultation on the potential effects of a plan with a wide range of stakeholders.

To support the development of WRMP, Anglian Water commissioned Mott MacDonald to conduct a Strategic Environmental Assessment (SEA).

This Environmental Report presents the results of the SEA process for WRMP including:

- A summary of the SEA Scoping stage
- The results of the high-level environmental screening exercise which was undertaken as a precursor to the main SEA to highlight key environmental risks and constraints
- The results of the WRMP options assessment which was undertaken to assess the feasible list[5] of options using the SEA Framework and develop appropriate mitigation measures
- Assessment of the WRMP (Baseline Least Cost Plan, Alternative Least Cost Plan, Preferred Plan, adaptive strategy) including cumulative effects using the SEA Framework.
- Details of monitoring proposals to be implemented by Anglian Water during the WRMP period.

Anglian Water is committed to delivering all mitigation measures identified by the SEA and HRA.

SEA Scoping Stage Results

The scoping stage of the SEA process sets the context and scope for the SEA and Environmental Report. The scoping stage for the WRMP was undertaken and a Scoping Report produced in April 2017. The Scoping Report was issued for a five-week statutory consultation period to the three Consultation Bodies: Environment Agency, Natural England, and Historic England. Comments received were taken into consideration in the preparation of the Environmental Report.

The scoping process identified the relevant plans and programmes at International, National, Regional, and Local level and their implications for the SEA and WRMP. Scoping also set the environmental, social, and economic baseline context for the Anglian Water area, and identified key environmental and sustainability challenges and opportunities. The baseline data was further updated during the SEA options assessment to include site specific baseline data for each of the options.

A key stage in the SEA process is the development of the SEA Framework which includes SEA objectives and indicators. The SEA objectives were used during the assessment stage to appraise the WRMP options and solutions to determine their potential environmental effects. The WRMP SEA objectives were developed to reflect and support the Anglian Water outcomes for customers and the environment, the Defra Guiding Principles for water resource planning, and the Defra Strategy to 2020 ‘Creating a great place for living’.

The SEA objectives for the Anglian Water WRMP are:

- Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers
- Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards
- Deliver a reliable and sustainable water supply that is flexible to cope with changing growth in demand and enable economic growth

[5] The ‘feasible list’ is a sub-set of the ‘constrained list’ following options feasibility studies. It is a set of options considered to be suitable to take forward for assessment as part of the preferred programme options. As such it should not include options with unalterable constraints that make them unsuitable for promotion e.g. unacceptable environmental impacts that cannot be overcome. (EA, NRW, Defra and Ofwat, 2016, “Final Water Resources Planning Guideline”, Page 29).

- Strive to become leaders of the natural environment through enhancement of ecological diversity and networks
- Protect and enhance landscape character and land quality
- Protect and enhance the historic environment and cultural diversity of the region
- Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making
- Protect community amenity through ensuring operations do not cause nuisance for local communities
- Contribute to the local economy and economic growth
- Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves

High Level Environmental Screening

As a precursor to the SEA and HRA, a high-level environmental screening exercise was undertaken to highlight environmental risks and constraints at an early stage in the options development process, in accordance with United Kingdom Water Industry Research (UKWIR) guidance. The environmental screening findings have been used as supporting evidence for the rejection of options to avoid potentially significant environmental effects or to identify suitable mitigation measures to be incorporated into option development. The results were also taken forward into the SEA and HRA for WRMP.

Assessment of the WRMP Options

As part of the WRMP development process Anglian Water undertook modelling to identify areas with a surplus or deficit of water supply. For areas with deficits, Anglian Water developed a range of options for maintaining the supply demand balance. These fall into two broad categories:

- Demand management options – options that will reduce the demand for water including metering, water efficiency, and leakage reduction.
- Supply options – options that will provide a water supply to customers including transfers, maximising existing resources, trading, tankering, and new resources.

The WRMP is a mix of these two broad categories. Although demand management options are likely to have the least significant environmental effects, if implemented on their own, they will not meet the deficits forecast in the region. Therefore, supply options were also needed.

In addition to demand management options and supply options, the WRMP also includes National Environmental Programme (NEP) mitigation options. The NEP is a list of environmental improvement schemes that ensure that water companies meet European and national targets related to water. The Environment Agency has identified a number of watercourses, and flora and fauna that they contain, to be at risk from the effects of abstraction. In areas where Anglian Water abstractions are implicated, the Environmental Agency has required the company to identify options to mitigate the effects of abstraction as part of the NEP.

The options assessment demonstrated the potential positive and negative effects of the different water resource options that could go forward into the preferred plan for WRMP. The common themes from the assessment included:

- Effects on ecological designated sites such as SPA, SAC, Ramsar, SSSI, ancient woodland, NNR, and LNR from direct loss of habitat due to pipeline construction
- Effects on ecological designated sites through species disturbance during construction
- Effects on water dependant designated sites and species through changes to water flow levels and water quality

- Effects on the fabric or setting of heritage assets including listed buildings, scheduled monuments, registered parks and gardens, and conservation areas
- Effects on transport, cyclist, and pedestrians through road and path closures or diversions during construction
- Effects on Marine Conservation Zones and nursery/spawning fisheries from desalination intake and outfall pipelines and screens, and discharged brine
- Opportunity to improve cycle routes and footpaths as part of re-instatement works
- Opportunity to create reservoirs that can be used for recreational activities and/or wildlife conservation
- Opportunity to increase resilience to droughts, leaving more water in the natural system for the environment
- Opportunity to improve customer understanding of their water consumption to facilitate behavioural change

Mitigation and enhancement measures were suggested as part of the SEA options assessment process. Where possible mitigation measures have been incorporated into the options development process and a register records where this has taken place. This has included pipeline re-routing and directional drilling to avoid significant effects on designated sites and heritage assets. Incorporation of these measures at this early strategic stage will help deliver a WRMP that benefits the environment and reduces the risk of significant negative effects and cost-prohibitive mitigation measures further down the line during detailed design of specific options. The options assessment included assessment pre-mitigation, and post-mitigation to demonstrate the remaining effects following implementation of mitigation measures. Following the assessment of the feasible list of options, several options were rejected based on factors including cost, environmental impact, and delivery. These options were recorded in a rejection register.

Assessment of the WRMP

The Baseline Least Cost Plan, Alternative Least Cost Plan, and the Preferred Plan including the adaptive strategy were assessed as part of the SEA.

The Preferred Plan) is likely to have an overall positive effect on delivering reliable and sustainable water supplies that are flexible to cope with future changing growth and demand. Positive effects identified include: increased availability and resilience of water supplies for human use; increased availability of water within the natural environment thus increasing resilience, benefiting water dependant ecological sites and maintaining an attractive natural landscape; reducing the need for future water supply infrastructure; and allowing customers to understand their water usage.

Where negative effects were identified in the options assessment, these have been mitigated through the options design process where possible, by re-routing pipelines or using directional drilling under sensitive sites and rivers or investigated further through the HRA and WFD processes. The use of best practice construction methods will also be utilised to minimise any effects during the construction phase. Minor negative effects remain for one option due to the predicted moderate effects on WFD objectives. Where effects relating to greenhouse gas emissions were known, all options had minor negative effects apart from three options where major negative effects were identified. Use of renewable energy technologies could help to reduce effects. Anglian Water is committed to delivering all mitigation measures identified by the SEA and HRA.

Monitoring the effects of the WRMP

Monitoring the negative effects of implementing the WRMP is an essential on-going element of the SEA process. Monitoring helps ensure that the identified SEA objectives are being achieved, allows early identification of unforeseen adverse effects and thus appropriate remedial action can be taken.

Negative effects or uncertainty identified during the SEA process were focussed on effects on ecology, carbon emissions, landscape, and the historic environment. Indicators for monitoring these potential issues were developed and indicators for recording the potential benefits that the WRMP achieves (e.g. recreational assets created, waste recycle/reused) were developed and included within the monitoring proposals.

1 Introduction

1.1 Context

1.1.1 Water companies have a statutory obligation to produce a Water Resources Management Plan (WRMP), which sets out how a company intends to maintain the balance between supply and demand for water over a minimum 25-year period. In the development of a WRMP, companies must follow the Water Resource Planning Guidelines[6] ('WRP Guidelines') and have regard to broader government policy objectives, as set out in the Department for Environment, Food and Rural Affairs' (Defra) Guiding Principles, for example. WRMPs should ensure a secure and sustainable supply of water, focus on efficiently delivering the outcomes that customers want, while reflecting the value that society places on the environment.

1.1.2 The WRP Guidelines state that a Strategic Environmental Assessment (SEA) is required where options are needed to balance a supply-demand deficit.[7]

1.1.3 The objective of SEA, according to Article I of the SEA Directive, is: 'to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans with a view to promoting sustainable development'[8].

1.1.4 In order to do this, the SEA Directive requires plans and programmes to undergo environmental assessment, and suggests that amongst other factors human health, population and water should be included as criteria.

1.2 Defra's Guiding Principles and WRP Guidance

1.2.1 Defra's Guiding Principles set out the government objective 'to deliver secure, reliable, sustainable and affordable supplies of water, value nature in decision-making and connect people with the environment'[9]. They encourage water companies to act as 'leaders' and 'stewards' of the natural environment, to use the WRMP process as an opportunity to connect communities to their local environment and to reflect the value of the environment in decision making by using natural capital (and ecosystems services) approaches[10].

1.2.2 In addition, the WRP Guidance highlights the following key environmental considerations:

- Impact of climate change in relation to river flows and groundwater recharge, and any future supply options.
- Issue of spread of invasive non-native species and proposed measures to mitigate that risk.

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6 EA, NRW, Defra and Ofwat, 2016, "Final Water Resources Planning Guideline"

7 EA, NRW, Defra and Ofwat, 2016, "Final Water Resources Planning Guideline", Page 10

8 The SEA Directive does not define what is meant by Sustainable Development. However, the Government SEA Guidance "A Practical Guide to the SEA Directive" (September 2005) sets out what "promotion of sustainability development" means in the UK context. The guidance references the UK Sustainable Development Framework "Our Future – difference paths" (2005) which states "The goal of sustainable development is to enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life, without comprising the quality of life for future generations. For the UK Government that goal will be pursued in an integrated way through a sustainable, innovative, and productive economy that delivers high levels of employment; and a just society that promotes social inclusion, sustainable communities, and personal well-being. This will be done in ways that protect and enhance the physical and natural environment and use resource and energy as efficiently as possible." This definition is reflected in the document 'Mainstreaming sustainable development – The Government's vision and what this means in practice' (Defra, February 2011) which sets out the vision of "stimulating economic growth and tacking the deficit, maximising wellbeing and protecting our environment, without negatively impacting on the ability of future generations to do the same".

9 Defra, May 2016 "Guiding Principles for Water Resource Planning", Page 1

10 Defra, May 2016 "Guiding Principles for Water Resource Planning", Page 4

- Consideration of using an ecosystem services approach to environmental valuation.
- Enhancing the natural resilience of catchments by effective catchment management planning, to increase the amount and/or quality of water available for abstraction without posing unacceptable pressures on the environment.
- Consider whether abstractions are truly sustainable by looking holistically at a catchment.

1.2.3 The supplementary guidance note; 'Environmental Valuation in Water Resources Planning' provides additional detail on how to integrate environmental and social considerations into the WRMP process. This includes a minimum requirement for companies to undertake a qualitative and quantitative assessment of the environmental and social impacts of options, and to monetise those impacts where proportionate. The note also emphasises the importance of understanding how a company's approach to environmental valuation works alongside the SEA and to avoid double counting.[11]

1.3 Integrating the Environment into WRMP

1.3.1 Defra's Guiding Principles state: 'We expect you to thoroughly investigate and report on environmental and social costs and benefits.'[12]

1.3.2 In response, Anglian Water developed a framework for assessing environmental and social costs and benefits and incorporating them into the WRMP options assessment process. This was closely linked to the PR19 Business Plan, and included:

- Qualitative appraisal through the:
  - SEA
  - Habitats Regulations Assessment (HRA)
  - Ecosystem Services Assessment (ESA)
  - Water Framework Directive (WFD) assessment
- Monetised appraisal through customer stated preference surveys

1.3.3 The HRA, ESA, and WFD assessment are presented in separate reports but the results have fed into the SEA by providing evidence for SEA objectives on water quality and ecology.

1.3.4 The SEA process has influenced the WRMP development at the following stages (described in more detail in Sections 3, 5, and 6):

- High level screening of the WRMP Constrained Options List[13] - as a precursor to the main SEA appraisal a high-level environmental screening exercise of the WRMP Constrained Options List was undertaken. This highlighted environmental risks and constraints, resulting in the rejection of certain options, or identification of high-level mitigation to be incorporated into option development.

[11] EA, 2016, "Environmental valuation in water resources planning - additional information", Page 8

[12] Defra, May 2016 "Guiding Principles for Water Resource Planning", Page 4

[13] The WRMP process generally starts with a generic of potential types of measures to meet water demand which is refined into an 'unconstrained list'. The unconstrained list is then screened using professional judgement to remove impractical options, leaving the 'constrained list' (UKWIR, 2012, "Strategic Environmental Assessment and Habitats Regulations Assessment – Guidance for Water Resources Management Plans and Drought Plans", Page 26.

- Assessment of the WRMP Feasible Options List[14] – assessment of the feasible list of options using the SEA Framework. Mitigation measures were identified and incorporated into option development where appropriate e.g. pipeline re-routing and directional drilling to avoid effects on designated sites and heritage assets.
- Assessment of the WRMP Preferred Plan[15] – assessment of the preferred plan options including cumulative effects using the SEA Framework.

1.4 The SEA Process

1.4.1 A SEA is required for the Anglian Water WRMP under the European Union Directive 2001/42/EC, more commonly known as the SEA Directive. The Directive was transposed into United Kingdom (UK) law via the Environmental Assessment of Plans and Programmes Regulations 2004, which requires an assessment of the effects of certain plans and programmes on the environment. Article 3 (2b) states that SEA is required for plans and programmes which are prepared for water management, set the framework for development consents, and/or are likely to have a significant environmental effect.

1.4.2 The SEA also works to inform the decision-making process through the identification and assessment of significant and cumulative effects a plan or programme may have on the environment. The SEA process is conducted at a strategic level and enables consultation on the potential effects of a plan with a wide range of stakeholders. Figure 1 presents the different stages in the SEA process.

1.4.3 To support the development of WRMP, Anglian Water commissioned Mott MacDonald to conduct a Strategic Environmental Assessment (SEA).

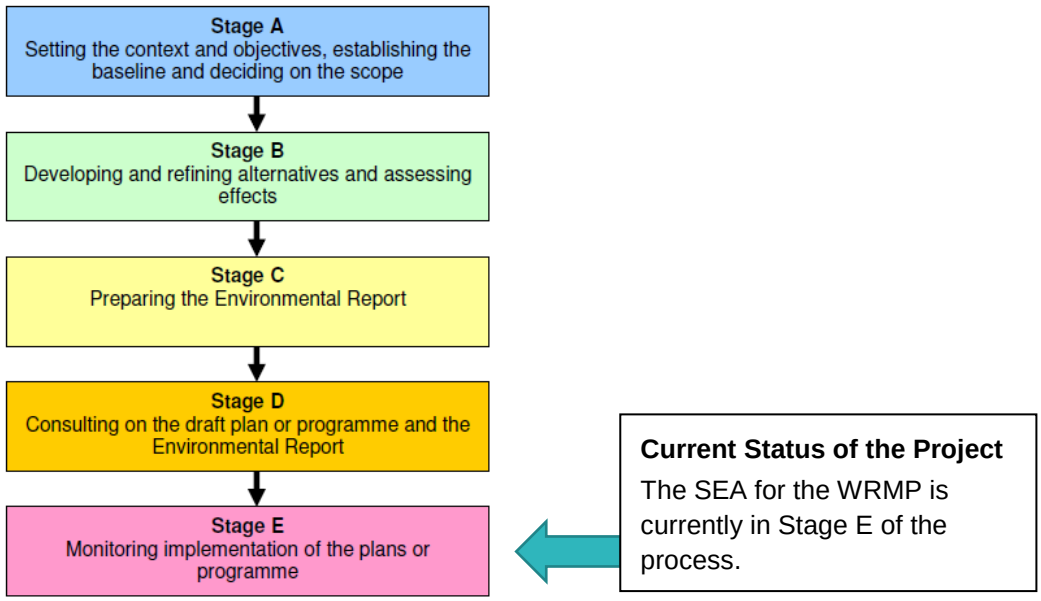
1.4.4 The Anglian Water WRMP SEA was carried out in accordance with the following guidance:

- UKWIR (2012) Strategic Environmental Assessment and Habitat Regulations Assessment – Guidance for Water Resources Management Plans and Drought Plans (ref. 12/WR/02/7).
- Office of Deputy Prime Minister (ODPM) (now the Department for Communities and Local Government (DCLG)) (September 2005) A Practical Guide to the Strategic Environmental Assessment Directive.
- Environment Agency (August 2011) Strategic Environmental Assessment and Climate Change: Guidance for Practitioners.
- Historic England (December 2016) Sustainability Appraisal and Strategic Environmental Assessment – Historic England Advice Note 8.

[14] The ‘feasible list’ is a sub-set of the ‘constrained list’ following options feasibility studies. It is a set of options considered to be suitable to take forward for assessment as part of the preferred programme options. As such it should not include options with unalterable constraints that make them unsuitable for promotion e.g. unacceptable environmental impacts that cannot be overcome. (EA, NRW, Defra and Ofwat, 2016, “Final Water Resources Planning Guideline”, Page 29).

[15] The Preferred Plan is the draft WRMP 2019 which describes the preferred supply and demand options strategy to meet the predicted deficits in the region.

Figure 1: SEA Process Stages



Source: Adapted by Mott MacDonald from the DCLG SEA Guidance 'A Practical Guide to the SEA Directive'

1.5 Purpose of the Assessment Stage and Environmental Report

1.5.1 The purpose of the Assessment Stage (Stage B of the SEA process) and Environmental Report (Stage C of the SEA process) (see Figure 1 for SEA process stages) was to review the feasible list of options for the WRMP and the subsequent preferred portfolio of options for the WRMP and identify any potential effects (positive and negative). This has been achieved through undertaking the following:

- Review of the Anglian Water WRMP SEA Scoping Report.
- Review of the feasible list of options and gathering option location baseline information.
- Identification and evaluation of the predicted effects of the WRMP feasible options through assessment using the SEA Framework.
- Identification and evaluation of the predicted effects of the WRMP preferred portfolio of options including consideration of cumulative effects.
- Identification of mitigation measures and opportunities for maximising benefits.
- Development of monitoring proposals to be implemented by Anglian Water during the WRMP period.
- Preparation of an Environmental Report for public consultation.

1.5.2 The draft WRMP and Environmental Report were issued for formal consultation from March to May 2018. Following public consultation, responses were reviewed, and the Environmental Report was updated as appropriate. A log of consultation comments and report updates is provided in Appendix O.

1.5.3 In order to produce this SEA Environmental Report, Mott MacDonald has relied on published data and information provided by Anglian Water and from third party organisations. The baseline information collected is the most up-to-date information currently available, however it is possible that conditions described in this report may have changed or will change over the plan period.

1.6 Compliance with the SEA Directive

1.6.1 This Environmental Report has been prepared in accordance with the requirements of the SEA Directive. Table 1 indicates where the specific requirements in the SEA Directive relating to the Environmental Report (SEA Directive Annex I) can be found within this report.

Table 1: SEA Directive Requirements Signposting Table

SEA Directive Environmental Report Requirements	Section of Environmental Report where Requirement is found
An outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes	Chapter 2, Section 4.2, Section 7.2, Appendix A
The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme	Section 4.4 – 4.5, Appendix B
The environmental characteristics of areas likely to be significantly affected	Section 4.4, Appendix B
Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC	Section 4.6, Appendix C
The environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation	Section 4.2 – 4.3, Appendix A
The likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, historic environment[16], landscape and the interrelationship between the above factors	Chapter 5, Chapter 6, Appendix E - K
The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme	Section 5.5, Section 6.5, Appendix L
An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information	Chapter 5
A description of the measures envisaged concerning monitoring in accordance with Article 10	Chapter 7
A non-technical summary of the information provided under the above headings	Non-technical summary at start of report

Source: SEA Directive Annex I

1.7 Environmental Report Structure

1.7.1 This Environmental Report is structured as follows:

- Chapter 1 – Induction to the WRMP and SEA process and requirements
- Chapter 2 – Description and context of the WRMP
- Chapter 3 – Results of the high-level screening exercise
- Chapter 4 – Summary of the Scoping Stage tasks (from the Scoping Report) including the plans and programmes review, baseline, key issues and opportunities, and the SEA Framework
- Chapter 5 – Description and assessment of the WRMP options and proposed mitigation measures
- Chapter 6 –WRMP Development and Assessment (including cumulative effects)

[16] Historic environment covers the SEA Directive topic cultural heritage including architectural and archaeological heritage

- Chapter 7 – Proposals for monitoring effects of the WRMP
- Chapter 8 - References
- Appendix A – Plans and programmes review
- Appendix B – Baseline information
- Appendix C – Key issues and opportunities
- Appendix D – Scoping Report consultation log
- Appendix E – High level environmental screening matrix
- Appendix F – Reservoirs options assessment
- Appendix G – Transfers options assessment
- Appendix H – Water reuse options assessment
- Appendix I – Aquifer storage and recovery options assessment
- Appendix J – Desalination options assessment
- Appendix K – Demand management options assessment
- Appendix L – Options assessment mitigation register
- Appendix M – DCLG Quality Assurance Checklist
- Appendix N – WRMP Least Cost Plans Assessment
- Appendix O – Environmental Report consultation log
- Appendix P – Superseded options assessment

2 Description and Context of the WRMP

2.1 Introduction

2.1.1 As already noted, water companies have a statutory obligation to produce a Water Resources Management Plan (WRMP), which sets out how a company intends to maintain the balance between supply and demand for water over a minimum 25-year period. New WRMPs are prepared every five years and Anglian Water is due to publish its next WRMP in 2019. The new WRMP is the subject of this SEA.

2.1.2 Anglian Water is the largest water and wastewater company in England and Wales by geographic area and is divided into 28 Water Resource Zones[17] (WRZs) (see Figure 2) including the South Humber Bank which is a non-potable WRZ that sits within Central Lincolnshire. It stretches from the Humber north of Grimsby, to the Thames estuary and then from Buckinghamshire to Lowestoft on the east coast. It also covers the Hartlepool area. It should be noted that Hartlepool is not covered in this SEA because no options are being considered for the Hartlepool area.

2.1.3 Anglian Water supply water and water recycling services to more than six million customers in the east of England and Hartlepool.[18]. The East of England is one of the driest regions in the UK, with low rainfall (71% of the UK average) and high evaporation losses[19]. Water supply is under pressure from population growth, climate change, sustainability reductions[20] and the need to increase resilience of water supplies to severe drought.

[17] WRZs represent an area within which managing supply and demand for water resources is largely self-contained. The definition of a WRZ (from Water Resources Planning Tools (WR27), UKWIR, 2012) is: 'The largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers will experience the same risk of supply failure from a resource shortfall'.

[18] Draft Water Resources Management Plan 2019 (Anglian Water, 2017)

[19] Anglian Water, 2017 "Our Company" [webpage]

[20] In some cases, water company abstractions have been found to cause, or the potential to cause, environmental harm. As a result, the company may be required to reduce the amount of water they can abstract from the environment. If this reduces the amount of water available to put into supply, then it is known as a sustainability reduction.

Figure 2: WRZs in the WRMP

Source: WRMP (Anglian Water, 2019)

2.2 WRMP Development

2.2.1 Anglian Water has adopted a planning approach that uses least-cost optimisation as well as broader criteria to develop a Best Value Plan (Preferred Plan) which takes account of 'best value' decision making criteria:

- Cost to build and operate the plan
- Adaptability and flexibility of the plan to cope with uncertain future needs
- Alignment to the Water Resource East regional strategy
- Resilience of the plan to severe and extreme drought and other hazards, and the residual risks

- Deliverability of the plan with timescales needed to manage risks
- Alignment to customer preferences
- Environmental and social impacts of the plan, including net environmental benefit

2.2.2 The SEA and other environmental studies undertaken were used as part of the decision-making criteria on environmental and social impacts of the plan to develop the Preferred Plan.

2.2.3 Demand management is a priority for Anglian Water. In developing the WRMP, Anglian Water has first considered what risk could be offset from demand management, before seeking to develop supply-side options. Despite the ambitious demand management strategy, the scale of the challenge is such that carefully targeted investment in supply- side capacity was still required. The supply-side options considered for inclusion in the WRMP have been developed following industry and regulator guidance.

2.2.4 The Preferred Plan provides the best value for customers in the long term. The strategy:

- Prioritises demand management, which aligns with customers' expectations
- Recognises the environmental benefits of demand management, such as offsetting treatment and pumping costs and carbon
- Challenges Anglian Water and its customers to push the boundaries of what is achievable, with respect to levels of future consumption
- Maximises the use of existing resources before developing new ones
- Provides future flexibility over the location and type of new resource inputs
- Delivers significant additional resilience across the region both to drought and non-drought events (e.g. freeze-thaw)
- Delivers environmental benefits, by reducing abstraction from the environment and ensuring no deterioration in the ecological status of water bodies in the region

2.2.5 The WRMP include an adaptive strategy to deal with uncertainties and future scenarios that will mean further investment is required (e.g. further future sustainability reductions). In some cases, there may not be a long lead time to implement schemes and therefore Anglian Water need to develop a plan which identifies thresholds beyond which they need to take further action. The potential options identified as part of the adaptive strategy have been assessed as part of the SEA. It should be noted that at this stage these are strategic supply side options that may be required in the future. They do not form a definitive list of options.

2.2.6 The Draft WRMP was published for consultation in March 2018, allowing interested stakeholders and customers to review and comment upon the proposals. The feedback received from the consultation process played a significant role in shaping the WRMP.

2.3 WRMP Option Types

2.3.1 The WRMP includes supply side options, demand management options, and National Environmental Programme (NEP) options. The broad option types considered included:

- **Aquifer storage and recovery** - aquifer storage options involve abstracting water from a river or reservoir, treating and injecting it underground to be stored in natural aquifers.
- **Desalination** – desalination options involve pumping sea water or brackish water (from an estuary) for treatment and release into supply. The water will be blended before putting into supply, with the brine to be piped out to sea for disposal (in the case of sea desalination) or to a sewer (in the case of brackish water desalination).

- **Conjunctive use** – involves the co-ordinated use of surface water and groundwater and allows flexibility depending on the conditions e.g. surface water can be used in wet periods, and groundwater can be used in dry periods. It should be noted that no conjunctive use options were taken forward into the EBSD modelling and, therefore, conjunctive use options are assessed in the high-level environmental screening but not in the SEA options assessment.
- **Water reuse** – effluent is treated and discharged into rivers for re-abstraction downstream into potable water treatment works or piped into supply.
- **Reservoirs** – reservoir options include dam raising (increasing the capacity of existing reservoirs), or creation of new reservoirs. It is likely that most of these will be bunded reservoirs (i.e. not within a valley) with piped transfers in and out of supply.
- **Tankering** - sea tankering options from abroad are being considered. Storage and offloading facilities will be required in the UK with water piped or tankered to water treatment works (WTWs) or reservoirs. It should be noted that no tankering options were taken forward into the EBSD modelling and, therefore, tankering options are assessed in the high-level environmental screening but not in the SEA options assessment.
- **Transfers** – transfers usually involve water being piped from one WRZ to another, or from one water company to another. However, they can also be a component of another option type such as a desalination plant. They will transfer water from the new asset to a suitable delivery point.
- **Trading** – involves an agreement with another water company to trade water where there is a surplus.
- **Demand management options** – several demand management options are being considered including smart metering, leakage reduction, and water efficiency measures.
- **NEP options** - The NEP is a list of environmental improvement schemes that ensure that water companies meet European and national targets related to water. The NEP options included in the WRMP fall into five broad categories: river restoration schemes; river support schemes; pond support scheme; recirculation scheme; and source relocation.

3 High Level Environmental Screening Results

3.1 Introduction

3.1.1 As a precursor to the SEA and HRA, a high-level environmental screening exercise was undertaken to highlight environmental risks and constraints at an early stage in the options development process, in accordance with UKWIR guidance[21]. The environmental screening findings have been used as supporting evidence for the rejection of options to avoid potentially significant environmental effects, or to identify suitable mitigation measures to be incorporated into option development. The results were also taken forward into the SEA and HRA for WRMP.

3.2 Methodology

3.2.1 The screening was structured around the following key environmental topics which have the potential for significant effects:

- Ecology
- Historic Environment
- Water
- Landscape
- Community

3.2.2 The potential negative environmental impacts on the designations/receptors listed in Table 2 were considered. Given the high-level nature of the environmental screening exercise, the screening was limited to European, National, and Regional designations/receptors. However, local designations/receptors have been considered through the SEA process.

Table 2: Environmental Designations/Receptors included in the High-Level Environmental Screening

Key Topic	Designations / Receptors	Sources[22]
Ecology	Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site, Site of Special Scientific Interest (SSSI) including geological SSSIs, National Nature Reserve (NNR), Regionally Important Geological Site (RIGS), Marine Protected Areas (MPA) (including Marine Conservation Zones (MCZ)), invasive non-native species (INNS)	GIS Datasets available from Data.gov.uk
Historic Environment	Listed Buildings, Conservation Areas, Scheduled Monuments, Archaeological Areas, Registered Battlefields, Registered Parks and Gardens, World Heritage Site, Protected Wreck Site	GIS Datasets available from Data.gov.uk

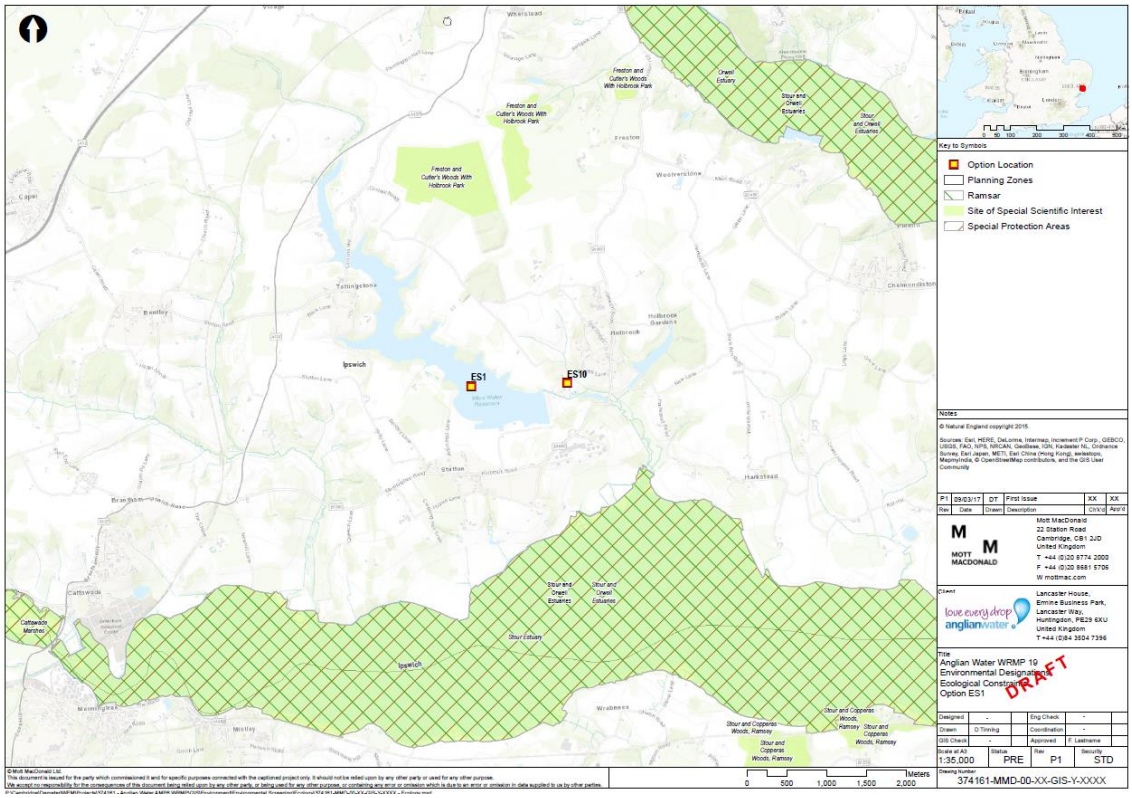
[21] Strategic Environmental Assessment and Habitats Regulations Assessment – Guidance for Water Resources Management Plans and Drought Plans (UKWIR, 2012)

[22] GIS Datasets contain public sector information licensed under the Open Government Licence v3.0.

Key Topic	Designations / Receptors	Sources[22]
Water	River Basin Management Plan (RBMP) and Water Framework Directive (WFD) river water quality and flow indicators, shellfish waters, bathing water	RBMP and WFD:[23] Shellfish and Bathing Waters: GIS Datasets available from Data.gov.uk
Landscape	Area of Outstanding Natural Beauty (AONB), National Character Area, National Parks, Ancient Woodland	GIS Datasets available from Data.gov.uk
Community	Agricultural land, Transport infrastructure (motorways, A roads, national cycle routes, railway lines, overriding community benefit[24]	GIS Datasets available from Data.gov.uk

3.2.3 GIS layers and data sourced from the websites referenced in Table 2 were used to map baseline information on the identified designations and receptors. Baseline maps were overlain with the options locations map to identify where potential interactions and negative effects may occur as a result of each of the options being implemented (see Figure 3).

Figure 3: Example Option Constraints Map for Ecology



Source: Mott MacDonald Ltd (March 2017)

3.2.4 Each option was screened using the scoring system presented in Table 3. Along with the colour coding, a risk narrative, high level mitigation measures, and how these have been incorporated into the option development were included (as shown in the example in Table 4).

23 Environment Agency website

24 Overriding community benefit means a significant social benefit to the local community such as a reservoir that is designed to provide recreational and visitor facilities. This is not part of the Habitats Regulations Assessment 'Imperative Reasons of Overriding Public Interest (IROPI) process.

Table 3: Scoring Definitions

Score	Definition
	Recommend rejecting option – Major effect on designated features. Option would cause irreversible loss to a sensitive designated feature
	Take option forward but further assessment and mitigation required – Moderate effects on designated features. Option would cause loss of a designated features but could be mitigated
	Take option forward – minor/no effect on designated features
	Option provides overriding public benefits. This score has been included in the process to ensure that options are not screened out too early in the process

Table 4: Example output from the High-Level Environmental Screening

Option	Ecology	Heritage	Water	Landscape	Community	Options Development Audit Trail / Mitigation
ES40 – Tankering (sea)	New pipeline infrastructure will cross the Stour and Orwell SPA/Ramsar site., Construction will likely cause disturbance to qualifying bird assemblages, internationally important waterfowl and overwintering species. There is also a potential direct impact on qualifying salt marsh habitat. The impact of increased tanker presence in the estuary will have implications for water quality and qualifying features.	No effects on heritage identified. However, there is potential for an impact upon undiscovered archaeology.	The potential effects on Suffolk Coastal Bathing waters is dependent on the location of the dock and storage/treatment facilities. Pipelines have the potential for leakages to occur affecting groundwater quality. Potential for invasive non-native species (INNS) and disease transmission from international source of water.	The storage and treatment facilities have the potential to impact the Suffolk Coast & Heaths Area of Outstanding National Beauty (AONB) and National Character Area. These effects are limited to the short-term construction period. There will be no permanent effects as the required development will be within existing industrial land. There are short-term effects due to pipeline construction on several National Character Areas (Northern Thames Basin, Suffolk Coast & Heaths, and South Suffolk & North Essex Clayland) and Suffolk Coast & Heath, and Dedham Vale AONBs.	The construction of storage and treatment facilities on non-agricultural/urban land surrounding Felixstowe Dock will likely have an impact upon the local community. Pipelines are likely to be routed through agricultural land of grades 1 & 2. Investigate re-routing of the pipeline or providing compensation to farmers. Disturbed land must be restored to original condition or better. The construction of pipelines is likely to affect A Roads and the Fakenham to Harwich National Cycle Route. Construction of the pipeline will cause disruption to rail lines between Ipswich and Colchester and between Colchester and Clacton-on-Sea where the pipeline crosses the railway lines.	As part of the INNS assessment, mitigation for the INNS risk has been applied to this option proposing that the water is treated to eradicate for INNS before it goes into storage before being pumped across to Alton water treatment works (WTW). Directional drilling can also be used to cross rivers and designated sites if re-routing is not possible. The SEA, HRA and WFD consider the potential ecological effects in more detail.

3.3 Summary

3.3.1 The high-level environmental screening identified the potential risks and constraints associated with each of the options. The results of the high-level environmental screening are presented in a matrix in Appendix E.

3.3.2 Ten options were identified as having potentially significant environmental effects. Table 5 presents these options; the potential effects identified, and how the effects have been addressed during the option development. Of these ten options, seven were rejected based on environmental and technical risks. Mitigation measures or further investigation were proposed for the remaining three options.

3.3.3 Several options were assessed as having potential for moderate environmental effects (see Appendix E). Effects were associated with pipelines going through designated ecological or heritage sites, effects on water quality and flows, and effects of physical infrastructure on the landscape. These effects have had suitable mitigation identified to avoid/minimise the negative effects or have been investigated further through the options development process and measures have been implemented through the option design such as re-routing pipelines or using directional drilling to avoid sensitive areas. HRA and WFD assessments have also been undertaken to further understand potential effects and develop specific mitigation.

Table 5: Options with Significant Environmental Effects

Option Name	Potential Effects	How Addressed in Options Development
Grantham Canal Transfer	Habitat damage, loss or change of conditions to Grantham Canal SSSI. Habitat damage, loss or change of conditions to Kinoulton Marsh and Canal SSSI (canal flows through designated site). Aerial photography suggests large sections have no open water out with designated sites and are either dry or support extensive emergent vegetation. Changes to flow regimes can result in habitat damage/destruction, and impact to fauna. Changes to water chemistry from different catchments and subsequent effect to flora and fauna. Potential for invasive species along canal bank.	The option has been rejected for the following reasons: • High risk of failure – Sustainability: the canal is disused and has become valuable wetland habitat. Changes in flow and water chemistry are considered likely to cause habitat damage. • High risk of failure – Technical: rehabilitation of a disused canal to transfer flows is likely to require extensive canal repair. • High risk of failure – Technical: pre-treatment may be required to protect existing habitat along the canal. • Option is not promotable – Cost: large pipeline transfer required, repairs to existing pounds, and pumping bypass around every canal lock is likely to render the option not feasible.
Pitsford Reservoir Dam Raising (4m)	Effects on receptors including: residential properties, farms, access roads, sailing club, car park and picnic area.	This option has been rejected due to the potential negative effects on the surrounding environment from water inundation and the land take required for the dam raising (the option of raising by 3m is considered to have fewer negative effects). The yield assessment for 4m dam raising option also indicates minimal increase in yield when compared with raising by 3m.

Option Name	Potential Effects	How Addressed in Options Development
Pitsford Reservoir Dam Raising (3m)	Effects on receptors including: residential properties, farms, access roads, soiling club, car park and picnic area.	The Pitsford dam raising option has been investigated using a land take assessment study and a constructability assessment. The option has included mitigation measures such as relocation of the sailing club and car park. However, there is a risk that additional mitigation measures will be required. The drawdowns required during construction are considerable and estimated to be greater than 4m below top water level over one or two summer/autumn construction periods. The effect of this will be tested in an Aquator model but other transfer options into Pitsford may minimise these effects by transferring straight to Pitsford WTW.
Rutland Water Dam Raising (1m and 2m)	Likely to cause significant effects on qualifying bird species of the Rutland SPA/Ramsar/SSSI site. Effects on heritage assets. Effects on receptors including: residential properties, areas of Egleton Village, former Church of St Matthew, access roads, and sailing club.	The option has been rejected due to the potential significant negative effects on the environment. The yield assessment provided an indication that raising above 0.5m does not significantly increase the yield unless it is combined with large transfers.
Rutland Water Dam Raising (0.5m)	Likely to cause significant effects on qualifying bird species of the Rutland SPA/Ramsar/SSSI site. Effects on heritage assets. Effects on receptors including: residential properties, areas of Egleton Village, former Church of St Matthew, access roads, and sailing club.	The option has been rejected due to the relatively small yield benefits and the extensive mitigation measures required to protect the environmental constraints including the Anglian Water bird lagoons, the water treatment works and the dwellings that would be affected.
Grafham Water Dam Raising (4m)	Effects on receptors including: residential properties, farms, electricity pylons, and sailing club.	The option has been rejected due to the potential significant negative effects on the environment, infrastructure, and housing due to water inundation. Raising of 3m is considered to be more feasible.
Ruthamford South New Reservoir (top water level of 60mAOD)	Effects on heritage asset (submergence of listed building). Effects on receptors including: Wybridge Road and the associated properties.	The option has been rejected due to the submergence of a listed building, causing that option to potentially fail a public acceptability test. The smaller reservoir option with a maximum top water level of 51mAOD and corresponding dam height of 22m is to be taken forward which does not have these issues and is likely to be more feasible.
Reduce the Gwash Glen transfer and release from Rutland	Likely to have significant ecological effects as option is located within a SPA/Ramsar/SSSI site.	The option has been rejected, as the required reduction in volume of water to be transferred from Gwash Glen is not considered viable

Option Name	Potential Effects	How Addressed in Options Development
Peterborough Water Reuse	Option is within 300m of Nene Washes SPA and Rutland Water SPA, goes through three SSSIs, and is within 500m of six more SSSIs. Likely to cause disturbance during construction from plant and the laying of pipelines and potential physical loss and/or damage to sensitive habitats or habitats used by qualifying bird species of Nene Washes and Rutland Water designated sites. New discharge points have the potential to cause hydrological and/or water quality changes and alterations to river levels and flows. This would impact on qualifying vegetation and fish species present in the system. Water flow changes could in turn affect sediment transport quantities into adjacent wetland habitats, such as fens and bogs, which are sensitive to siltation and hydrological changes, thereby indirectly affecting species reliant on these habitats.	Re-routing of the pipeline and the use of directional drilling has been included in the option to mitigate against some of the potential significant negative environmental effects identified by the environmental screening. The SEA, HRA and WFD consider the potential ecological and water quality/flow effects in more detail.
Felixstowe Sea Tankering	New pipeline infrastructure will cross Stour and Orwell SPA/Ramsar site with likely disturbance through construction activities to qualifying bird assemblages and potential direct effects on qualifying salt marsh habitat. Potential for non-native invasive species and disease transmission from international source of water.	As part of the INNS assessment, mitigation for the INNS risk has been applied to this option proposing that the water is treated to eradicate for INNS before it goes into storage before being pumped across to Alton WTW. Directional drilling can also be used to cross rivers and designated sites if re-routing is not possible. The SEA, HRA and WFD consider the potential ecological effects in more detail.

4 Stage A Scoping Summary

4.1 Introduction

4.1.1 The scoping stage of the SEA process sets the context and scope for the SEA and Environmental Report. During scoping key plans and programme are reviewed, baseline conditions, and key issues and opportunities are identified, and the SEA Framework is developed. The scoping stage for the WRMP was undertaken and a Scoping Report produced in April 2017. The Scoping Report was issued for five-week statutory consultation period to the three Consultation Bodies: Environment Agency, Natural England, and Historic England. The Reponses received and how these have been addressed are presented in full in Appendix D.

4.1.2 Key themes arising from the Scoping Report consultation include:

- **Plans and Programmes Review:**
  - Addition of further plans and programmes on heritage
- **Baseline:**
  - Add trends where possible
  - Location specific baseline information
  - Separation of designated and non-designated heritage assets
  - Updated WFD data
  - More information of water dependent ecological sites
- **Key Issues and Opportunities:**
  - Opportunities to contribute to the reduction of flood risk
  - Opportunities to enhance the historic environment
- **Alternatives:**
- – Assessment of alternative plan identified under scenario testing
- **Objectives:**
  - Alteration of the wording of the sub-objective “Avoid adverse impacts on habitats and species” to recognise the hierarchy of biodiversity designations.
  - Amendment to the wording of the “Protect best quality agricultural land” sub-objective so that it is consistent with wording used in relevant legislation and policy.
  - Addition of an objective specifically related to the protection and improvement of the WFD status.

4.1.3 This chapter summarises the results of the scoping stage.

4.2 Relationship with other Policies, Plans, and Programmes

4.2.1 A review of the policies, plans, and programmes relevant to the WRMP was undertaken as part of the SEA scoping process. The aim was to determine how the emerging WRMP may be affected by these external factors. Furthermore, the WRMP must aim to support current relevant policies, plans, programmes, and environmental protection legislation at international, national, and local levels. The WRMP must aim to support, and where possible, strengthen the objectives of other local plans and strategies within the Anglian Water region. A review of these documents is required to identify potential inconsistencies or constraints, and consistencies between these documents and the WRMP to inform the development of the SEA Framework. Figure 4 lists

current relevant policies, plans, and programmes which were considered during the SEA scoping stage and updated following scoping consultation. Appendix A presents the policies, plans, and programmes review.

4.3 Identification of Key Themes and Messages

4.3.1 The main themes, messages, and objectives from the policies, plans and programmes review that are considered relevant to the WRMP are presented below. These are as follows:

- Conserve flora and fauna and their habitats
- Conservation and wise use of wetlands and their resources
- Protection of wild birds and their habitats
- Halt overall biodiversity loss
- Creation of green infrastructure[25]
- Protection of landscape character and quality
- Improve water quality so all waters achieve 'good status' as set out in the Water Framework Directive
- Prevent or limit inputs of pollutants into groundwater
- Monitor and provide information to consumers on drinking water quality
- Promote efficient use of water
- Reduce and manage the risks of flooding
- Reduce greenhouse gas emissions
- Adapt to the impacts of climate change
- Increase resource efficiency and reduce natural resource use and waste
- Create a green economy and promote sustainable growth
- Promote sustainable and healthy communities[26]
- Promote social inclusion and community participation
- Protect the historic environment including archaeology and built heritage
- Protect best quality soils and agricultural land
- Support the Lawton recommendation[27] for statutory undertakers planning the management of water resources to:
  - Make space for water and wildlife along rivers and around wetlands
  - Restore natural processes in river catchments, including in ways that support climate change adaptation and mitigation
  - Accelerate the programme to reduce nutrient overload, particularly from diffuse pollution

[25] The European Commission defines green infrastructure as a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services such as water purification, air quality, space for recreation and climate mitigation and adaptation. This network of green (land) and blue (water) spaces can improve environmental conditions and therefore citizens' health and quality of life. It also supports a green economy, creates job opportunities, and enhances biodiversity. The Natura 2000 network constitutes the backbone of the EU green infrastructure. (Source: http://ec.europa.eu/environment/nature/ecosystems/index_en.htm)

[26] The UK Government definition of sustainable communities as outlined in the document 'Sustainable Communities: Homes for All' (ODPM, January 2005, page 74) is: "Sustainable communities are places where people want to live and work, now and in the future. They meet the diverse needs of existing and future residents, are sensitive to their environment, and contribute to a high quality of life. They are safe and inclusive, well planned, built and run, and offer equality of opportunity and good services for all".

[27] Lawton, 2010, Making Space for Nature, Recommendation 4, Page 73

4.3.2 The themes, messages and objectives identified from the policies, plans, and programmes review provided an input into the process of identifying key issues and opportunities and developing the SEA Framework.

Figure 4: Relevant Policies, Plans, Programmes, and Environmental Protection Legislation

International and European

- UN Framework Convention on Climate Change (1992)
- Kyoto Protocol on Climate Change (1997)
- Berne Convention on the Conservation of European Wildlife and Natural Habitats (1979)
- Bonn Convention on the Conservation of Migratory Species of Wild Animals (1979)
- Ramsar Convention on Wetlands of International Importance especially as Wildfowl Habitat (1971)
- Charter for the Protection and Management of Archaeological Heritage (1990)
- Convention for the Protection of Architectural Heritage of Europe (2009)
- EC Nitrates Directive (91/676/EC)
- EU Air Quality Directive (2008/50/EC)
- EU Strategy on Climate Change - Limiting Global Climate Change to 2 Degrees Celsius: The Way Ahead for 2020 & Beyond (2007)
- UNESCO World Heritage Convention
- The European Convention on the Protection of Archaeological Heritage
- Council Regulation No. 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel
- EU Biodiversity Strategy to 2020: Our life insurance, our natural capital (2011)
- EC Water Framework Directive (2000/60/EC)
- Council Directive concerning Urban Waste Water Treatment (91/271EEC)
- EC Drinking Water Directive (98/83/EC)
- EC Directive on Bathing Water (76/160/EEC); and Directive 2006/7/EC repealing Directive 76/160/EEC (from 2014)
- EC Freshwater Fish Directive (2006/44/EC)
- EC Groundwater Directive (2006/118/EC)
- EC Marine Strategy Framework Directive (2008/56/EEC)
- EU Directive 2007/60/EC on the Assessment and Management of Flood Risks
- EC Birds Directive formally known as Council Directive 2009/147/EC
- EC Habitats Directive formally known as the Council Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (92/43/EEC)
- The European Landscape Convention (2004)
- Mainstreaming Sustainable Development into EU Policies (2009) including Johannesburg Declaration on Sustainable Development (2002) and EU Sustainable Development Strategy (2006)

National

- National Planning Policy Framework and Planning Policy Guidance (2012)
- Draft National Policy Statement for Water Resources (2017)
- Securing the future – Delivering UK Sustainable Development Strategy (2005)
- Climate Change – UK Programme (2006)
- Future Water: The Government's Water Strategy for England (2008)
- UK Post-2010 Biodiversity Framework (2012)
- Making space for Nature (2010)
- Water White Paper (2012)
- Natural Environment White Paper (2014)
- Biodiversity 2020: A Strategy for England's Wildlife and Ecosystems (2011)
- Understanding the Risks, Empowering Communities, Building Resilience: The National Flood and Coastal Erosion Risk Management Strategy for England (2011)
- Creating a Great Place for Living: Defra's strategy to 2020 (2016)
- Planning (Listed Buildings & Conservation areas) Act 1990
- Marine and Coastal Areas Access Act 2009
- Wildlife and Countryside Act 1981
- The Conservation of Habitats and Species Regulations (2010) (amended 2011)
- Climate Change Act 2008
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003
- Groundwater Protection: Policy and Practice (GP3)
- The UK's shared framework for sustainable development (2005)
- Environmental Protection Act 1990
- The Countryside and Rights of Way (CROW) Act 2000
- The Natural Environment and Communities Act 2006 (NERC Act)
- Flood and Water Management Act 2010
- Creating a better place: Our ambition to 2020 (2016)
- Ancient Monuments & Archaeological Areas Act 1979
- Government Statement on the Historic Environment

International and European

Regional and Local

Environment Agency:

- Anglian Region River Basin Management Plan (2015)
- Grimsby and Ancholme CFMP (2009)
- River Witham CFMP (2009)
- Louth Coastal CFMP (2009)
- North Norfolk CFMP (2008)
- Broadland Rivers CFMP (2008)
- East Suffolk CFMP (2008)
- River Nene CFMP (2009)
- Great Ouse CFMP (2010)
- River Welland CFMP (2009)
- North Essex CFMP (2008)
- South Essex CFMP (2008)
- River Tees CFMP (2009)
- East Suffolk CFMP (2009)
- South Essex CFMP (2009)
- The Grimsby, Ancholme, and Louth CAMS (2013)
- The Nene CAMS (2013)
- The Steeping, Great Eau and Long Eau CAMS (Feb 2013)
- The Welland CAMS (2013)
- The Witham CAMS (February 2013)
- Broadland Abstraction Licensing Strategy (February 2013)
- Essex Abstraction Licensing Strategy (February 2013)
- North Norfolk Abstraction Licensing Strategy (February 2013)
- Cam and Ely Ouse Abstraction Licensing Strategy (March 2013)
- The North-West Norfolk Abstraction Licensing Strategy (March 2013)
- East Suffolk Abstraction Licensing Strategy (February 2013)
- Tees Abstraction Licensing Strategy (February 2013)
- Idle and Torne Abstraction Licensing Strategy (February 2013)

Anglian Water:

- Anglian Water Biodiversity Strategy (April 2016)
- Hartlepool Water: Our Biodiversity Priorities (May 2014)
- Love Every Drop
- Our Plan 2015 – 2020

Local Authorities:

- There are 65 Local Authorities within the Anglian Water region. The Local Development Framework for each Local Authority has been reviewed

AONB Management Plans:

- Norfolk Coast Management Plan 2014 - 2019
- Suffolk Coast and Heaths Management Plan 2013 - 2018
- Dedham Vale AONB and Stour Valley Management Plan 2016 - 2021
- Lincolnshire Wolds Management Plan 2013 - 2018
- The Chilterns Management Plan 2014 - 2019

4.4 Baseline Scoping Summary

4.4.1 A high-level review of the current baseline information for the environment and socio-economics for the Anglian Water WRMP area was undertaken as part of the scoping process. The baseline was collected from published sources as referenced in the text and was updated following the scoping consultation process. The baseline information formed an evidence base against which environmental issues and opportunities resulting from the WRMP were predicted and assessed. The complete baseline information is presented in Appendix B under the SEA Directive topics:

- Biodiversity, Flora, and Fauna
- Water
- Soil
- Air
- Climatic Factors
- Population and Human Health
- Historic Environment[28] and Landscape

4.4.2 The Anglian Water WRMP covers a large geographical area and as mentioned above a high-level review of conditions was undertaken at the scoping stage. Following scoping, the feasible list of options was defined, and option location-specific baseline information was gathered. Due to the number of options and scale of the area covered, the baseline was reviewed using a GIS tool (see Section 5.2 for further details).

4.4.3 The baseline information for each of the SEA Directive topics is summarised below:

- **Biodiversity, Flora, and Fauna** – The Anglian region has a rich and diverse natural environment which is reflected in many of the designated sites of national and international importance contained in the region[29]. In the Anglian Water region, there are 33 Special Areas of Conservation (SAC) and 27 Special Protection Areas (SPA)[30]. A map showing the designated sites is presented in Figure 5. A separate Habitats Regulations Assessment (HRA) has been undertaken for the WRMP to identify potential effects on these sites. There are also 741 Sites of Special Scientific Interest (SSSIs) in the Anglian Water region designated for their geology, biodiversity, or habitat quality[31]. Anglian Water has responsibility for 47 SSSIs across the region, covering nearly 3,000 hectares of land, which they have a legal duty to maintain in 'favourable condition'. A number of these SSSI are given additional protection at the European or international level because they are also designated as SAC, SPA, or Ramsar sites. The Anglian Water region also contains a number of internationally important wetland sites and other water dependent habitats, such as SPA and Ramsar sites, which are vulnerable to future reduced availability and water quality. There are many habitats and species of principal importance found on operational Anglian Water sites which Anglian Water has a duty to regard the conversation of when exercising its function. These may be designated Local Wildlife Sites (LWS), 72 of which Anglian Water fully or partially own and are actively managing[32]. There are also a number of invasive non-native species (INNS), as highlighted in the Anglian Water Biodiversity

[28] Historic environment covers the SEA Directive topic cultural heritage including architectural and archaeological heritage

[29] East of England Biodiversity Forum, East of England Biodiversity Audit 2002, Page 16

[30] Designated site numbers obtained from Anglian Water Ltd (2017)

[31] Designated site numbers obtained from Anglian Water Ltd (2017)

[32] LWS information obtained from Anglian Water (2017). It should be noted that Anglian Water are currently undertaking LWS assessments and therefore, the number of priority LWS may increase

Strategy[33], that cause particular concern for Anglian Water in terms of social, environmental, or economic impacts.

- **Water** – The Anglian Water region is the most water stressed in England and has the lowest precipitation[34]. This coupled with planned growth, increased water demand and climate change will place extra pressure on its already limited resources. The number of nationally and internationally important wetland and other water-dependent habitats further make the management of water resources particularly important. The Anglian river basin district covers 27,900km^2 and extends from Lincolnshire in the north to Essex in the south and from Northamptonshire in the west to the east Anglian coast[35]. The Anglian River Basin Management Plan (RBMP) states that 'there are 11 management catchments that make up the river basin district, which include many interconnected rivers, lakes, groundwater and coastal waters'. According to the RBMP there are several water management issues in the river basin including: physical modification; pollution from waste water; pollution from town, cities, and transport; changes to the natural flow and level of water; negative effects of INNS; and pollution from rural areas. The WFD indicator of the health of the water environment is whether a water body is at good status or potential for ecological, chemical and groundwater. The prevention of the deterioration of WFD status is a key challenge for Anglian Water. Low flows associated with droughts and climate change can impact abstractions and cause flow changes in rivers that can affect WFD objectives. There is a need to protect and improve WFD status, including groundwater qualitative and quantitative status to support WFD objectives and targets. A separate WFD assessment has been undertaken for the WRMP and its options[36].
- **Soil** – The Anglian region predominately consists of agricultural land, 70% (2.1 million ha) was farmed in 2009 with 1.6 million ha used for crops and horticulture[37]. Much of the soil is derived from silt and peat deposits, providing highly fertile soils, and resulting in some of the best and versatile agricultural land in England. Agriculture is an important activity in the region not only for land use, but also for the economy where cereals, rapeseed and potatoes make up the majority of the arable crops grown. In addition, the region is also estimated to contain 5,700 ha of brownfield and contaminated land which is derelict, vacant or is in use with the potential for redevelopment[38].
- **Air** – Air quality in the region is generally good, although there are up to 38 declared Air Quality Management Areas (AWMAs). Motor vehicles, particularly on heavily trafficked roads, are the main source of air emissions. However, agriculture also contributes to the local air quality, as a result of housed livestock and the spreading of slurries and manures. Trends in annual average emissions of nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and particulate matter (PM_{10}) show the East of England is on track to meet the UK Air Quality Strategy Targets.
- **Climatic Factors** – The region produced 60,000 kilo tonnes of carbon dioxide (CO_2) in 2008, contributing to 14% of England's total emissions (414,000 KtCO_2)[39]. Almost 50% of the local CO_2 emissions in 2008 was from industrial and commercial sectors, and on average each person in the region was responsible for 9.7 tonnes of CO_2 which is 1.5 tonnes higher than the national average. Approximately 20% of the region is in areas designated as flood zones with 400,000 properties and 30% of the most productive agricultural land at risk. Climate

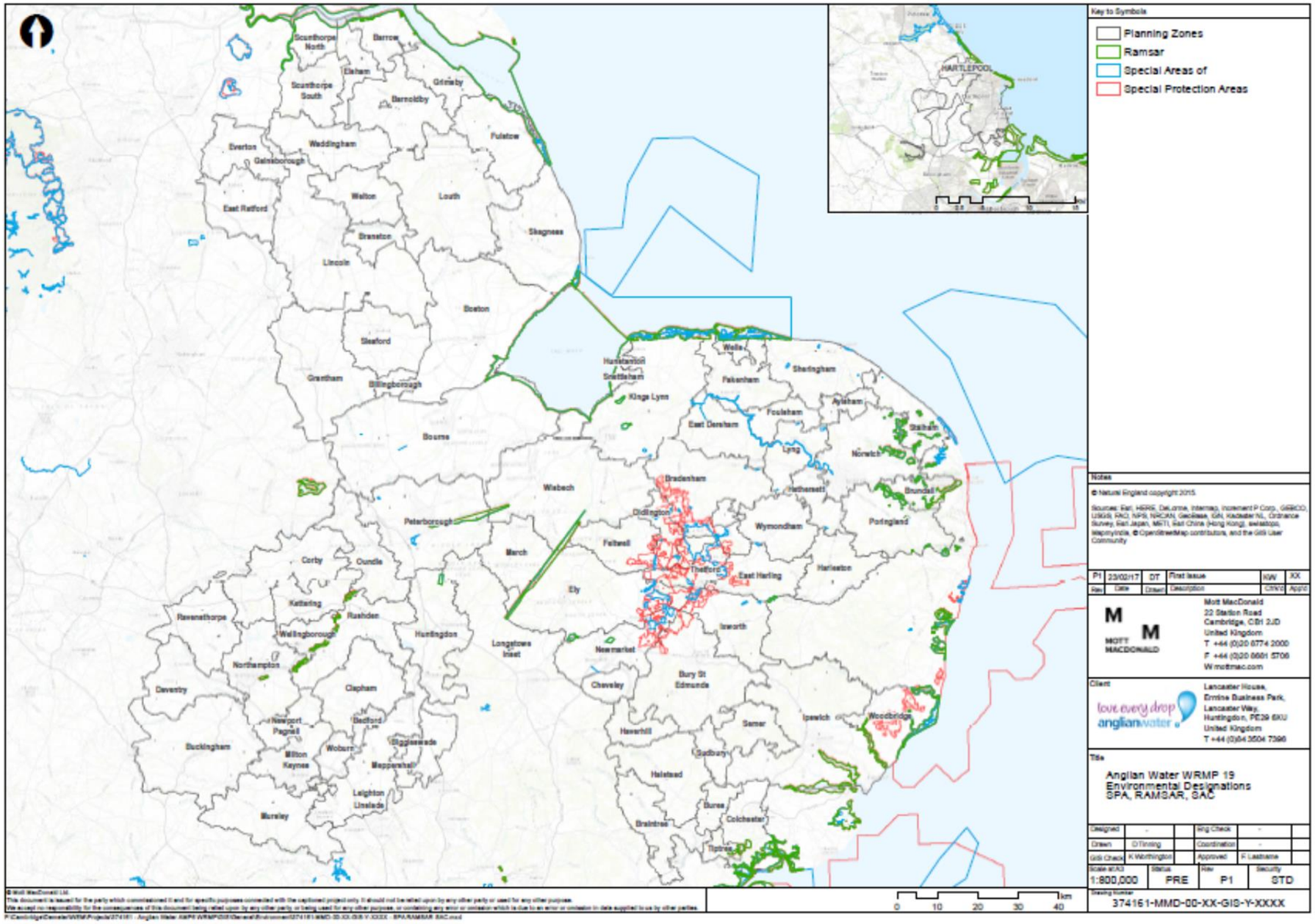
[33] Anglian Water, 2016 'Biodiversity Strategy'
[34] Anglian Water, Our Company
[35] Defra, EA, December 2015 'Part 1: Anglian river basin district river basin management plan', Page 9
[36] AMEC, 2017 'WRMP 2019 WFD Screening Assessment'
[37] Environment Agency, State of the Environment – Agriculture and Land Management, Page 1
[38] National Land use database, 2010. NLUD 2008 Mixed Vintage Dataset
[39] AEA for DECC, 2010. Index to Local Authority CO_2 emissions dataset - full dataset National Statistics

change, alongside inappropriate development of flood plains, is likely to increase the number of properties at risk in the future. The UK Climate Change Projections 2009 (UKCCP09) medium emissions scenario for 2080 estimates the average summer temperature for the east of England will increase by 3.6°C. Average annual rainfall is estimated to remain consistent, but it is expected to rain significantly more in winter (17%) with much drier summers (23% less rainfall in the southern areas). This is representative of almost all the administrative areas of the Anglian region, predicting wetter winters and warmer, drier summers.

- **Population and Human Health** – The Anglian Water region has an approximate population of 7.1 million people[40] and is amongst one of the fastest growing populations in the United Kingdom. Although a significant proportion of this growth can be attributed to natural increases, most is a result of migration into the region from the UK and overseas which has been driven by the region's proximity to London. The population is projected to grow by approximately 17% by 2028, an increase of some 900,000 residents. Life expectancy for both men and women in the East of England is higher than in England as a whole. The Index of Multiple Deprivation (IMD) allows the identification of small pockets of deprivation down to small geography areas known as Lower Super Output Areas (LSOAs). The scoring shows that 0.8% of Anglian LOSAs are classed as 'most deprived', which is approximately 45,000 people or 0.7% of the population.

[40] Defra, EA, December 2015 'Part 1: Anglian river basin district river basin management plan', Page 9

Figure 5: European Designated Sites (Special Areas of Conservation, Special Protection Areas, Ramsar Sites)



Source: Mott MacDonald, 2017

4.5 Future Baseline

4.5.1 The SEA Directive requires that 'the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the Plan or Programme' is identified. Prediction of future trends is difficult because they depend on a wide range of global, national, and regional factors and decision-making.

4.5.2 From an initial review of the baseline it is likely that the following trends will continue:

- **Biodiversity, Flora, and Fauna** – habitats and species are likely to continue to be protected through European and UK legislation. The European Habitats and Birds Directive, which is implemented in the UK through the 'Habitats Regulations', provides a high level of protection to a network of water-dependent special areas of conservation. Thus, protecting the quantity and quality of water in these important water dependent habitats will continue to attract the focus of policymakers. 'Making Space for Nature'[41] states that 'declines in wildlife are a global problem: the world has failed to meet its commitment to achieve a significant reduction in the rate of global biodiversity loss by 2010. England's wildlife habitats have become increasingly fragmented and isolated, leading to declines in the provision of some ecosystem services, and losses to species populations'. Lawton recognises that future climate change, demographic change, economic growth, new technologies, societal preferences and changes in policy and regulatory environments may all have profound consequences.
- **Water** – water quality is likely to continue to be maintained and improved through legislation such as the WFD. The region is a water-stressed area and localised over-abstraction from ground and surface waters, coupled with high water use, puts added pressure on some of the region's water resources and water dependent environments. Furthermore, the water quality standards of the WFD combined with population increase and planned growth, could involve more wastewater treatment using energy intensive processes. This could increase the water industry's CO_2 emissions contributing to further change in climate.
- **Soil** – climate change may cause a rise in temperatures and a reduction in summer rainfall, which could increase the likelihood of drought conditions, putting pressure on soils. In addition, there will be an increasing demand for water in agriculture, and climate change is likely to result in increasing summer demand for irrigation water of up to 25% in the Anglian region.
- **Air** – air quality will continue to be protected through national and European legislation and targets. However, future development and growth will continue to affect air quality through transport and industry.
- **Climatic Factors** – climate change may result in reduced summer rainfall and low river flows. These climate conditions, combined with localised over abstraction, could further concentrate pollutants in water and impact water quality. Climate change may also result in increased frequency and severity of extreme weather events causing or exacerbating future droughts and floods.
- **Population and Human Health** – more frequent droughts or floods may limit the regions access to water. In addition, more challenging environmental standards have led, and may continue to lead, to an increase in the water set aside for the environment. This will decrease the quantity of water available for consumptive use. The region has a fast-growing population which is largely attributed to high levels of migration. Population in the Anglian region is projected to grow by 17% by 2028. Life expectancy is also higher than the national

[41] Lawton, September 2010 'Making Space for Nature: A review of England's Wildlife Sites and Ecological Network', Page V and IV

average and numbers of elderly residents are likely to increase. These increases in population will increase demand for water and put pressure on water resources.

- **Landscape and the Historic Environment** – landscapes are constantly evolving and changing. Future development may put pressure on green belt. The historic environment is likely to continue to be preserved through legislation and the planning process.

4.6 Key Issues, Opportunities, and Scoping

4.6.1 A key stage in the scoping process was to decide what topics were relevant for the Anglian Water WRMP SEA and what topics (if any) should be scoped out. It was considered that all the SEA Directive topics were relevant to the WRMP and therefore they were all scoped in, as presented in Table 6, which also provides an overview of the key issues and opportunities relevant to each SEA Directive topic.

4.6.2 Topics were scoped in based on the baseline situation and the potential for the WRMP to impact them. This was assessed by reviewing baseline conditions and current environmental issues for the Anglian Water region and assessing the likelihood of a potential impact.

4.6.3 Key issues and opportunities were identified for each of the different water resource supply option types (as described in section 2.4) proposed for WRMP (see Appendix C).

Transboundary Effects

4.6.4 The WRMP could have transboundary effects, as described below. Justification for scoping in or out transboundary effects is also provided below.

- Tankering of water from other catchments (outside the Anglian Water region) and countries – tankering was included in the high-level screening but was not taken forward into the EBSD modelling, and therefore, wasn't considered further.
- Options that include pipelines, intakes, or other infrastructure outside the Anglian Water region – the whole length of pipelines, and source intakes have been included in the assessment.
- Effects on qualifying species of designated sites outside the Anglian Water region – the HRA includes designated sites outside the Anglian Water region where there is potential for effects on qualifying species such as birds.
- Effects on water quality and fisheries, effects of brine discharge and marine infrastructure on the sea – these effects are mainly associated with desalination plants and have been included in the assessments.
- Climate change effects – effects of climate change on the options and effects of the options on climate change have been included. Generation of carbon from each option has been assessed.

Table 6: Key Issues and Opportunities

SEA Topic	Scoped In	Scoped Out	Evidence and Issues	Implications and Opportunities
Air Quality	✓[42]		In general, air quality in the region is good. However, there are some declared Air Quality Management Areas (AQMAs). Air pollution sources include road transport, agriculture, and industry.	Air pollutants could be generated from treatment plants. There may be temporary construction effects from proposed WRMP options. However, it is assumed that these would be mitigated through best site practice and a Construction Environmental Management Plan (CEMP).
Water	✓		Diffuse pollution, point source pollution and physical modification are the most common reasons for the region's surface waters not to meet 'good' status. Prevention of deterioration in WFD status is a big challenge facing Anglian Water.	Implementation of options in the WRMP can affect water quality. The WRMP should avoid measures which may negatively impact water quality and identify opportunities to reduce known pressures on water quality and ecology, for example by alleviation of low flows. Consideration of WFD during the selection of options will help to reject options that could lead to WFD deterioration. Opportunities to enhance WFD status should also be considered. The WFD assessment will include prevention of deterioration of both surface and groundwater qualitative and quantitative status.
			Large areas of the region are at or below sea level and 20% of the region is within the flood zone. 30% of the most productive agricultural land is also within the flood zone. Over 400,000 properties are at risk of flooding from either rivers or the sea. This is approximately 11% of the total properties in the region. Water and wastewater treatment works, and pumping stations are particularly at risk, since they tend to be located near rivers.	WRMP options should be located away from high flood risk areas and where appropriate, should include flood protection in their design.
Climatic Factors	✓		The region is predicted to have hotter, drier summers and wetter, warmer winters. This may lead to summer droughts, a reduction in natural river flows during late summer and early autumn, more properties at risk of river or coastal flooding, and, important habitats declining due to changes in weather and temperature conditions. Sea levels are projected to rise as a result of climate change. The Anglian region contributes approximately 14% of England's total CO_2 emissions.	As much of the region is flat and low-lying Anglian Water have to pump more water than other companies. This uses a large amount of energy. Therefore, options located further away from where the water is needed will incur more pumping costs and use of energy. Climate change may lead to future periods of drought conditions and scarcity of water. This should be taken account of in the development of options and in the options assessment process. Anglian Water has business goals in relation to climate change and carbon: 'To deliver a 70% reduction in capital (embodied)carbon by 2030 from a 2010 baseline', 'To deliver a 7% reduction in real terms in gross operational carbon by 2020 from a 2015 baseline', 'Lead and champion the effective management of the impact of growth and climate change'. The WRMP and the options proposed should help deliver these goals through design and efficiency.

[42] Air Quality has been scoped in but will be included under the community amenity objective in regard to dust and air pollution nuisance. However, it is anticipated that this will be managed through adherence to a CEMP. The greenhouse gas emissions objective covers emission releases to the atmosphere, however, only carbon emissions data is available for the assessment.

SEA Topic	Scoped In	Scoped Out	Evidence and Issues	Implications and Opportunities
Soil	✓		Over 70% of the land in the Anglian region was farmed in 2009, the majority for crops and horticulture. Over 90% of land the in the region is classified as Nitrate Vulnerable Zones. Over 40% of the Country's most productive agricultural land (grade 1 and 2) is in the Anglian region.	The WRMP has the potential to impact agricultural land through the options proposed (for example a new reservoir has the potential to could loss of agricultural land). Options could negatively affect agricultural land through actual loss of land for options, or through reduction in water available for irrigation. When choosing options this should be taken into account. There are also opportunities to benefit agricultural land from new options to increase raw water storage and supply.
Biodiversity, Fauna, and Flora	✓		The Anglian region is rich in flora and fauna. It contains several SPA, SAC, SSSI, NNR, LNR and RIGS. These are also important for tourism. The region supports large proportions of England's wetland and coastal habitats including reedbeds, grazing marshes and inter-tidal mudflats. 60% of the Anglian rivers fail the 2015 target of 'Good' status for fish under the Water Framework Directive. Wildlife habitat such as woodlands and wetlands can help keep water clean by removing sediment and other contaminants and can slow its movement through the catchment to prevent flooding. Approximately 10-15% of invasive non-native species in the UK cause significant social, environmental, or economic impacts. Species of particular concern for Anglian Water include: Zebra mussel and Quagga mussel, Killer Shrimp, Japanese Knotweed, Himalayan balsam, and Giant hogweed.	Works carried out as a result of the WRMP, e.g. options involving construction, have the potential to cause loss of habitat or damage designated and non-designated sites. This could lead to fragmentation and isolation of remaining habitat patches which reduces species' ability to move in the landscape and increases threat of local extinction. Therefore, the locations for such options should be carefully considered There is potential risk of the spread of invasive non-native species (INNS) as a result of options included within the WRMP. An INNS risk assessment will be undertaken. Options implemented as part of the WRMP also have the potential to cause pollution to surface and groundwaters which may have effects on wildlife. Wetland and marsh habitat rely on water, the WRMP should ensure that it does not affect these areas through over abstraction and should look for opportunities to reduce abstraction pressure where cost effective and possible. This would support the Restoring Sustainable Abstraction (RSA) Programme which aims to identify over abstraction in rivers and wetland sites and where possible, correct this. Use of wetlands can provide a natural filtration system for removing contaminants from water reducing the needs for mechanical/chemical treatment. There is an opportunity within the WRMP to implement options which also benefit the natural environment e.g. habitat creation or enhancement, connectivity of ecological networks to increase species resilience, vegetation to slow the movement of water thus keeping more water within the catchment and available for use, and vegetation to slow run-off to reduce flood risk. WRMP should consider the impact of measures on geomorphology, particularly river bank and channel processes, and should maximise opportunities to reduce pressures on natural processes that affect biodiversity and habitats. The HRA will consider effects on European Designated sites.
Landscape	✓		There are several important landscape areas in the region (e.g. The Chilterns, The Broads) including designated landscapes (AONB and National Parks), and landscape character areas. Large parts of the region are typically flat and low-lying and approximately a quarter of the land is below sea level.	Works carried out as a result of the WRMP e.g. options involving construction have the potential to affect visual amenity and character of a landscape area. However, the WRMP also has an opportunity to implement options that may enhance landscape (for example, through planting strategies, choice of materials and colours, and habitat creation).

SEA Topic	Scoped In	Scoped Out	Evidence and Issues	Implications and Opportunities
Historic Environment	✓		The region has a rich heritage and contains many listed buildings, conservation areas, historic parks and gardens and heritage coast. These areas are also important for tourism.	Works carried out as a result of the WRMP e.g. options involving construction have the potential to damage the fabric of a heritage assets or affect its setting. Options could cause loss or erosion of landscape/seascape/townscape character or quality which could have direct or indirect effects on the historic environment and/or people's enjoyment of it. When considering WRMP options location and effects on heritage assets should be considered and adverse effects minimised. There is also potential for unknown archaeology which could be uncovered during infrastructure works. Traffic, noise, and air quality can all affect the historic environment and WRMP options could increase effects especially during construction works. There is the opportunity for conserving and enhancing designated and non-designated heritage assets through enhancing their setting. Where assets are close to new water supply options, improved accessibility and information signs could be included as part of options.
Population	✓		Approximately 7.1 million people were living in the Anglian region and this is projected to increase. Future growth will put further pressure on already stretched environmental resources and infrastructure.	Projected population growth in the region will have implications for the WRMP and increase demand and pressure on water resources. The WRMP needs to balance meeting this increased demand with encouraging sustainable use of water resources. The WRMP should aim to ensure security of water supply while encouraging and supporting Anglian Water customers use water more efficiently. Delivery of the WRMP may also present opportunities to work with local supply chain and implement training programmes that enhance the skills of the workforce.
Human Health	✓		0.8 % of Anglian lower super output areas (LSOAs) (30 out of 3955) are classed as 'most deprived', equivalent to approximately 45,000 people or 0.7% of the population. However, the majority of local LSOAs are within the five lowest bands of deprivation, and South Northamptonshire and South Cambridgeshire are the least deprived. Access to greenspace can improve health and well-being for local communities.	WRMP options involving construction may cause temporary dust and noise nuisance. Water bodies e.g. rivers, reservoirs etc. are used both for water-based recreation and nature trails. The WRMP should aim to reduce any negative effects on existing recreational areas and maximise opportunities to enhance or create recreational opportunities and green space for communities. This would support the Defra guiding principles to connect communities to the local environment. Development and delivery of the WRMP may also present opportunities to work and engage with local communities supporting the Defra guiding principles to engage with communities.
Material Assets	✓		Anglian Water operate 1,257 water and wastewater treatment works. Anglian Water has 112,833 km of water and wastewater pipes supplying and transporting water across an area of 27,500 square km.	The WRMP should consider the resource demands of water resource measures in terms of energy use, material use, and waste generation. WRMP options involving construction of water resource infrastructure may generate waste material during construction and operation. The WRMP should seek to minimise waste generated and reuse and recycle material where possible. Anglian Water has a business goal of 'Zero waste. Get it right first time, every time''. WRMP options should aim to reduce waste associated with construction and operation.

4.7 SEA Framework

4.7.1 A key stage in the SEA scoping process was the development of the SEA Framework which includes objectives and indicators that were used in Stage B (the assessment stage) to appraise the WRMP options and preferred programme.

4.7.2 Table 7 presents the SEA Framework development process. It demonstrates how the proposed WRMP SEA objectives have been developed to reflect and support the Anglian Water outcomes for customers and the environment, Defra's Guiding Principles, and Defra's Strategy to 2020 'Creating a great place for living'.

4.7.3 Table 8 presents the proposed SEA Framework including the WRMP SEA objectives, sub-objectives, and indicators that will form the assessment framework for the options and WRMP assessment. It also includes monitoring that could be implemented by Anglian Water if the assessment identifies negative effects or uncertainty over effects. Receptors considered as part of the high-level environmental screening process are also listed.

4.7.4 It should be noted that the specific monitoring proposals and indicators chosen will depend on the results of the assessment. Monitoring should be focused where the potential for negative effects or uncertainty over effects is identified (see Section 7.1 for monitoring proposals).

Table 7: SEA Framework Development

Anglian Water Outcomes for Customers and the Environment	'Creating a great place for living' Defra strategy to 2020 (Aims)	Defra's Guiding Principles for water resource planning (May 2016)	Anglian Water WRMP SEA Objectives	Anglian Water WRMP SEA Sub-Objectives
Safe, Clean Water Drinking water is safe, clean, and acceptable. A good outcome will be… Customers are confident that their water is always clean and safe to drink and use. Water sources are used wisely and protected properly, and all legal requirements are met.	Cleaner water and sustainable usage	Contribute to delivering a healthier water environment, more resilient to pollution	**Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers**	• Protect and use water sources wisely • Ensure water is always clean and safe to drink • Protect and enhance water quality of surface water and groundwater bodies • Contribute to the achievement of WFD and RBMP objectives (no deterioration)
Resilient Services Our services cope with the effect of disruptive events, in particular increasingly severe weather events. We plan ahead for the impacts of our changing climate. A good outcome will be… Our business understands and is prepared for the impact of extreme natural and man-made hazards. Such hazards do not cause customers to suffer interruptions to water supply or disposal of sewage. Customers understand the risks from disruptive events. We use the best available science to understand, successfully plan for and adapt to a changing climate. We monitor the impacts of these changes on our assets and processes and consider their impacts on all investments and decision making. We set an example to others in the region on adapting to our changing climate.	Enhanced resilience of businesses and individuals to drought and loss of water supply UK better protected against flooding and coastal erosion	Deliver secure, reliable, sustainable, and affordable supplies of water Meeting the challenges of climate change Contribute to delivering a healthier water environment, more resilient to drought	**Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards**	• Provide a resilient water supply for current and future customers • Plan for and adapt to the impacts of extreme natural and man-made hazards, including climate change and drought • Protect and enhance the resilience of the water environment

Anglian Water Outcomes for Customers and the Environment	'Creating a great place for living' Defra strategy to 2020 (Aims)	Defra's Guiding Principles for water resource planning (May 2016)	Anglian Water WRMP SEA Objectives	Anglian Water WRMP SEA Sub-Objectives
Supply Meets Demand Manage and meet the growth in demand for sustainable and reliable water and wastewater services. A good outcome will be… Prudent investment in reliable, affordable, and sustainable supplies that are flexible enough to cope with uncertain demands. Manage changing demand on our water and wastewater systems from new and existing customers, as well as meeting demand and enabling economic growth with additional supply. The level of leakage is acceptable to customers.	Greater resilience to climate change	Deliver secure, reliable, sustainable, and affordable supplies of water Secure the long-term resilience of the water sector Meet the needs of a growing population and economy Promote efficient water use and reduce leakage Achieve a reduction in per capita consumption	**Deliver reliable and sustainable water supply that is flexible to cope with changing growth in demand and enable economic growth**[43]	• Ensure supplies are flexible to cope with uncertain and changing demand • Manage and meet growth in demand • Provide a reliable and sustainable water supply that meets changing demands • Educate customers on the value of water • Encourage and facilitate a reduction in water consumption
Flourishing Environment A flourishing environment, for nature and for everyone. A good outcome will be… The environment in our region flourishes. Rivers, lakes, aquifers, and coastal waters support a rich biodiversity, contribute to a growing economy, and provide a valuable amenity for families and communities. There is joined up, effective and collaborative management of the water cycle in our catchments (an area drained by a river) from source to tap and back to the environment. Our activities are sensitive to environmental needs, and risks and adverse impacts are avoided. People, businesses, water- and land-users in our region are engaged in the challenges of maintaining a sustainable environment. All legal requirements are met.	Increased biodiversity, improved habitat and expanded woodland areas Productive land and soils Conserved and enhanced landscapes Maintained protection of designated sites UK better protected against invasive non-native species	Water companies to play an active role as stewards of water resources and leaders of the natural environment Valuing the environment in decision making New and innovative opportunities for investment in natural assets Contribute to local environmental improvement	**Protect and enhance ecological diversity and networks**	• Avoid impacts to biodiversity, recognising the hierarchy of site designations from international to local importance • Enhance the ecological value of areas through habitat creation or restoration/enhancement of existing habitat • Reduce risk of non-native species transfer • Increase connectivity and resilience of ecological networks • Promote provision of green infrastructure • Support water dependant ecosystems • Contribute to the achievement of WFD objectives to support ecological enhancement

[43] This objective will not be assessed as part of the individual options assessments. Instead it will be assessed as part of the WRMP assessment because it depends on the plan-wide strategy rather than the option level

Anglian Water Outcomes for Customers and the Environment	'Creating a great place for living' Defra strategy to 2020 (Aims)	Defra's Guiding Principles for water resource planning (May 2016)	Anglian Water WRMP SEA Objectives	Anglian Water WRMP SEA Sub-Objectives
A Smaller Footprint Leading by example on reducing emissions and conserving the world's natural resources. A good outcome will be… We lead by example on mitigating climate change and protecting natural resources. Decarbonisation and resource efficiency are central to investment and operational decisions. We continue to reduce energy consumption and carbon emissions related to water production, consumption, and disposal. Water footprinting is established as a social and business norm and drives down usage.	Cleaner air Reduced waste and waste crime	Carbon costing of options	**Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making**	• Reduce greenhouse gas generation from operations including transport • Reduce energy consumption and carbon emissions • Use renewable energy sources and technologies • Assets designed to deliver a reduction in capital (embodied) carbon • Assets designed to contribute to reducing operational carbon emissions by 7% in real terms by 2020 from 2010 baseline • Design zero waste options • Reduce use of raw materials in favour of recycled materials and materials with recycled content • Maximise capacity and efficiency of existing water infrastructure
Caring for Communities Working responsibly with and for your community. A good outcome will be… An inclusive and accessible service, sensitive to the needs of individual customers. Our infrastructure underpins and contributes to a successful regional economy. Our operations do not unduly disturb the community. Our water parks and nature reserves provide valued recreational benefits. Our sites are maintained to ensure the health and safety of visitors and our employees. The next generation has a real personal belief in the value of water.	Greater local control of decisions affecting rural areas Faster growth in productivity and living standards in rural areas in England Rural areas are fully connected to the wider economy A highly skilled rural workforce Strong conditions for rural business growth Living and working in rural areas made easier A sustainable fisheries industry Greater enjoyment of the natural environment Productive land and soils Conserved and enhanced landscapes	Connect communities to their local environment Meaningful engagement with customers Collaboration with businesses	**Protect community amenity through ensuring operations do not cause undue nuisance for local communities**	• To be a responsible neighbour ensuring operations do not cause undue disturbance from noise, dust, air pollution, light, visual, and transport • Actively engage and work with local communities to foster an inclusive environment and participation in decision making
			Contribute to the local economy and economic growth	• Create links with local community groups, schools, and universities • Use local labour and suppliers • Create assets that provide a valuable amenity for communities and tourism
			Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves	• Increase access to and enjoyment of the natural environment • Provide valuable community resources • Encourage active lifestyles
			Protect and enhance landscape character and land quality	• Enhance landscape quality and character including tranquillity and views • Protect best and most versatile agricultural land • Protect and enhance geological sites and geo-diversity

Anglian Water Outcomes for Customers and the Environment	'Creating a great place for living' Defra strategy to 2020 (Aims)	Defra's Guiding Principles for water resource planning (May 2016)	Anglian Water WRMP SEA Objectives	Anglian Water WRMP SEA Sub-Objectives
			Protect and enhance the historic environment and cultural diversity of the region	• Protect the fabric of historic assets • Enhance the setting of historic assets • Contribute to the heritage and cultural identity of the region

Table 8: Proposed SEA Framework

Anglian Water WRMP SEA Objectives	Anglian Water WRMP SEA Sub-Objectives	Key Receptors / Designations / Issues	Indicators	Monitoring	High Level Environmental Screening Criteria
Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers	Protect and use water sources wisely Ensure water is always clean and safe to drink Protect and enhance water quality of surface water and groundwater bodies Contribute to the achievement of WFD objectives (no deterioration)	River water quality, Bathing waters, WFD objectives, Shellfish waters, disease transmission	Ecological status of water bodies Chemical status of water bodies Number of pollution incidents during construction of WRMP options Drinking water quality / contamination incidents Achievements against WFD objectives	Water quality monitoring Pollution incident monitoring Drinking water contamination monitoring	Water: RBMP river water quality, shellfish waters, bathing water, WFD objectives
Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards	Provide a resilient water supply for current and future customers Plan for and adapt to the impacts of extreme natural and man-made hazards, including climate change and drought Protect and enhance the resilience of the water environment	Effects of climate change / resilience – flood risk, temperatures extremes, storms and gales, drought	Number of supply disruptions per annum Number of WRMP options and proportion of new deployable output designed to take future climate change effects into account Number of WRMP options involving adaptation measures such as flood storage, drought resilience planting etc.	Customer water supply disruption monitoring Monitoring option design for inclusion of climate change effects on water demand and availability and adaptation measures	-
Deliver reliable and sustainable water supply that is flexible to cope with changing growth in demand and enable economic growth[44]	Ensure supplies are flexible to cope with uncertain and changing demand Manage and meet growth in demand Provide a reliable and sustainable water supply that meets changing demands Educate customers on the value of water Encourage and facilitate a reduction in water consumption	Population growth, business growth, Multiple users, water supply resilience/reliability, leakage reduction, education, metering, water efficiency	% of people with deficits in 2045	2024 deficit forecasting	-

[44] This objective will not be assessed as part of the individual options assessments. Instead it will be assessed as part of the WRMP cumulative assessment because it depends on the plan-wide strategy rather than the option level

Anglian Water WRMP SEA Objectives	Anglian Water WRMP SEA Sub-Objectives	Key Receptors / Designations / Issues	Indicators	Monitoring	High Level Environmental Screening Criteria
Strive to become leaders of the natural environment through enhancement of ecological diversity and networks	Avoid impacts to biodiversity, recognising the hierarchy of site designations from international to local importance Enhance ecological value of areas through habitat creation or restoration/enhancement of existing habitat Reduce risk of non-native species transfer Increase connectivity and resilience of ecological networks Promote provision of green infrastructure Support water dependant ecosystems Contribute to the achievement of WFD objectives to support ecological enhancement	SAC, SPA, Ramsar sites, SSSI, NNR, LNR, priority habitats and species of Principal Importance under NERC Act, protected species, MPA/MCZ, invasive non-native species, freshwater and marine fisheries, WFD objectives, river flows	% of habitat creation or existing habitat enhancement Area (hectares) and number of statutory and non-statutory ecological sites that will be harmed or lost to WRMP options Area of both blue and green infrastructure created River flow levels Invasive non-native species transfer Achievement of WFD objectives	River flow level monitoring Water quality monitoring Invasive non-native species transfer monitoring Option design monitoring – habitat creation and/or enhancement, habitat loss, consultation with Natural England (design and EIA monitoring)	Ecology: SAC, SPA, Ramsar site, SSSI, NNR, MPA/MCZ
Protect and enhance landscape character and land quality	Enhance landscape quality and character including tranquillity and views Protect best and most versatile agricultural land Increase access and enjoyment of the countryside Protect and enhance geological sites and geo-diversity	AONB, NCA, LCA, Woodland, National Parks, Agricultural land, contaminated land, RIGS, geological SSSIs	Number of WRMP options located within designated landscape areas Number of WRMP options including additional landscaping. Area of agricultural land (by grade) lost due to the need for water resource options/infrastructure Number of geological sites affected	Option design monitoring – inclusion of landscaping, agricultural land loss, geological site disturbance (design and EIA monitoring)	Landscape: AONB, national character areas, national parks, ancient woodland, RIGS, agricultural land, geological SSSIs
Protect and enhance the historic environment and cultural diversity of the region	Protect the fabric of historic assets Enhance the setting of historic assets Contribute to the heritage and cultural identity of the region	Listed Buildings, Conservation Areas, Scheduled Monuments, archaeological areas, registered battlefields, registered parks, and gardens, protected wreck sites, HER	Number of historic assets damaged by a WRMP option Number of WRMP options built within 500m of a historic asset Number of historic assets enhanced by options	Construction monitoring for archaeological assets Option design monitoring– consultation with Historic England to confirm no adverse effects (design and EIA monitoring)	Historic Environment: Listed buildings, conservation areas, schedule monuments, archaeological areas, registered battlefields, registered parks and gardens, protected wreck sites

Anglian Water WRMP SEA Objectives	Anglian Water WRMP SEA Sub-Objectives	Key Receptors / Designations / Issues	Indicators	Monitoring	High Level Environmental Screening Criteria
Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making	Reduce greenhouse gas generation from operations including transport Reduce energy consumption and carbon emissions Use renewable energy sources and technologies Assets designed to deliver a reduction in capital (embodied carbon) Assets designed to contribute to reducing operational carbon emissions by 7% in real terms by 2020 from 2010 baseline Design zero waste options Reduce use of raw materials in favour of recycled materials and materials with recycled content Maximise capacity and efficiency of existing water infrastructure	GHG emissions, carbon, energy use, renewables Waste generation and disposal, material use, resource use, re-use of existing infrastructure	Reduction of greenhouse gas emissions per Ml/d Energy use from new operations and change in energy use per Ml/d % energy supplied by renewable sources Reduction of operational and capital carbon emissions % of A-Rated, recycled, reused material used in infrastructure options; Number of options that utilise existing infrastructure; Volume of waste generated Waste disposal method by %	Operational energy use and emissions monitoring Waste management monitoring Option design monitoring – material use, utilisation of existing infrastructure, embodied carbon	-
Protect community amenity through ensuring operations do not cause nuisance for local communities	To be a responsible neighbour ensuring operations do not cause disturbance from noise, dust, air pollution, light, visual, and transport Actively engage and work with local communities to foster an inclusive environment and participation in decision making	Disturbance to community amenity – noise and vibration, dust and air quality, light pollution, visual effects, transport movements, closures/diversion to roads/PRoW Community surveys, exhibitions, events, leaflets	Number of complaints Number of road/PRoW closures / diversions Number of, and attendance levels at public engagement events	Construction and operational monitoring for community complaints Construction monitoring – road/PRoW closures/diversions Monitoring through consultation strategy – engagement levels	Community: transport infrastructure (motorways, A roads, national cycle routes, railway lines), overriding community benefit
Contribute to the local economy and economic growth	Create links with local community groups, schools, and universities Use local labour and suppliers Create assets that provide a valuable amenity for communities and tourism	Local supplies and work force, links with academics, apprenticeships, job creation, tourism assets	Number of tourism assets created Number of apprenticeships	Procurement monitoring – local suppliers and labour, apprenticeships offered Number of larger scale options delivering tourism benefits	

Anglian Water WRMP SEA Objectives	Anglian Water WRMP SEA Sub-Objectives	Key Receptors / Designations / Issues	Indicators	Monitoring	High Level Environmental Screening Criteria
Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves	Increase access and enjoyment of the natural environment Provide valuable community resources Encourage active lifestyles	Recreational and water - related community activities – walking, canoeing, cycling, fishing, sailing. .	Number, type, and area of community assets created Km of new footpath/cycleways	Options design monitoring – creation of community assets	

4.8 Compatibility of SEA Objectives

4.8.1 When developing SEA objectives based on environmental, social, and economic issues, it is likely that not all objectives will relate or be compatible. For example, objectives which are economic issues may sometimes conflict with environmental objectives, and vice versa. A compatibility assessment of the SEA objectives is presented in Figure 6, and demonstrates any potential conflicts and uncertainties between the SEA objectives.

4.8.2 The following key has been used to illustrate the SEA objectives compatibility:

Key

+	Objectives are compatible
-	Objectives are potentially incompatible
0	Objectives are not related
/	Uncertainty over relationship

Figure 6: SEA Objectives Compatibility Matrix

SEA Objectives	Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers	Plan and adapt for the impacts of a changing climate to avoid disruption to water supply	Deliver reliable and sustainable water supply that is flexible to cope with changing growth in demand and enable economic growth	Strive to become leaders of the natural environment through enhancement of ecological diversity and networks	Protect and enhance landscape character and land quality	Protect and enhance the historic environment and cultural diversity of the region	Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making	Protect community amenity through ensuring operations do not cause nuisance for local communities	Contribute to the local economy and economic growth	Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves
Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers										
Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards	+									
Deliver reliable and sustainable water supply that is flexible to cope with changing growth in demand and enable economic growth	+	+								
Strive to become leaders of the natural environment through enhancement of ecological diversity and networks	+	+	+							
Protect and enhance landscape character and land quality	+	+	+	+						
Protect and enhance the historic environment and cultural diversity of the region	+	+	+	+	+					
Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making	+	+	+	+	+	+				
Protect community amenity through ensuring operations do not cause nuisance for local communities	+	+	+	+	+	+	+			
Contribute to the local economy and economic growth	+	+	+	+	+	+	+	+		
Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves	+	+	+	+	+	+	+	+	+	

SEA Objectives

4.9 Compatibility of WRMP Objectives and SEA Objectives

4.9.1 It is important that the objectives developed for the Anglian Water WRMP are compatible with the SEA objectives. Figure 7 indicates the compatibility of the objectives.

4.9.2 Figure 7 demonstrates that the WRMP objectives and the SEA objectives are compatible and no conflicts have been identified. WRMP objectives will support the SEA objectives in terms of delivering water security for communities, protecting the natural environment, encouraging efficient use of water, and responding and adapting to the effects of climate change.

Figure 7: Compatibility of WRMP and SEA Objectives

SEA Objectives	Ensure the potable water delivery system is resilient to the combined effects of severe drought (defined as an event with an approximate 1 in 200-year return period) and climate change, so that no household and non-household customers are exposed to an unacceptable risk of standpipes and rota-cuts	Provide enough water to meet local authority growth targets	Meet all statutory environmental obligations. These include restoring abstraction to sustainable levels and preventing deterioration in water body status	Make best use of available water resources, before developing new ones. This includes prioritising cost-beneficial demand management and trading to share any available surpluses	Ensure that solutions for the WRMP are flexible enough to be adapted to meet unknown AMP8 needs, including possible future exports to Affinity Water (Central)	Ensure the economic evidence used to develop the investment strategy is robust and transparent	Clearly set out the bill implications of the investment strategy and ensure they are supported by customers	Ensure the Plan represents 'best value' for customers over the long-term	Minimise the risk of delivering assets that become stranded or under-utilised in the longer term
Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers	+	+	+	+	+	0	0	+	+
Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards	+	0	+	+	0	0	0	0	+
Deliver reliable and sustainable water supply that is flexible to cope with changing growth in demand and enable economic growth	+	+	+	+	+	0	0	+	+
Strive to become leaders of the natural environment through enhancement of ecological diversity and networks	0	0	+	+	0	0	0	0	0
Protect and enhance landscape character and land quality	0	0	+	+	0	0	0	0	0
Protect and enhance the historic environment and cultural diversity of the region	0	0	+	+	0	0	0	0	0
Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making	0	0	0	+	0	0	0	+	+
Protect community amenity through ensuring operations do not cause nuisance for local communities	+	+	+	+	0	0	0	0	0
Contribute to the local economy and economic growth	+	+	+	+	+	0	+	+	+
Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves	0	0	+	+	0	0	+	0	0

WRMP Objectives

5 Description and Assessment of WRMP Options

5.1 Introduction

5.1.1 As part of the WRMP development process Anglian Water undertook modelling to identify areas with a surplus or deficit of water supply. For areas with deficits, Anglian Water developed a range of options for maintaining the supply demand balance. These fall into two broad categories:

- Demand management options – options that will reduce the demand for water including metering, water efficiency, and leakage reduction.
- Supply options – options that will provide a water supply to customers including transfers, maximising existing resources, trading, tankering, and new resources.

5.1.2 The WRMP is a mix of these two broad categories. Although demand management options are likely to have the least significant environmental effects, however, if implemented on their own they will not meet the deficits forecast in the region. Therefore, supply options are also needed.

5.1.3 In addition to demand management options and supply options, the WRMP also includes NEP options. The NEP is a list of environmental improvement schemes that ensure that water companies meet European and national targets related to water. The Environment Agency has identified a number of watercourses, and flora and fauna that they contain, to be at risk from the effects of abstraction. In areas where Anglian Water abstractions are implicated, the Environmental Agency has required the company to identify options to mitigate the effects of abstraction as part of the NEP. Further details on NEP options are presented in section 5.3.

5.2 Options Assessment Methodology

Approach to the Assessment

5.2.1 Assessments were undertaken on whole options i.e. all elements of an option that are dependent on each other, and not the individual parts. For example, the assessment of a reservoir option included the reservoir works themselves plus any works that are related to it such as transfers in/out and treatment.

5.2.2 Where there were several variations of an individual option, e.g. different transfer capacity, the assessment considered these variations and assessed them as part of the one whole option. Aspects of the option that may cause environmental harm were noted (e.g. if a particular variation might be more harmful).

5.2.3 The assessments were based on the options as set out in the Options Reports (Mott MacDonald, July 2017) and the associated GIS shapefiles.

5.2.4 The assessment of each option included:

- A description of the option including:
  - The option location
  - Capacity
  - Existing and new infrastructure

  - Option schematic (not available for transfers)
- The option assessment table including:
  - Potential positive and negative effects of the option in relation to the SEA objectives and their significance
  - Temporal and spatial scale of effects
  - Proposed mitigation and enhancement measures

Gathering Baseline Information

5.2.5 Baseline data was gathered for key receptors and assets under each of the SEA objectives (as identified in the Scoping Report). GIS layers and data from websites (such as the Environment Agency, Defra etc.) were used to map and identify baseline information. The mapping was used to determine potential environmental effects of options by overlaying the baseline maps with the options map to identify where potential interactions and effects could occur. Table 9 presents the baseline information and sources used for the assessment.

5.2.6 Only key receptors and assets within 500m of the option (works) location were considered in the assessment. The exception to this was European and National ecological designated sites such as Special Protection Areas (SPA), Special Areas of Conservation (SAC), Ramsar Sites, and Sites of Specialist Scientific Interest (SSSI), which were considered up to 5km away.

5.2.7 Other assessments and studies being undertaken as part of the wider WRMP project were also used to inform the SEA options assessment. Further details of these can be found in Section 5.3 and they include:

- HRA Task 1 (Test of Likely Significance) Screening Report (Mott MacDonald, December 2017)
- HRA Task 2 Appropriate Assessment Report (Mott MacDonald, December 2017)
- Water Framework Directive (WFD) Screening Assessment (AMEC, November 2017)
- Invasive Non-Native Species Risk Assessment (Mott MacDonald, August 2017)
- Operational carbon calculations and relative scale (Mott MacDonald, December 2017)
- Option Type Reports (Mott MacDonald, July 2017)

Table 9: Baseline Information and Sources

Anglian Water WRMP SEA Objectives	Key Receptors / Designations / Issues	Sources of information
Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers	River water quality, Bathing waters, WFD objectives, Shellfish waters, disease transmission	River water quality and WFD objectives - WFD Screening Assessment (AMEC, August 2017) Bathing waters – Environment Agency Bathing Water Quality Shellfish waters - Defra MAGIC website Disease transmission – consultant knowledge and Options Reports (Mott MacDonald, July 2017)
Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards	Effects of climate change / resilience – flood risk, temperatures extremes, storms and gales, drought	Temperatures extremes, storms and gales, drought - East of England projections presented in the SEA Scoping Report and consultant knowledge. Flood Risk – GIS layer

Anglian Water WRMP SEA Objectives	Key Receptors / Designations / Issues	Sources of information
Strive to become leaders of the natural environment through enhancement of ecological diversity and networks	SAC, SPA, Ramsar sites, SSSI, NNR, LNR, Marine Planning Areas (MPA)/Marine Conservation Zones (MCZ), non-native species, freshwater and marine fisheries, WFD objectives and river flows (in relation to ecology)	SAC, SPA, Ramsar sites – HRA Task 1 Screening Report (Mott MacDonald, August 2017) SSSI, NNR, LNR – GIS layer and Defra MAGIC website MPA/MCZ – Defra JNCC website Non-native species – consultant knowledge and invasive non-native species (INNS) risk assessment (Mott MacDonald, August 2017). Freshwater and marine fisheries – CEFAS website (spawning areas, nursery areas, fishing fleet distribution). Shellfish waters - Defra MAGIC website WFD objectives, river flows – WFD Screening Assessment (AMEC, August 2017)
Protect and enhance landscape character and land quality	AONB, NCA, Ancient Woodland, National Parks, Agricultural land, SSSI (geological)	Agricultural land classification - Defra MAGIC website AONB, Ancient Woodland, National Parks, SSSI (geological only), National Character Areas (NCA) – GIS layer and Defra MAGIC website
Protect and enhance the historic environment and cultural diversity of the region	Listed Buildings, Conservation Areas, Scheduled Monuments, registered battlefields, registered parks, and gardens, protected wreck sites	Listed Buildings, Scheduled Monuments, registered battlefields, registered parks, and gardens – GIS layer and Defra MAGIC Conservation Areas – GIS layer and Local Planning Authority websites Protected wreck sites – GIS layer and Defra MAGIC website
Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making	(Greenhouse Gas) GHG emissions, carbon, energy use, Waste generation and disposal, resource use, re-use of existing infrastructure	GHG emissions, energy use, renewables, waste generation, material use, resource use, re-use of existing infrastructure – consultant knowledge and Options Reports. Operational Carbon calculations (Mott MacDonald, August 2017)
Protect community amenity through ensuring operations do not cause nuisance for local communities	Disturbance to community amenity – noise and vibration, light pollution, visual effects, transport movements	Noise and vibration, light pollution, visual effects – consultant knowledge Cycle Routes (national and regional) - SUSTRANS website National / Regional Footpaths - Bing maps (Ordnance Survey map and Defra MAGIC website
Contribute to the local economy and economic growth	Job creation and potential to create new tourism assets	Job creation and tourism – consultant knowledge
Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves	Recreational and water - related community activities and access to the environment – walking, canoeing, cycling, fishing, sailing. PRoW and cycle routes	Recreational and water -related community activities and access to the environment - OS base mapping, google maps, consultant knowledge

Assessment of Effects

Nature of Environmental Effect

5.2.8 The assessment indicated whether the proposed option would help meet or prevent achievement of the SEA objectives. If it contributed to the SEA objectives, then it was considered a positive effect. If the option prevents the SEA objective being met, then it was

considered a negative effect. Both construction and operation effects were considered within the assessment.

5.2.9 The assessment focused on high-level issues as identified through the objectives, sub-objectives, and key receptors and assets, and was not undertaken to the level of detail that an Environmental Impact Assessment (EIA) would be.

5.2.10 It was assumed that all options would include standard environmental controls including:

- No surface water (river) abstractions will be able to reduce water levels below the minimum flow levels agreed for that river.
- Construction works will be undertaken according to existing good practice to manage impacts on site, such as dust creation, noise and vibration, and disturbance.
- Environment Agency Pollution Prevention Guidance (and the advice that supersedes it) will be followed during construction.
- Good practice construction management includes using construction environment management plans (CEMPs), construction and logistics plans (including construction traffic management plans (CTMPs)), waste management plans, etc.
- Sites would be surveyed for species/habitats prior to construction. Non-native species would be identified, and methods/works put in place to avoid spreading them during construction.
- Construction sites situated in a flood zone will have appropriate plans in place to manage the site in the event of flooding, e.g. management of materials and/or equipment likely to cause pollution.
- Construction health of workers would be managed on site using good practice such as avoidance, or personal protective equipment. Where in-river working is proposed, the potential for the transmission of waterborne infectious diseases (e.g. Leptospirosis, Cyanobacteria, Gastro-intestinal illness, and Hepatitis A) during construction of the new infrastructure would be managed appropriately.
- Construction sites will be in adherence to the Considerate Contractor Scheme, including engagement with the local community.
- Construction methods to be used are sympathetic and reduce effects on the surrounding landscape e.g. suitable hoardings.
- Any required consents will be obtained prior to undertaking works, e.g. tree preservation orders, listed building consent.
- Safe access will be available for pedestrians, vehicles, bicycles, horses, etc during construction. Any roads, footpaths, cycleways that are closed during construction will be re-instated to their original or better condition following completion of the works.
- The WFD assessment assumes that standard best practice construction measures and operational procedures are employed, meaning that some options are assumed to be compliant with the objectives of the WFD and require no further assessment.
- Where options involve disturbance of land for pipeline laying, the land will be restored to its original or better condition on completion of the works.
- Where options involve works crossing roads or public rights of way, appropriate diversions and signage will be implemented, and roads/paths will be restored to their original or better conditions following completion of the works.
- Where options involve loss of agricultural land, Anglian Water policy on compensation, land requisition will be followed.
- Options that use energy, either during construction and/or operation, will use the energy mix available at the time from the UK energy grid.

Temporal Scale of Effect

5.2.11 The temporal scale of effects was considered based on whether it would be permanent or temporary, and the duration of the effect.

5.2.12 Permanent changes were considered as those which are irreversible (e.g. land use change from woodland to development) or will last for the near future (e.g. noise from road traffic).

5.2.13 Temporary effects were considered as those which are reversible and are generally related to construction, e.g. construction traffic.

5.2.14 The timescales used are shown below and are based on the WRMP being a minimum 25-year plan:

- Short term (ST) effects are defined as being those which may take place between 0 and 2 years, and primarily include construction impacts
- Medium term (MT) effects are defined as being those between 2 and 25 years
- Long term (LT) effects are defined as being those over 25 years

Spatial Scale of Effect

5.2.15 The spatial scale of the environmental effects of the options were split into four categories, as follows:

- Local – within 5km of the option, within the vicinity of the proposed option works
- Regional – the option affects an area outside the local area, but still within the East of England region and/or the water company area and/or affects several locations within the water company area
- National – the option affects the land, air and/or waters of other parts of England, or Scotland, Wales, and/or Northern Ireland
- International - when the option may affect the environment (including the land, air and / or waters) of countries outside the United Kingdom

Significance of Effect

5.2.16 The significance was scored using symbols and colour-coding (see Table 10).

5.2.17 Significant negative effects were defined as effects which would exacerbate existing problems and/or cause irreversible negative effects. These were represented by a major negative effect rating and red colour coding in the assessment tables.

5.2.18 Significant positive effects were defined as those effects which would resolve an existing issue or maximise opportunities. These were represented by a major positive rating and dark green colour coding in the assessment tables.

Table 10: Scoring Definitions

Scoring Definitions	
++	Option would have a **major positive** effect in its current form as it would resolve an existing issue or maximise opportunities. SIGNIFICANT
+	Option would have a **minor positive** effect
0	Option would have a neutral or no effect
-	Option would have a **minor negative** effect
--	Option would have a **major negative** effect as it would substantially exacerbate existing problems and/or cause irreversible adverse effects. Consider exclusion of option. SIGNIFICANT
?	Effects of the option are uncertain

Limitations of the Assessment

5.2.19 Options were being developed in parallel to the SEA options assessment. The SEA options assessment is based on the options as set out in the Options Type Report and GIS shapefiles (August 2017). The assessment of preferred options taken forward into the WRMP have been updated (in the assessment in Chapter 6) to reflect any option changes since the original assessment.

5.2.20 Baseline data used for the options assessment was based on GIS datasets. Spot checks using the Defra MAGIC website have been undertaken to ensure accuracy of data, but the full data sets have not been validated.

Mitigation and Enhancement Measures

5.2.21 Where negative effects were identified mitigation measures (measures to avoid, reduce or offset negative effects) were recommended. Enhancement opportunities were also identified where the option could be used to the benefit of people and/or wildlife, e.g. reservoirs provide an opportunity to be used as wetlands, or for recreational benefit such as sailing. A post-mitigation assessment has been included in the assessment tables to demonstrate any residual effects following implementation of mitigation measures. Anglian Water is committed to delivering all mitigation measures identified by the SEA and HRA.

5.3 Assessment of NEP options

Context of NEP Options

5.3.1 Anglian Water are required to contribute to the Water Industry National Environment Programme (WINEP) through its AMP7 investment, part of which will be delivered through the WRMP.

5.3.2 Anglian Water have determined if changes to its abstractions are required to meet RBMP objectives and have discussed the scope of changes with the Environment Agency as part of WINEP for PR19. Any Anglian Water WINEP actions required related to maintaining sustainable abstractions between 2019-2024 form part of the WRMP.

5.3.3 The PR14 NEP outlined 25 waterbodies 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. In AMP6 Anglian Water carried out investigations and options appraisals to determine how to address these issues. These were completed according to the

December 2017 deadline, set by the Environment Agency to ensure that the outcome of the options appraisals could be in the WRMP.

5.3.4 Options considered included those to reduce or mitigate the potential effects of abstraction on low flows, groundwater bodies and water dependant terrestrial ecosystems. Options appraisals were 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.

Assessment Process

5.3.5 The NEP options have been developed through a separate process to the WRMP demand management and supply options. This process has included environmental assessment and consultation processes which are described below. The results of the NEP assessments have been used to inform the WRMP SEA through inclusion in the cumulative effects assessment.

5.3.6 Following modelling and site walkovers, Anglian Water produced a 'long list' of options for each scheme based on the requirements outlined in the scoping documents, and WFD 'no deterioration' requirements. The long lists were shared with the Environment Agency for comment. Anglian Water 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)
- Wider socio-environmental considerations (20% weighting) – including carbon, ecology, flooding, erosion/sedimentation, water quality, recreation, tourism, and aesthetics.

5.3.7 The highest scoring options, and those preferred by the Environment Agency, were taken forward into a short list. The option to switch abstraction off was included in all short lists to provide a baseline comparison. Short lists were shared with the Environment Agency for review.

5.3.8 Cost Benefit Analysis was carried out on all short-listed options, whereby financial, environmental, and social costs were compared against environmental benefit. In addition, Anglian Water have carried out an extensive programme of customer engagement as outlined in the WRMP summary document, including engagement surrounding environmental impact.

5.3.9 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
- Fulfilment of WFD 'no deterioration', including the wider scale impacts of river support schemes

NEP Options included in WRMP

5.3.10 As a result of the AMP6 options appraisals, as well as the AMP7 sustainability schemes identified prior to AMP6, Anglian Water have agreed to a significant number of sustainability changes and mitigation options as follows:

- Sustainability Changes – for six schemes, Anglian Water have agreed to a sustainability change (without a mitigation option). These schemes are detailed in the WRMP Technical Document: Sustainable Abstraction. Where sustainability changes lead to an impact upon

supply forecast, a supply side option has been developed. Supply-side options are detailed in the WRMP Technical Document: Supply-Side Option Development.

- Mitigation Options - The selected NEP mitigation options to be implemented for the remaining schemes include:
  - Four river support and river restoration schemes
  - Five river support only schemes
  - Nine river restoration only schemes
  - One recirculation scheme
  - One adaptive management scheme
  - One pond support scheme
  - One source relocation

5.3.11 Details of the mitigation options are detailed in the WRMP Technical Document: Sustainable Abstraction.

Integrating NEP Assessment Results into the SEA

5.3.12 The NEP options have undergone environmental assessment as outlined above. The assessment included environmental factors such as carbon, ecology, flooding, erosion/sedimentation, water quality, recreation, tourism and aesthetics. These directly or indirectly reflect the SEA Directive topics on water, population and human health, soil, biodiversity, fauna and flora, climatic factors, historic environment, landscape and material assets. To provide more detail on environmental and social effects the NEP options were also included in the WRMP ecosystem services assessment. A summary of the potential effects of the NEP options is included in Table 11. These results have also fed into the SEA cumulative effects assessment for the WRMP.

5.3.13 The WINEP is driven by requirements derived from the Water Framework Directive, which are formally set out in a number of England's River Basin Management Plans (RBMP). The most recent RBMP's, from which the WINEP derive, were adopted by the Environment Agency in 2015 and are subject to SEA.

5.3.14 The Anglian River Basin Management Plan (RBMP) has itself undergone SEA which provided stakeholders and the public with an opportunity to engage and influence the context of Anglian Water's WRMP NEP activities. Consultation on the draft Anglian RBMP and the SEA Environmental Report took place in 2015. Most people who responded agreed with the conclusions that the plans will lead to significant positive effects on the environment and society and a wide range of potential positive and some negative effects more locally. The RBMP includes the types of mitigation schemes that Anglian Water has included in the WRMP such as river support schemes.

5.4 Incorporation of the Results of other Assessments and Studies

5.4.1 As discussed above several other assessments and studies are being undertaken to support the development of the WRMP and were used to inform the SEA options assessment. These are discussed in more detail below.

Habitats Regulations Assessment

5.4.2 A Habitats Regulations Assessment (HRA) Task 1: Test of Likely Significance (Screening) was undertaken for the WRMP. The results were used to inform the option assessment process

through the SEA objective relating to ecology to determine potential for effects on European designated sites[45].

5.4.3 A HRA Task 2: Appropriate Assessment (Task 2 AA) was undertaken for options taken forward into the WRMP that were screened as having potential likely significant effects at Task 1. The results were used to inform the final assessment of the WRMP and its cumulative effects.

Water Framework Directive Assessment

5.4.4 A Water Framework Directive (WFD) Screening Assessment was undertaken for the WRMP. The results were used to inform the options assessment through the SEA objectives on water quality and ecology to determine potential issues with WFD objectives.

5.4.5 A Phase 2 WFD screening was undertaken taking into account standard mitigation measures such as directional drilling under rivers. The results were used to inform the final assessment of the WRMP and its cumulative effects.

Invasive Non-Native Species Risk Assessment

5.4.6 An Invasive Non-Native Species (INNS) Risk Assessment was undertaken for the WRMP. The results were used in the SEA objective on ecology to determine the potential risk of INNS transfer associated with water resource options.

Operational Carbon

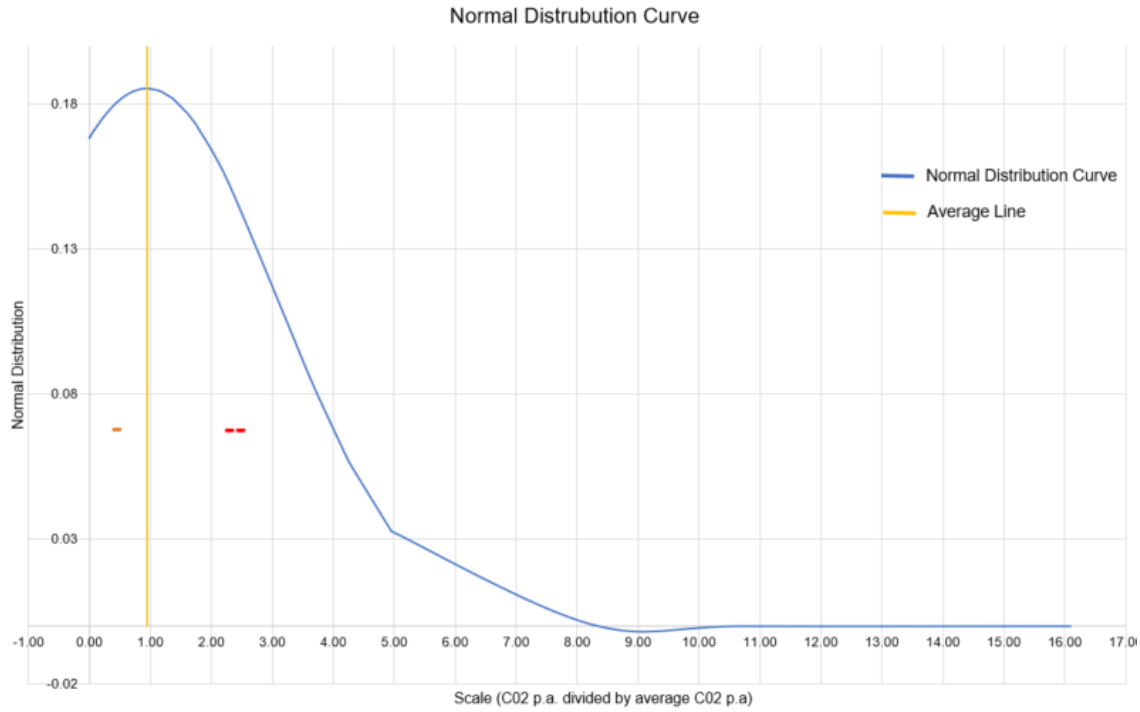
5.4.7 The predicted operational carbon of each water resource option was calculated and an annual CO_2e figure was produced. The carbon figures were used in the SEA objective on climate change mitigation to determine relative carbon emissions of options. Rather than using an absolute scale, a relative scale has been developed to allow comparison of options. The methodology for development of this scale is outlined below.

5.4.8 The relative carbon scale uses a normal distribution curve to assign each CO_2e per annum value a classification e.g. minor negative or major negative. To achieve this the following steps were undertaken:

- The CO_2e per annum values (in tonnes) were obtained for each option and were entered in a spreadsheet along with the corresponding option number.
- The average of the CO_2e per annum figures (in tonnes) was calculated. This average value was then compared to each CO_2e per annum value, to give a relative value or ‘scale’.
- The scale values were then sorted in ascending order, and the average scale value and the standard deviation of the scale values calculated, so that the normal distribution value could be obtained.
- The normal distribution value for each scale value was obtained and then plotted using a scatter graph to give a normal distribution curve. The scale values were plotted on the x-axis and the normal distribution values were plotted on the y-axis (see Figure 8).
- A vertical line was added at the average point on the x-axis to divide the area under the curve into two categories (minor negative and major negative), (see Figure 8).

[45] European designated sites include Special Protection Areas (and potential SPA), Special Areas of Conservation (and candidate SAC), and in the UK Ramsar Sites.

Figure 8: Operational annual CO_2e – Normal Distribution Curve and Scoring



5.5 Summary of Results

5.5.1 The description of each option and its corresponding assessment table is provided in the Appendices as follows:

- Appendix F – Reservoirs options assessment
- Appendix G – Transfers options assessment
- Appendix H – Water reuse options assessment
- Appendix I – Aquifer storage and recovery options assessment
- Appendix J – Desalination options assessment
- Appendix K – Demand management options assessment

5.5.2 The options assessment has demonstrated the potential positive and negative effects of the different water resource options that could go forward into the preferred plan for WRMP. The common themes from the assessment are presented in Table 11.

Table 11: Summary of options assessment potential effects and opportunities

Options	Potential effects and opportunities
Demand Management	Potential for effects on ecological designated sites, the historic environment, agricultural land, NCA and ancient woodland during leakage reduction works
	Opportunity to improve customer understanding of their water consumption to facilitate behavioural change
	Opportunity to increase the resilience of water supplies

Options	Potential effects and opportunities
	Opportunity to benefit water dependent ecological sites and WFD by retaining water in the natural environment
	Opportunity to reduce greenhouse gas emissions as a result of a decreased need for water supply infrastructure
	Opportunity for the creation of employment
ASR	Effects on WFD objectives during construction and operational phases
	Effects on ecological designated sites, the historic environment, agricultural land, NCA and ancient woodland during construction and operation
	Effects on water dependant designated sites and species through changes to water flow levels and water quality
	Generation of greenhouse gas emissions during construction and operation
	General nuisance effects on the local community, road and footpath closures or diversions during construction
	Opportunity to increase the resilience of water supplies
	Opportunity for the creation of construction jobs
	Opportunity to improve cycle routes and footpaths as part of re-instatement works
Desalination	Effects on WFD objectives during construction and operational phases. Brine discharge
	Effects on designated sites and nursery/spawning fisheries from desalination intake and outfall pipelines and screens, and discharged brine
	Effects on ecological designated sites, the historic environment, agricultural land, NCA and ancient woodland during construction and operation
	Generation of greenhouse gas emissions during construction and operation. Desalination has high energy requirements
	General nuisance effects on the local community, road and footpath closures or diversions during construction
	Opportunity to increase the resilience of water supplies
	Opportunity for employment
Water Reuse	Effects on WFD objectives during construction phases
	Effects on ecological designated sites, the historic environment, agricultural land, NCA and ancient woodland during construction and operation
	Generation of greenhouse gas emissions during construction and operation
	General nuisance effects on the local community, road and footpath closures or diversions during construction
	Opportunity to increase the resilience of water supplies and flows in rivers
	Opportunity for the creation of employment
	Opportunity to improve cycle routes and footpaths as part of re-instatement works
Reservoirs	Effects on WFD objectives during construction and operational phases
	Effects on water dependant designated sites and species through changes to water flow levels and water quality

Options	Potential effects and opportunities
	Effects on ecological designated sites, the historic environment, agricultural land, NCA and ancient woodland during construction and operation
	Visual effects and change of landscape character
	Generation of greenhouse gas emissions during construction and operation
	General nuisance effects on the local community, road and footpath closures or diversions during construction
	Opportunity to increase the resilience of water supplies
	Opportunity for the creation of employment
	Opportunity to improve cycle routes and footpaths as part of re-instatement works
	Opportunity to create reservoirs that can be used for recreational activities and/or wildlife conservation
Water Transfers	Effects on WFD objectives during construction and operational phases
	Effects on ecological designated sites, the historic environment, agricultural land, NCAs and ancient woodland from laying of pipelines during construction
	Potential for transfer of invasive non-native species
	Generation of greenhouse gas emissions during construction and operation
	General nuisance effects on the local community, road and footpath closures or diversions during construction
	Opportunity to improve water quality
	Opportunity to increase the resilience of water supplies
	Opportunity for the creation of employment during construction
	Opportunity to improve cycle routes and footpaths and enhance designated sites as part of re-instatement works
NEP: River support schemes	River support schemes often include management of tree shade, tree planting, buffer strips, fish bypasses and weirs. These can have positive effects for numerous ecosystem services including provision of food, fresh water in the environment, fibre and fuel, genetic resources, air quality regulation, water regulation, erosion regulation, recreation, aesthetics, habitat provision and water and nutrient cycling
NEP: River restoration schemes	River restoration schemes often include management of tree planting, buffer strips, weirs, ecosystem restoration, fish spawning bypasses, and wetland creation. These can have positive effects for numerous ecosystem services including provision of food, fresh water in the environment, fibre and fuel, genetic resources, air quality regulation, water regulation, erosion regulation, recreation, aesthetics, habitat provision and water and nutrient cycling
NEP: Recirculation scheme	Positive effects for provision of fresh water due to increased flows and water in the environment. Positive effects for provision of natural hazard regulation through providing additional river flows to increase resilience of water supply and mitigating the current effects of low flows. This will also have benefits for water purification, recreation, aesthetics, nutrient cycling and habitat provision
NEP: Pond support scheme	Positive effects for provision of fresh water through providing resilience against low water levels thus increasing the water available in the natural environment. This will also have benefits for natural hazard regulation (associated with drought resilience), recreation, aesthetics and habitat provision

Options	Potential effects and opportunities
NEP: Source relocation scheme	Positive effects for provision of fresh water, water regulation and water purification by creating a new source of water and improving flows and WFD status at the current abstraction water source. Potential benefits for amenity, recreation, aesthetic, and habitat provision
NEP: Sustainability Reductions	Positive effects for provision of food, fresh water, fibre and fuel, natural hazard regulation, erosion regulation, water purification, recreational and tourism, aesthetic value and habitat creation as the sustainability reductions are likely to increase the retention of water in the natural environment and reducing risk of water quality deterioration and ecology effects.

5.6 Mitigation and Enhancement Measures

5.6.1 Mitigation and enhancement measures were suggested as part of the SEA options assessment process and are recorded in the assessment tables in the appendix. These measures have also been collated into a register (see Appendix L). Where possible mitigation measures have been incorporated into the options development process and the register records where this has taken place. This has included pipeline re-routing and directional drilling to avoid significant effects on designated sites and heritage assets. Incorporation of these measures at this early strategic stage will help deliver a WRMP that benefits the environment and reduces the risk of significant negative effects and cost-prohibitive mitigation measures further down the line during detailed design of specific options. It is proposed that the register is a live document used to record the status of mitigation and enhancement measures as the detailed design of options is taken forward. Anglian Water is committed to delivering all mitigation measures identified by the SEA and HRA.

5.6.2 Following the assessment of the feasible list of options, several options were rejected based on factors including cost, environmental, and delivery. These options were recorded in a rejection register.

6 WRMP - Development and Assessment

6.1 Development of the WRMP

6.1.1 Traditionally, companies have used the EBSD approach to guide decision making. EBSD allows planners to meet a supply-demand deficit with the lowest overall cost, or 'least cost' solution. The Anglian Water WRMP 2010 and WRMP 2015 were both based on least cost option appraisal.

6.1.2 The limitations of a least cost planning approach are now widely recognised, and there is support from regulators, stakeholders and customers, to develop best value plans which take account of a wider range of factors such as environmental impacts of programmes, resilience, and customer preferences, in addition to cost.

6.1.3 The supply-side programme appraisal process to determine the Preferred Plan can be summarised in four stages. Table 12 presents these four stages and how the SEA fed into the process

Table 12: Supply-side programme appraisal process

Supply-side programme appraisal process stages	SEA interactions
Stage 1 – EBSD least cost optimisation	All the options that went into EBSD were assessed as part of the SEA and mitigation measures were included in options development and costing
Stage 2 – Scenario testing to develop alternative plans	The Baseline Least Cost Plan and Alternative Least Cost Plan were assessed as part of the SEA including cumulative effects
Stage 3 – Selection of final strategy	The Preferred Plan was assessed as part of the SEA including cumulative effects
Stage 4 – Stress testing the final strategy	Residual effects and mitigation measures were identified for the Preferred Plan with a commitment from Anglian Water to implement these.

6.1.4 When moving from the Least Cost Plan to the Best Value Plan a number of factors were evaluated including: cost; adaptability and flexibility; alignment to WRE; risk and resilience; customer preferences; and environmental and social impacts. The Least Cost Plan performs better in terms of cost as it has lower overall capital and operating costs. The Preferred Plan performs similar or better in all of the other factors:

- It allows greater flexibility for development and sharing of new resource options beyond 2025
- It delivers better alignment with the WRE strategy due to an increase in the capacity of strategic transfers across the region
- It performs better when compared with customer preferences as it makes best use of existing resources and defers the development of desalination which is less favourable to customers than transfers
- Both plans perform equally when considering the % reduction of single supply population but the Preferred Plan performs better in stress testing
- Both plans deliver similar environmental benefits by aiming to reduce abstraction through demand management, keeping more water available in the natural environment, and using supply side options where environmental risks can be mitigated.

6.1.5 The WRMP include an adaptive strategy to deal with uncertainties and future scenarios that will mean further investment is required (e.g. further future sustainability reductions). In some cases, there may not be a long lead time to implement schemes and therefore Anglian Water need to develop a plan which identifies thresholds beyond which they need to take further action. The potential options identified as part of the adaptive strategy have been assessed as part of the SEA. It should be noted that at this stage these are strategic supply side options that may be required in the future. They do not form a definitive list of options.

6.2 WRMP Assessment

6.2.1 The Baseline Least Cost Plan and Alternative Least Cost Plan have been assessed as part of the SEA and the results are included in Appendix N. The section below summarises the assessment of the Preferred Plan including the adaptive strategy.

6.2.2 The assessment is based on the post-mitigation scoring presented in the options assessment appendices. The medium-term effects from the options assessment are included in the summary assessments in this Chapter to demonstrate the effects over the 25-year period of the WRMP. Further details on specific option effects (pre- and post-mitigation), and details of construction and long-term (over 25 years) effects can be found in the option assessment appendices F- K.

6.3 WRMP - Preferred Plan

Description

6.3.1 The options for the WRMP Preferred Plan are presented in Table 13.

Table 13: WRMP Preferred Plan

Option ref.	Option name	WRZ
-	Demand Management Strategy Extended Plus	All
BHV5	Newmarket RZ to Bury Haverhill RZ Transfer (20Ml/d)	Bury Haverhill
CLN13a	South Humber Bank RZ to Central Lincolnshire RZ Transfer (31Ml/d)	Central Lincolnshire
CLN14	South Humber Bank RZ to Central Lincolnshire RZ Transfer (6Ml/d)	Central Lincolnshire
CLN15	South Humber Bank RZ to Central Lincolnshire RZ Transfer (Existing)	Central Lincolnshire
CLN16	South Humber Bank RZ to Central Lincolnshire RZ Transfer	Central Lincolnshire
ELY9	North Fenland RZ to Ely RZ Transfer (20Ml/d)	Ely
CVY1	Newmarket RZ to Cheveley RZ Transfer	Cheveley
ESU1	Felixstowe Desalination	East Suffolk
ESU8	Bury Haverhill RZ to East Suffolk RZ transfer (20Ml/d)	East Suffolk
HPB1	Norwich & the Broads RZ to Happisburgh RZ Transfer	Happisburgh
HPB2	Norwich & the Broads WRZ to Happisburgh Transfer (East Ruston/Witton)	Happisburgh
NFN4	South Fenland RZ to North Fenland RZ Transfer (20Ml/d)	North Fenland
NNR8	Norwich & the Broads RZ to Norfolk Rural North RZ Transfer (5Ml/d)	Norfolk Rural North
NTM1	Central Lincolnshire RZ to Nottinghamshire RZ Transfer	Nottinghamshire
NWM6	Ely RZ to Newmarket RZ Transfer (20Ml/d)	Newmarket
RTC2	Ruthamford South RZ to Ruthamford Central RZ Transfer	Ruthamford Central
RTN27	South Lincolnshire RZ to Ruthamford North RZ (67Ml/d)	Ruthamford North
SEX4	East Suffolk RZ to South Essex RZ transfer (15Ml/d)	South Essex
SFN4	Ruthamford North RZ to South Fenland RZ Transfer (40 Ml/d)	South Fenland
SHB2	Pyewipe Water Reuse for non-potable use	South Humber Bank

Option ref.	Option name	WRZ
SLN6	Central Lincolnshire RZ to South Lincolnshire RZ Transfer (63Ml/d)	South Lincolnshire
THT1	Bury Haverhill WRZ to Thetford WRZ Transfer (existing)	Thetford
-	Birchmoor WTW Resilience	Ruthamford South
-	Meppershall WTW Resilience	Ruthamford South
-	Diddlington WTW Resilience	Norfolk Rural North
-	Great Wratting WTW Resilience	Bury Haverhill

Summary of Results

6.3.2 The summary results for the Preferred Plan are presented in Table 14 and a narrative for each option is presented below. More detailed assessments for options within the Preferred Plan can be found in the relevant options assessment appendices (Appendix F – K). The cumulative effects of the Preferred Plan are presented in section 6.6.

6.3.3 The Preferred Plan is likely to have an overall positive effect on delivering reliable and sustainable water supplies that are flexible to cope with future changing growth and demand. Positive effects identified include increased availability and resilience of water supplies for human use; increased availability of water within the natural environment thus increasing resilience, benefiting water dependant ecological sites, and maintaining an attractive natural landscape; reducing the need for future water supply infrastructure; and allowing customers to understand their water usage.

6.3.4 Where negative effects were identified in the options assessment, these have been mitigated where possible through the options design process by re-routing pipelines or using directional drilling under sensitive sites and rivers or investigated further through the HRA and WFD processes. The use of best practice construction methods will also be utilised to minimise any effects during the construction phase. Minor residual negative effects remain for option ESU1 due to the predicted moderate effects on WFD objectives and effects of brine discharge on ecology. Where effects relating to greenhouse gas emissions were known, all options had minor negative effects apart from the ESU1, SHB2 and SLN6 options where major negative effects were identified. Future consideration of renewable energy options would reduce these effects.

Demand Management Strategy Extended Plus

6.3.5 The demand management strategy is likely to have positive effects through achieving water savings that reduce the scale of new water supply infrastructure needed and future abstractions. Maintaining water within the natural environment will benefit ecology, water quality, landscapes, and the community/tourism. Water metering provided as part of the demand management strategy aims to connect customers to the environment by allowing them to understand their water usage and how this affects wider environmental systems. Minor negative effects were identified due to disruption (e.g. road diversions, noise, dust) and land disturbance (e.g. ecology, agricultural land) during leakage reduction works, and resources required for manufacturing and fitting smart meters. However, it is likely that these effects can be largely mitigated through planning of leakage reduction works to avoid peak periods, daytime working hours, signage for diversions, and restoration of land to its original or better condition. There could be opportunities to use materials with recycled content in the manufacture of smart meters, but this is dependent on Anglian Water procurement processes.

Newmarket RZ to Bury Haverhill RZ Transfer (20Ml/d) (BHV5)

6.3.6 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies

6.3.7 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified that the working area of the proposed pipeline is within the vicinity of three ancient woodlands. Three listed buildings are also within the vicinity of the pipeline and the route passes through a conservation area. Mitigation measures including re-routing the pipeline and good construction practices will reduce effects. Short-term effects relating to the disturbance of agricultural land, visual intrusion and community nuisance during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

South Humber Bank RZ to Central Lincolnshire RZ Transfer (31Ml/d) (CLN13a)

6.3.8 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.9 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential negative ecological effects on one SSSI which is located adjacent to the proposed pipeline route, from habitat removal and disturbance effects during construction. Mitigation measures including pipeline re-routing and complex directional drilling will reduce effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

South Humber Bank RZ to Central Lincolnshire RZ Transfer (6Ml/d) (CLN14)

6.3.10 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.11 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential negative ecological effects on one SSSI which is located adjacent to the proposed pipeline route, from habitat removal and disturbance effects during construction. Mitigation measures including pipeline re-routing and complex directional drilling will reduce effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

South Humber Bank RZ to Central Lincolnshire RZ Transfer (Existing) (CLN15)

6.3.12 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.13 The options assessment did not identify any negative effects on water quality, ecology, landscape, historic environment or community as the option uses existing infrastructure. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

South Humber Bank RZ to Central Lincolnshire RZ Transfer (CLN16)

6.3.14 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.15 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential negative ecological effects on one SSSI which is located adjacent to the proposed pipeline route, from habitat removal and disturbance effects during construction. Mitigation measures including pipeline re-routing and complex directional drilling will reduce effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Newmarket RZ to Cheveley RZ Transfer (CVY1)

6.3.16 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.17 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified that the proposed pipeline route is adjacent to three listed buildings. Mitigation measures including good construction site practices will reduce effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

North Fenland RZ to Ely RZ Transfer (20Ml/d) (ELY9)

6.3.18 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.19 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential negative ecological effects on one SSSI from temporary disturbance during construction. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Felixstowe Desalination (ESU1)

6.3.20 The options assessment identified positive effects through employment opportunities during construction and operation, and increased resilience of water supplies.

6.3.21 The WFD screening and Phase 2 assessment concluded potential for moderate effects on one or more waterbodies during the construction and operational phases. A Phase 3 WFD assessment will therefore be required if this option is taken forward. The options assessment identified potential negative ecological effects on four SSSIs. The pipeline route as part of this option is located within the vicinity of a LNR and therefore may remove habitats. Pipeline re-routing will reduce effects. A HRA Task II Appropriate Assessment was undertaken to determine effects on European designated sites. It concluded that further assessment is necessary at the lower tier, project-level assessment but it is assumed that appropriate mitigation can be

designed to ensure no reasonably foreseeable effects on site integrity. The construction and operation of the intake and outfall pipes from the desalination plant are also likely to affect several areas identified as important to supporting marine fisheries. Further investigation and monitoring should be undertaken as part of this option. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option requires significant new infrastructure and is very energy intensive. Future consideration of renewable energy options would reduce effects. The scaled operation CO_2 equivalent per annum for this option is higher than the average. Use of renewable energy technologies may reduce effects.

Bury Haverhill RZ to East Suffolk RZ transfer (20Ml/d) (ESU8)

6.3.22 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.23 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential negative ecological effects on one SSSI which is located adjacent to the proposed pipeline route, from disturbance effects and the removal of habitats during construction. The route is also adjacent to two areas of ancient woodland. The proposed pipeline also passes through a conservation area. Mitigation including pipeline re-routing, directional drilling and good practice construction methods will reduce effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Norwich & the Broads RZ to Happisburgh RZ Transfer (HPB1)

6.3.24 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.25 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential negative ecological effects on the Broadland SPA and Ramsar, and The Broads SAC from disturbance to qualifying species, habitat loss, and water quality changes during construction of the pipeline. Mitigation to re-route the pipeline to avoid the designated sites was incorporated which mitigated the effects. The options assessment also identified potential negative ecological effects on one SSSI, from disturbance during construction. The proposed pipeline route also passes through a conservation area. Mitigation including pipeline re-routing and good construction practices will reduce effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Norwich & the Broads WRZ to Happisburgh Transfer (East Ruston/ Witton) (HBP2)

6.3.26 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.27 The WFD screening identified a potential moderate level of effect during construction[46]. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment showed that the Norfolk Broads National Park is approximately 400m from the pipeline. A small section of the pipeline route is within 515m of the Broadland SPA and SAC, and Smallburgh Fen SSSI. The options assessment also identified potential negative ecological effects on one Ancient Woodland, from disturbance during construction. Although habitat loss is not expected to be required from these designated sites, there is potential for temporary disturbance from the construction process to affect these sites. Mitigation such as following best practice construction methods and pollution prevention measures will reduce effects. The options assessment identified a potentially negative impact on one registered park and garden. However, following mitigation such as ensuring that the pipeline route and the working width remain to the west of Howards Hill Road utilise complex directional drilling techniques, effects will be minimised. Short-term effects relating to visual intrusion, community nuisance, transport and footpath diversions and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

NNR8 Norwich & the Broads RZ to Norfolk Rural North RZ Transfer (5Ml/d)

6.3.28 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.29 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be a low risk of deterioration. The route is adjacent to a listed building, Sweet Briar Meadows SSSI, and crosses through a LNR and areas of ancient woodland. Mitigation including pipeline re-routing and good practice construction methods will reduce effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

South Fenland RZ to North Fenland RZ Transfer (20Ml/d) (NFN4)

6.3.30 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.31 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential temporary negative ecological effects on The Wash SAC, SPA and Ramsar site. Mitigation to re-route the pipeline to avoid the designated sites was incorporated which mitigated the effects. The options assessment also identified potential negative ecological effects on one SSSI, from temporary disturbance during construction. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

[46] The HBP2 was added to the WRMP at a late stage as a result of a sustainability assessment. A full WFD assessment has therefore not been undertaken for the HBP2 option, however the effects stated are from an indicative WFD assessment.

Central Lincolnshire RZ to Nottinghamshire RZ transfer (NTM1)

6.3.1 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.2 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be a low risk of deterioration. The options assessment identified that the proposed pipeline route will pass through an area of ancient woodland. Mitigation measures including pipeline re-routing and good construction site practices will reduce effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Ely RZ to Newmarket RZ Transfer (20Ml/d) (NWM6)

6.3.3 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.4 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential temporary negative ecological effects on Fenland SAC and Chippenham Fen Ramsar site. Mitigation to re-route the pipeline to avoid the designated site was incorporated which mitigated the effects. The options assessment also identified ecological effects on two SSSIs, from temporary disturbance during construction. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Ruthamford South RZ to Ruthamford Central RZ Transfer (RTC2)

6.3.5 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.6 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential negative ecological effects on two SSSI, from temporary disturbance during construction. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

South Lincolnshire RZ to Ruthamford North RZ (67Ml/d) (RTN27)

6.3.7 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.8 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential negative ecological effects on one SSSI, from temporary disturbance during construction. The route passes through a registered park and garden and Colchester Conservation Area therefore there is potential for effects. Mitigation measures include pipeline rerouting and directional drilling will reduce effects. Short-term effects

relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

East Suffolk RZ to South Essex RZ transfer (15Ml/d) (SEX4)

6.3.9 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.10 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential negative ecological effects on one SSSI, from temporary disturbance during construction. The route is also adjacent to two areas of ancient woodland which could potentially be damaged during construction. There are also two listed buildings within the vicinity of the pipeline. Mitigation measures pipeline re-routing, directional drilling and good construction site practices will reduce effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Ruthamford North RZ to South Fenland RZ Transfer (40 Ml/d) (SFN4)

6.3.11 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.12 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential temporary negative ecological effects on Nene Washes SAC, SPA and Ramsar sites. Mitigation to re-route the pipeline to avoid the designated sites was incorporated which mitigated the effects. The options assessment also identified potential negative ecological effects on one SSSI, from habitat loss and temporary disturbance during construction. There is also likely to be temporary disturbance to the Rings End LNR which the proposed route passes through. Mitigation including pipeline re-routing, directional drilling and good construction site practices will reduce effects. The pipeline route was identified as being within the vicinity of a listed building. Mitigation to reduce effects include re-routing or directional drilling. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Pyewipe Water Reuse for non-potable use (SHB2)

6.3.13 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.14 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be a low risk of deterioration. The options assessment identified potential negative ecological effects on the Humber Estuary SPA, Ramsar, SAC and SSSI through adding to the existing anthropogenic pressures on the designated site, potentially affect qualifying habitats and species through altering the underlying processes supporting them. There is likely to be disturbance to species during construction and changes to water chemistry may alter the wetland and coastal habitats

which support the qualifying bird species of the SPA. A HRA Task 2 AA was undertaken which concluded there would be no significant effects on site integrity. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The pipeline route was identified as being adjacent to a listed building, where possible pipeline routes have been re-routed to provide a 10m buffer. Good site practices will also reduce effects of historic assets. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is higher than the average. Use of renewable energy technologies may reduce effects.

Central Lincolnshire RZ to South Lincolnshire RZ Transfer (63Ml/d) (SLN6)

6.3.15 The options assessment identified positive effects through employment opportunities during construction and increased resilience of water supplies.

6.3.16 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential negative ecological effects, from disturbance effects and removal of habitats. The proposed pipeline route also passes through a conservation area. Mitigation including pipeline re-routing, directional drilling and good practice construction methods will reduce effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is higher than the average. Use of renewable energy technologies may reduce effects.

Bury Haverhill to Thetford Transfer (Existing) (THT1)

6.3.17 The options assessment identified positive effects from increase resilience of water supplies.

6.3.18 The options assessment did not identify any negative effects on water quality, ecology, landscape, historic environment or community as it is using existing infrastructure. It is assumed that the installation of any new pumps will be within existing pump stations. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Birchmoor WTW Resilience

6.3.19 The options assessment identified positive effects from increase resilience of water supplies.

6.3.20 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential temporary effects on one listed building which is within the vicinity of the propose pipeline route. These disturbance effects will be mitigated through implementing best practice construction methods. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Meppershall WTW Resilience

6.3.21 The options assessment identified positive effects from increase resilience of water supplies.

6.3.22 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential temporary effects on one listed building which is within the vicinity of the propose pipeline route. These disturbance effects will be mitigated through implementing best practice construction methods. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Diddlington WTW Resilience

6.3.23 The options assessment identified positive effects from increase resilience of water supplies.

6.3.24 The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. The options assessment identified potential ecological effects on a SSSI, from disturbance and removal of habitats. Mitigation including re-routing the pipeline to avoid the site, or the use of complex directional drilling will reduce effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Great Wratting WTW Resilience

6.3.25 The options assessment identified positive effects from increase resilience of water supplies. The WFD screening identified a potential moderate level of effect during construction. However, following mitigation the Phase 2 WFD assessment concluded there would be no likely effects. Short-term effects relating to visual intrusion, community nuisance, and disturbance of agricultural land during construction were identified. These effects can be mitigated through good construction practices and restoration of land. The option will use resources and generate emissions during construction. The scaled operational CO_2 equivalent per annum for this option is lower than the average.

Table 14: Preferred Plan Summary Results

Options	Option Name	SEA Objectives									Commentary
		Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers	Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards	Strive to become leaders of the natural environment through enhancement of ecological diversity and networks	Protect and enhance landscape character and land quality	Protect and enhance the historic environment and cultural diversity of the region	Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making	Protect community amenity through ensuring operations do not cause nuisance for local communities	Contribute to the local economy and economic growth	Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves	
Extended Plus Demand Mgt Strategy		+	+	+	+	0	-	0	+	+	Positive effects include increased availability of water within the natural environment increasing resilience, benefiting water dependant ecological sites, maintaining an attractive natural landscape, reducing the need for future water supply infrastructure, and allowing customers to understand their water usage. Mitigation measures will be implemented during leakage reduction works to minimise effects on ecology, landscape, the historic environment, and the community.
BHV5	Newmarket RZ to Bury Haverhill RZ Transfer (20Ml/d)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
CLN13a	South Humber Bank RZ to Central Lincolnshire RZ Transfer (31Ml/d)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
CLN14	South Humber Bank RZ to Central Lincolnshire RZ Transfer (6Ml/d)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
CLN15	South Humber Bank RZ to Central Lincolnshire RZ Transfer (Existing)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Unlikely to be other positive or negative effects due to the use of existing infrastructure. The CO_2e is lower than the scaled operational average.
CLN16	South Humber Bank RZ to Central Lincolnshire RZ Transfer	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
CVY1	Newmarket RZ to Cheveley RZ Transfer	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
ESU1	Felixstowe Desalination	-	+	-	0	0	--	0	+	0	Positive effects include increased resilience of water supplies and opportunities for employment. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, and the community. The WFD Phase 2 assessment concluded there would be moderate effects. The effects of brine discharge on water quality and ecology will need to be further investigated once specific project details are known during the design process. A HRA Task II Appropriate Assessment was undertaken to determine effects on European designated sites. It concluded that further assessment is necessary at the lower tier, project-level assessment but it is assumed that appropriate mitigation can be designed to ensure no reasonably foreseeable effects on site integrity. Carbon emissions will be generated during construction and operation. The scaled CO_2e will be higher than the scaled operational average. Use of renewable energy technologies may reduce effects.
ESU8	Bury Haverhill RZ to East Suffolk RZ Transfer (20Ml/d)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
ELY9	North Fenland RZ to Ely RZ Transfer (20Ml/d)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
HPB1	Norwich & the Broads RZ to Happisburgh RZ Transfer	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.

Options	Option Name	SEA Objectives									Commentary
		Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers	Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards	Strive to become leaders of the natural environment through enhancement of ecological diversity and networks	Protect and enhance landscape character and land quality	Protect and enhance the historic environment and cultural diversity of the region	Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making	Protect community amenity through ensuring operations do not cause nuisance for local communities	Contribute to the local economy and economic growth	Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves	
HPB2	Norwich and the Broads WRZ to Happisburgh Transfer (East Ruston/Witton)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, historic environment, landscape, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
NFN4	South Fenland RZ to North Fenland RZ Transfer (20Ml/d)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, and community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
NNR8	Norwich & the Boards RZ to Norfolk Rural North RZ Transfer (5Ml/d)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average. After applying standard mitigation, a Task 2 AA is not required as there will be no likely significant effects on designated sites.
NTM1	Central Lincolnshire RZ to Nottinghamshire RZ Transfer	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
NWM6	Ely RZ to Newmarket RZ Transfer (20Ml/d)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on landscape, the historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
RTC2	Ruthamford South RZ to Ruthamford Central RZ Transfer	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
RTN27	South Lincolnshire RZ to Ruthamford North RZ Transfer (67Ml/d)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
SEX4	East Suffolk RZ to South Essex RZ transfer (15Ml/d)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
SFN4	Ruthamford North RZ to South Fenland RZ Transfer (40Ml/d)	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
SHB2	Pyewipe Water Reuse for non-potable use	0	+	0	0	0	--	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. The scaled CO_2e will be higher than the scaled operational average. Use of renewable energy technologies may reduce effects.
SLN6	Central Lincolnshire RZ to South Lincolnshire RZ Transfer (63Ml/d)	0	+	0	0	0	--	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. The scaled CO_2e will be higher than the scaled operational average. Use of renewable energy technologies may reduce effects.
THT1	Bury Haverhill to Thetford (existing)	0	+	0	0	0	-	0	0	0	Positive effects included resilience of water supplies. There are not likely to be any effects on ecology, landscape, historic environment therefore there will be no mitigation required. The CO_2e is lower than the scaled operational average.
-	Birchmoor WTW	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.

Options	Option Name	SEA Objectives									Commentary
		Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers	Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards	Strive to become leaders of the natural environment through enhancement of ecological diversity and networks	Protect and enhance landscape character and land quality	Protect and enhance the historic environment and cultural diversity of the region	Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making	Protect community amenity through ensuring operations do not cause nuisance for local communities	Contribute to the local economy and economic growth	Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves	
-	Meppershall WTW	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on water quality, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
-	Diddlington WTW	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, historic environment, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.
-	Great Wratting WTW	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on water quality, landscape, and the community. Carbon emissions will be generated during construction and operation. However, due to the small scale of the works this is lower than the scaled operational average.

6.4 Adaptive Strategy

6.4.1 The options for the adaptive strategy are presented in Table 15.

Table 15: Adaptive Strategy

Option ref.	Option name	WRZ
ESU1	Felixstowe Desalination	East Suffolk
ESU2	Ipswich Water Reuse	East Suffolk
NFN1	Kings Lynn Desalination	North Fenland
NFN2	Kings Lynn Water Reuse	North Fenland
NFN3	Fenland Reservoir	North Fenland
RTN1	South Lincolnshire Reservoir (unsupported)	Ruthamford North
RTN2	South Lincolnshire Reservoir (supported)	Ruthamford North
RTN7	Severn Trent Water Import	Ruthamford North

Summary of Results

6.4.2 The summary results for the adaptive strategy are presented in Table 16. More detailed assessments for options within the adaptive strategy can be found in the relevant options assessment appendices (Appendix F – K). The cumulative effects of the adaptive strategy are presented in section 6.8.

6.4.3 The adaptive strategy is likely to have an overall positive effect on delivering reliable and sustainable water supplies that are flexible to cope with future changing growth and demand. Positive effects identified include increased availability and resilience of water supplies for human use; increased availability of water within the natural environment thus increasing resilience, benefiting water dependant ecological sites, and maintaining an attractive natural landscape; reducing the need for future water supply infrastructure; and allowing customers to understand their water usage. The adaptive strategy contains two new reservoir options. Reservoirs will have negative effects associated with landtake and visual intrusion. However, they also have significant opportunities for ecology and recreational enhancement.

6.4.4 Where negative effects were identified in the options assessment, these have been mitigated through the options design process where possible by re-routing pipelines or using directional drilling under sensitive sites and rivers or investigated further through the HRA and WFD processes. Negative effects for options associated with construction are assumed to be mitigated using best practice construction working methods. Minor and major negative effects remain for the following options:

- ESU1 Felixstowe desalination – this option will require a Phase 3 WFD assessment if it is taken forward as the WFD screening and Phase 2 assessment concluded potential for moderate effects on one or more waterbodies during the construction and operational phases. A HRA Task II Appropriate Assessment was undertaken to determine effects on European designated sites. It concluded that further assessment is necessary at the lower tier, project-level assessment but it is assumed that appropriate mitigation can be designed to ensure no reasonably foreseeable effects on site integrity.
- NFN1 Kings Lynn desalination – this option will require a Phase 3 WFD assessment if it is taken forward as the WFD screening and Phase 2 concluded potential for moderate effects on one or more waterbodies. A HRA Task II Appropriate Assessment was undertaken to determine effects on European designated sites. It concluded that further assessment is necessary at the lower tier, project-level assessment but it is assumed that appropriate mitigation can be designed to ensure no reasonably foreseeable effects on site integrity.

- NFN3 Fenland reservoir – this option will require a Phase 3 WFD assessment if it is taken forward as the WFD screening and Phase 2 concluded potential for moderate effects on one or more waterbodies. The option is also expected to have minor negative effects on the surrounding water dependent SSSIs and minor effects on landscape due to changes to the NCA. There are opportunities to improve cycleways and roads affected during their reinstatement. There is also an opportunity to create a reservoir which is a recreational and tourism asset and provides habitat creation.
- RTN1 / RTN2 South Lincolnshire reservoir - the options will have moderate negative effects on WFD objectives and will require a Phase 3 WFD if they are taken forward as WFD screening and Phase 2 assessment concluded potential for moderate adverse effects. The options will also have minor negative effects on the landscape due to the introduction of a new reservoir changing the landscape character. There is also an opportunity to create a reservoir which is a recreational and tourism asset and provides habitat creation. Cycleways and roads could also be enhanced as part of reinstatement works.
- All options will generate GHG emissions during construction and operation.

In relation to GHG emissions, NFN1 and NFN2 have a CO_2 equivalent lower than the average of all the proposed options within the WRMP. The remaining options in the adaptive strategy, ESU1, ESU2, RTN1, RTN2, and NFN3 all have a high CO_2 equivalent compared with other options. There are opportunities to consider innovative energy and material options to reduce emissions, for example, the ESU1 desalination plant could be linked to offshore wind farms with a battery storage facility. The operational CO_2 equivalent for RTN7 was unavailable.

Table 16: Adaptive Strategy Summary Results

Options	Option Name	SEA Objectives									Commentary
		Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers	Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards	Strive to become leaders of the natural environment through enhancement of ecological diversity and networks	Protect and enhance landscape character and land quality	Protect and enhance the historic environment and cultural diversity of the region	Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making	Protect community amenity through ensuring operations do not cause nuisance for local communities	Contribute to the local economy and economic growth	Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves	
ESU1	Felixstowe Desalination	-	+	-	0	0	--	0	+	0	Positive effects include increased resilience of water supplies and opportunities for employment. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, and the community. The WFD Phase 2 assessment concluded there would be moderate effects. The effects of brine discharge on water quality and ecology will need to be further investigated once specific project details are known during the design process. A HRA Task II Appropriate Assessment was undertaken to determine effects on European designated sites. It concluded that further assessment is necessary at the lower tier, project-level assessment but it is assumed that appropriate mitigation can be designed to ensure no reasonably foreseeable effects on site integrity. Carbon emissions will be generated during construction and operation. The scaled CO_2e will be higher than the scaled operational average. Use of renewable energy technologies may reduce effects.
ESU2	Ipswich Water Reuse	0	+	0	0	0	--	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, and the community. A HRA Task II Appropriate Assessment was undertaken to determine effects on European designated sites. It concluded that, following mitigation measures, the option is unlikely to result in adverse effects on the integrity of the European sites or their interest features. Carbon emissions will be generated during construction and operation. The scaled CO_2e will be higher than the scaled operational average. Use of renewable energy technologies may reduce effects.
NFN1	King's Lynn Desalination	-	+	-	0	0	-	0	+	0	Positive effects include increased resilience of water supplies and opportunities for employment. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, and the community. The WFD Phase 2 assessment concluded there would be moderate effects. A HRA Task II Appropriate Assessment was undertaken to determine effects on European designated sites. It concluded that further assessment is necessary at the lower tier, project-level assessment but it is assumed that appropriate mitigation can be designed to ensure no reasonably foreseeable effects on site integrity. Carbon emissions will be generated during construction and operation. Carbon emissions will be generated during construction and operation. The scaled CO_2e will be lower than the scaled operational average.
NFN2	King's Lynn Water Reuse	0	+	0	0	0	-	0	0	0	Positive effects include increased resilience of water supplies. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, historic environment, and the community. HRA Task II AA required if this option is taken forward as major adverse will likely remain post mitigation. A HRA Task II Appropriate Assessment was undertaken to determine effects on European designated sites. It concluded that, following mitigation measures, the option is unlikely to result in adverse effects on the integrity of the European sites or their interest features. Carbon emissions will be generated during construction and operation. The scaled CO_2e will be lower than the scaled operational average.
NFN3	Fenland Reservoir	-	+	-	-	0	--	-	+	+	Positive effects include increased resilience of water supplies and recreational opportunities which may provide opportunities for employment. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, and the community. The WFD Phase 2 assessment concluded there would be moderate effects. Carbon emissions will be generated during construction and operation. The scaled CO_2e will be higher than the scaled operational average. Use of renewable energy technologies may reduce effects. There is significant opportunity to benefit ecology and recreation through providing wetland and other habitat creation and recreational facilities at the reservoir. The Task II AA undertaken concluded that no significant effects are reasonably foreseeable on the integrity of the European sites.
RTN1	South Lincolnshire Reservoir (unsupported)	-	+	0	-	0	--	0	+	+	Positive effects include increased resilience of water supplies and recreational opportunities which may provide opportunities for employment. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, historic environment, and the community. The WFD Phase 2 assessment concluded there would be moderate effects. Carbon emissions will be generated during construction and operation. The scaled CO_2e will be higher than the scaled operational average. Use of renewable energy technologies may reduce effects. There is significant opportunity to benefit ecology and recreation through providing wetland and other habitat creation and recreational facilities at the reservoir.
RTN2	South Lincolnshire Reservoir (supported)	-	+	0	-	0	--	0	+	+	Positive effects include increased resilience of water supplies and recreational opportunities which may provide opportunities for employment. Mitigation measures will be implemented during construction to reduce effects on water quality, ecology, landscape, historic environment, and the community. The WFD Phase 2 assessment concluded there would be moderate effects. Carbon emissions will be generated during construction and operation. The scaled CO_2e will be higher than the scaled operational average. Use of renewable energy technologies may reduce effects. There is significant opportunity to benefit ecology and recreation through providing wetland and other habitat creation and recreational facilities at the reservoir.
RTN7	Severn Trent Water Import	0	+	0	0	0	?	0	0	0	Positive effects include increased resilience of water supplies. There are no mitigation measures implemented as there are no expected effects as the options uses existing infrastructure. Carbon emissions will be generated during the operational phase, however as this is an existing transfer it is unlikely it will require increased resource use. The scaled CO_2e is unknown as operational value was not available at time of assessment.

6.5 Mitigation and Enhancement

6.5.1 As described in section 5.5, high level mitigation and enhancement measures were identified during the options assessment and are recorded in a Mitigation Register in Appendix L. The majority of negative effects identified were mitigated (or can be mitigated during detailed design and construction) by re-routing pipelines, use of directional drilling, and implementation of good practice construction methods. The remaining mitigation measures and enhancement opportunities are presented in Table 17. Anglian Water is committed to delivering all mitigation measures identified by the SEA and HRA.

Table 17: Mitigation and Enhancement Measures

Option name and reference	Mitigation / Enhancement Measure
Preferred Plan	
Felixstowe Desalination (ESU1)	The WFD Phase 1 and Phase 2 assessment concluded potential for moderate effects on one or more waterbodies during the construction and operational phases. A Phase 3 WFD assessment will therefore be required if this option is taken forward. A HRA Task II Appropriate Assessment was undertaken to determine effects on European designated sites. It concluded that further assessment is necessary at the lower tier, project-level assessment but it is assumed that appropriate mitigation can be designed to ensure no reasonably foreseeable effects on site integrity. The option has a high CO_2 equivalent compared with other options. There is an opportunity to consider innovative energy solutions during the detailed design, such as linking the desalination plant to offshore wind farms with a battery storage facility.
Adaptive Strategy	
Felixstowe Desalination (ESU1)	As above for the Preferred Plan.
King's Lynn Desalination (NFN1)	The WFD Phase1 and 2 assessment concluded potential for moderate effects on one or more waterbodies during the construction and operational phases. A Phase 3 WFD assessment will therefore be required if this option is taken forward. A HRA Task II Appropriate Assessment was undertaken to determine effects on European designated sites. It concluded that further assessment is necessary at the lower tier, project-level assessment but it is assumed that appropriate mitigation can be designed to ensure no reasonably foreseeable effects on site integrity.
Fenland Reservoir (NFN3)	The WFD Phase 1 and 2 assessment concluded potential for one or more waterbodies during the construction and operation phases. A Phase 3 WFD assessment will therefore be required if this option is taken forward. Incorporate landscape and habitat creation to reduce effects on landscape character and ecology. The option has a high CO_2 equivalent compared with other options. There is an opportunity to consider innovative energy solutions during the detailed design, such as linking the desalination plant to offshore wind farms with a battery storage facility. There is significant opportunity to benefit ecology and recreation through providing wetland and other habitat creation and recreational facilities at the reservoir.

Option name and reference	Mitigation / Enhancement Measure
South Lincolnshire Reservoir (unsupported) (RTN1)	Incorporate landscape and habitat creation to reduce effects on landscape character and ecology. The option has a high CO_2 equivalent compared with other options. There is an opportunity to consider innovative energy solutions during the detailed design, such as linking the desalination plant to offshore wind farms with a battery storage facility. There is significant opportunity to benefit ecology and recreation through providing wetland and other habitat creation and recreational facilities at the reservoir. The WFD Phase 1 and Phase 2 assessment concluded potential for moderate effects on one or more waterbodies during the construction and operational phases. A Phase 3 WFD assessment will therefore be required if this option is taken forward.
South Lincolnshire Reservoir (supported) (RTN2)	As above for option RTN1.

6.6 Cumulative Effects

6.6.1 Table 18 presents the cumulative assessment for the Preferred Plan, and the adaptive strategy. The cumulative effects assessments for the Baseline Least Cost Plan and the Alternative Least Cost Plan are presented in Appendix N. The relationship of the WRMP to other plans and programmes and the project level, and potential in-combination effects is included in section 7.2.

Table 18: Cumulative Effects Assessment

WRMP SEA Objectives	WRMP (Preferred Plan)	Adaptive Strategy	Comments
Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers	+	-	The Preferred Plan is likely to have a minor positive effect on the protection of water sources and their quality as it could reduce future abstractions, retaining more water in the natural environment. NEP options contained in the WRMP will help prevent future water quality deterioration and protect water sources. The risk of disease transmission was also concluded to be low. The adaptive strategy is likely to have minor negative cumulative effects as the strategic supply side options included in the adaptive strategy may have effects on water quality as identified in the WFD assessment.
Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards	+	+	The Preferred Plan and Adaptive Strategy increase the capacity of water supplies through new resources or transfers from areas of surplus to areas of deficit. The Preferred Plan takes this a step further by including the demand management strategy extended plus. The demand strategy contains options to conserve and increase water efficiency which will reduce water demand and retain more water in the natural environment, therefore enhancing resilience during drought conditions. The adaptive strategy includes large supply side options which will provide more resilience in the future for water supplies.
Deliver reliable and sustainable water supply that is flexible to cope with changing growth in demand and enable economic growth	++	+	The Preferred Plan and Adaptive Strategy will deliver a sustainable water supply to meet future demand and growth. The Preferred Plan would also have wider benefits and additional flexibility.
Strive to become leaders of the natural environment through enhancement of ecological diversity and networks	+	+	The Preferred Plan and Adaptive Strategy are likely to have a minor positive cumulative effect on ecology. The retention of water in the natural environment from the demand strategy will benefit water dependent ecological sites and WFD objectives. The NEP options included in the WRMP will also provide ecological benefits. Overall, the options within the Preferred Plan and Adaptive Strategy are spread across WRZs (meaning there aren't major effects focussed in one area) and the majority of land that would be disturbed (e.g. for pipeline laying) will be restored to its original or better condition. Options have been re-routed, where possible, to avoid designated sites. Reservoir options contained in the adaptive strategy have significant opportunities to include ecological enhancement.
Protect and enhance landscape character and land quality	0	0	Options within the Preferred Plan and Adaptive Strategy are spread across WRZs (meaning there aren't major effects focussed in one area) and the majority of land disturbed (e.g. for pipeline laying) will be restored to its original or better condition. The further retention of water resulting from the demand strategy in the Preferred Plan will lead to a more attractive landscape through providing a protective mechanism against drought. The adaptive strategy will change the landscape character by introducing large infrastructure such as desalination plants and reservoirs. However, reservoir options have significant opportunities for landscape and habitat benefits.
Protect and enhance the historic environment and cultural diversity of the region	0	0	Overall, the Preferred Plan and Adaptive Plan are likely to have a neutral cumulative effect on the historic environment. Options have been re-routed, where possible, to avoid heritage assets.
Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making	-	--	The Preferred Plan and Adaptive Plan will use resources and materials and generate greenhouse gas emissions. The majority of the options in the Preferred Plan have scaled CO_2e figures lower than the average and therefore perform better in terms of CO_2 emissions. The adaptive strategy contains some larger supply options that have high CO_2e figures (new reservoir, desalination). This also provides an opportunity to consider innovative energy solutions and materials selection to reduce energy demand and CO_2 emissions.

WRMP SEA Objectives	WRMP (Preferred Plan)	Adaptive Strategy	Comments
Protect community amenity through ensuring operations do not cause nuisance for local communities	0	0	The Preferred Plan and Adaptive Strategy will have temporary nuisance effects during construction works, with mitigation measures implemented to reduce effects. However, during operation there are unlikely to be cumulative nuisance effects.
Contribute to the local economy and economic growth	+	+	The Preferred Plan and Adaptive Strategy will create jobs during construction (site construction workers, material and equipment suppliers, indirect hospitality and retail) and potential limited jobs during operation. The Preferred Plan and Adaptive Strategy will cause short-term disruption to some businesses through construction works affecting freight/commercial vehicle travel and nuisance outside business premises (pipeline laying). The Preferred Plan and Adaptive Strategy will contribute to the local economy and economic growth by providing secure, reliable, and resilient water supply for domestic and non-domestic use.
Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves	+	+	The Preferred Plan and Adaptive Strategy are likely to have a minor positive effect on connecting customers to the environment. The demand strategy in the Preferred Plan allows customers to understand the water use and how this effects the environment through smart meters and efficiency measures. The adaptive strategy has the most potential to offer recreational benefits through the new reservoir creation if these are included in future designs.

7 Monitoring

7.1 Monitoring Proposals

7.1.1 Monitoring the negative effects of implementing the WRMP is an essential on-going element of the SEA process. Monitoring helps ensure that the identified SEA objectives are being achieved and allows for early identification of unforeseen adverse effects and thus appropriate remedial action can be taken. Monitoring will be an important requirement to measure performance and ensure the WRMP is being successfully implemented. The DCLG guidance states that it is inappropriate to monitor everything and monitoring proposals should be focused on the following areas:

- Identify potential breaches of international, national, or local legislation, recognised guidelines, or standards.
- Actions which may give rise to irreversible damage, with a view to identifying trends before such damage occurs.
- Where there was any uncertainty in the SEA and where monitoring would enable prevention or mitigation measures to be taken.

Negative effects or uncertainty identified during the SEA process focused on effects on ecology, carbon emissions, landscape, and the historic environment. Table 19 presents the SEA monitoring proposals for the WRMP. The indicators have been adapted to those developed as part of the SEA Framework in Table 8. Indicators have also been chosen to record the potential benefits that the WRMP achieves (e.g. recreational assets created, waste recycle/reused).

Table 19: Monitoring Proposals

SEA Objective	Indicators	Timescale
Protect water sources and their quality to deliver a reliable, clean, and safe water supply for customers	Ecological status of water bodies Chemical status of water bodies Achievements against WFD objectives	Annually
Protect and enhance the resilience of water supplies and the environment to natural and man-made hazards	Number of supply disruptions per annum	Annually
Deliver reliable and sustainable water supply that is flexible to cope with changing growth in demand and enable economic growth	% of people with deficits in 2045	For each WRMP
Strive to become leaders of the natural environment through enhancement of ecological diversity and networks	% of habitat creation or existing habitat enhancement Area (hectares) and number of statutory and non-statutory ecological sites that will be harmed or lost to WRMP options Area of both blue and green infrastructure created River flow levels SSSI monitoring at reservoirs	Every five years Annually Annually
Protect and enhance landscape character and land quality	Number of WRMP options including additional landscaping. Area of agricultural land (by grade) lost due to the need for water resource options/infrastructure Number of geological sites affected	Every five years

SEA Objective	Indicators	Timescale
Protect and enhance the historic environment and cultural diversity of the region	Number of historic assets damaged by a WRMP option Number of historic assets enhanced by options	Every five years
Lead by example on reducing greenhouse gas emissions and conserving natural resources by making decarbonisation and resource efficiency central to decision-making	Reduction of greenhouse gas emissions per Ml/d Energy use from new operations and change in energy use per Ml/d % energy supplied by renewable sources Reduction of operational and capital carbon emissions % of A-Rated, recycled, reused material used in infrastructure options; Number of options that utilise existing infrastructure; Volume of waste generated Waste disposal method by %	Annually
Protect community amenity through ensuring operations do not cause nuisance for local communities	Number of complaints Number of road/PRoW closures / diversions Number of, and attendance levels at public engagement events	During project construction
Contribute to the local economy and economic growth	Number of tourism assets created Number of apprenticeships	Every five years
Connect customers to the environment and provide recreational benefits through new, or enhancement to existing, water parks and nature reserves	Number, type, and area of community assets created Km of new footpath/cycleways	Every five years

7.2 Links to other tiers of Plans, Programmes, and the Project Level

7.2.1 The WRMP and its options have been assessed at a high strategic level. The options that form the WRMP (the Preferred Plan) will be subject to the formal planning process and may require an Environmental Impact Assessment under the Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (as amended). Requirements for EIA will be determined on an option by option basis. As part of this process more detailed option specific mitigation measures will be developed.

7.2.2 The large supply options proposed under the adaptive strategy (e.g. new reservoirs and desalination plants) may be classified as ‘Nationally Significant Infrastructure’ and would therefore be required to go through the Development Consent Order planning route. As mentioned previously the adaptive strategy has been identified to enable ‘pre-planning’ activities for these options so that they are available for delivery if they are selected in WRMP 2024.

7.2.3 The WRMP supports several local, regional, and national plans and programmes. It will have a direct link to water resources and water supply plans and policies, for example in Local Plans. The development of WRMP has taken future population growth into account and as such will support Local Plan policies on housing and development. The WRMP will also have indirect links to plans relating to health and well-being, housing, and the environment.

7.2.4 The WRMP will also have direct links to other Anglian Water plans such as the Drought Management Plan and other water company's plans. The WRMP will interact with and support the emerging Anglian Water Drought Plan. The Drought Plan looks at demand side management actions and supply side management actions for ensuring water supply during drought conditions. Demand management options in the Drought Plan such as meter optants and leakage reduction are also contained in the WRMP but for the Drought Plan meter optants would be focussed in areas at most risk of impact of drought, and leakage reduction works would be increased during periods of potential or actual drought. The Drought Plan also includes measures such as hosepipe bans and non-essential use bans. The Drought Plan also includes supply side schemes such as desalination and water reuse, however, specific details in terms of locations are not defined. Eight supply side schemes that would require a drought permit or drought order are defined and include increasing abstraction and changing current conditions attached to abstractions to allow Anglian Water to take more of its licensed abstraction quantities.

7.2.5 Links are possible with other water company's plans and strategies, particularly where water trading and transfers cross water company boundaries. A trade with Severn Trent Water is being considered as part of the adaptive strategy. A number of the Anglian Water WRMP options are within 20km of a boundary with a neighbouring water company. However, as the majority of the options are transfers using existing abstractions, in-combination effects are likely to be low because water sources are not immediately shared.

7.2.6 The WRMP covers the 25-year period from 2020 to 2045. Through Water Resources East (WRE), Anglian Water has also carried out longer term planning (beyond 2045) at the regional level. The WRE Programme is a long-term water resources strategy to 2100. The purpose of the WRE programme is to develop a reliable, affordable, and sustainable system of water supply in the East of England which is resilient to the effects of climate change, growth, and multi-season drought. The WRMP is aligned with the WRE preliminary regional strategy as outlined below. The WRE strategy includes:

- New reservoir storage capacity, capturing high winter flows – the WRMP provides the flexibility to deliver new reservoir storage capacity in the region in the future, and distribute resources across the region.
- Treated water imports – Anglian Water has considered import options in the decision-making approach and will continue to assess these working towards WRMP 2024.
- A network of strategic transfers, to share resources between companies and across sectors – the WRMP delivers a network of strategic transfers across the region.
- Desalination and water reuse at key locations on the east coast – the WRMP includes water reuse in AMP7 and the development of desalination in AMP9. Anglian Water will continue to assess these options working towards WRMP 2024.

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