



Essex & Suffolk Water - Water Resources Management Plan 2024

Environmental Report

October 2024

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Abbreviations

Abbreviation	Explanation
AA	Appropriate Assessment
ACWG	All Companies Working Group
AMP	Asset Management Plan
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
ASR	Aquifer Storage and Recovery
BAP	Biodiversity Action Plan
BAU+	Business as Usual Plus
BMV	Best and Most Versatile
BNG	Biodiversity Net Gain
BVP	BVP
CAMS	Catchment Abstraction Management Strategy
CEMP	Construction Environmental Management Plan
CEMP	Construction Environmental Management Plan
CROW	Countryside and Rights of Way
CTMP	Construction Traffic Management Plan
DCLG	Department for Communities and Local Government
DLUHC	Department for Levelling Up, Housing and Communities
DO	Deployable Output
DYAA	Dry Year Annual Average
DYCP	Dry Year Critical Period
EA	Environment Agency
EBSD	Economics of Balancing Supply and Demand
EC	European Commission
EIA	Environmental Impact Assessment
ENCA	Enabling a Natural Capital Approach
ENG	Environmental Net Gain
ESA	Ecosystem Services Assessment
ESW	Essex and Suffolk Water
EU	European Union
FRA	Flood Risk Assessment
GHG	Greenhouse Gas
GWDTE	Groundwater Dependent Terrestrial Ecosystem
HED	High Environmental Destination
HLS	High Level Screening
HMWB	Heavily Modified Water Body

Abbreviation	Explanation
HoF	Hands Off Flows
HRA	Habitats Regulations Assessment
HRSR	Habitat Regulations Sustainability Reductions
HS2	High Speed 2
IEA	Integrated Environmental Assessment
INNS	Invasive Non-Native Species
LNR	Local Nature Reserve
LSE	Likely Significant Effects
MCZ	Marine Conservation Zone
MPA	Marine Protection Zone
NCA	Natural Capital Assessment
NChA	National Character Area
NEA	Natural Ecosystem Assessment
NEA	National Ecosystem Assessment
NERC	Natural Environment and Rural Communities
NNR	National Nature Reserve
NO ₂	Nitrogen Dioxide
NPPF	National Planning Policy Framework
NPV	Net Present Value
NWL	Northumbrian Water Limited
ODPM	Office of the Deputy Prime Minister
Ofwat	Office of Water Services
PCC	Per Capita Consumption
PM ¹⁰	Particulate Matter
PRoW	Public Right of Way
PWS	Public Water Supplies
RBD	River Basin District
RBMP	River Basin Management Plan
rdWRMP24	Revised Draft Water Resources Management Plan 2024
RIGS	Regionally Important Geological Site
ROWIP	Rights of Way Improvement Plan
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Urban Drainage Systems
ToLS	Test of Likely Significance
TUBS	Temporary Use Bans
UK	United Kingdom
UKWIR	United Kingdom Water Industry Research
WAFU	Water Available for Use
WFD	Water Framework Directive

Abbreviation	Explanation
WINEP	Water Industry National Environment Programme
WR	Water Reservoir
WRE	Water Resources East
WRMP	Water Resource Management Plan
WRNF	Water Resources National Framework
WRPG	Water Resources Planning Guideline
WRSE	Water Resources South East
WRZ	Water Resource Zone
WTW	Water Treatment Works

Executive summary

Introduction

Essex & Suffolk Water (ESW) is part of Northumbrian Water Limited (NWL) and provides water services to 1.8 million people, operating in two areas: one serving parts of Norfolk and Suffolk, and the other serving parts of Essex and Greater London. The scope of this final Water Resources Management Plan (WRMP)24 and accompanying documents refer specifically to the two ESW supply areas in the East of England. A separate WRMP has been produced for the Northumbrian Water region.

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 Guideline (WRPG). WRMPs should ensure a secure and sustainable supply of water, with the objective 'to efficiently deliver resilient, sustainable water resources for your customers and the environment, both now and in the long term.'

The WRPG states that in developing a WRMP in England and Wales, water companies should screen for a Strategic Environmental Assessment (SEA) and carry out a full SEA if required.

According to the SEA Regulations Part 2 (5) SEA Regulations:

'the responsible authority shall carry out, or secure the carrying out of, an environmental assessment, in accordance with Part 3 of these Regulations, during the preparation of that plan or programme and before its adoption or submission to the legislative procedure.'

And Schedule 2 (6) confirms that the list of topics to be considered includes; biodiversity, flora and fauna, population and human health, soil, water, air, climatic factors, material assets, cultural heritage, and landscape. The SEA also considers the inter-relationship between these topics.

The SEA process involves five stages; Stage A through to Stage E as outlined below:

- A. Setting out the context and objectives, establishing the baseline and deciding on the scope
- B. Developing and refining alternatives and assessing effects
- C. Preparing the Environmental Report
- D. Consulting on the draft plan or programme and the Environmental Report
- E. Monitoring implementation of the plans or programme

The SEA for ESW's WRMP24 has completed Stage D of the SEA process. Therefore, this final Environmental Report has been issued alongside the final WRMP24 .

The SEA and Environmental Report has been completed for ESW WRMP24, including assessment of demand packages and individual supply side options and the plans as a whole, in accordance with the requirements of the SEA Directive.

For the ESW WRMP24 environmental assessments, including the SEA and supporting assessments of Habitats Regulations Assessment (HRA), Biodiversity Net Gain (BNG), Invasive Non-Native Species (INNS), Natural Capital Assessment and Water Framework Directive (WFD) assessments, have been completed. The assessments have been used by ESW to aid the decision-making on mitigation requirements, option development, and the selection of preferred options within ESW's WRMP24, with the aim of developing a WRMP that meets legislative requirements and provides environmental gain.

Essex & Suffolk Water's Final WRMP24

ESW have adopted a planning approach that uses least-cost optimisation as well as broader criteria to develop a Best Value Plan (BVP) (ESW's 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.

The SEA and other environmental assessments undertaken were used as part of the decision-making criteria on environmental and social impacts of the plan to develop the final WRMP24. Options that were rejected are outlined within the Rejection Register, this includes options that were rejected or refined on environmental grounds, which can be found in Appendix 2 of ESW's WRMP24 Options Appraisal Technical Report.

The strategy for water resource management in the Essex and Suffolk region:

- 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 ESW 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.

All the broad supply option types that were initially considered included:

- **Aquifer storage and recovery (ASR)** – 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).
- **Borehole abstraction** – Usually a borehole which abstracts water from an aquifer which then goes to a treatment works.
- **Effluent re-use** – effluent is treated and discharged into rivers 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 banded reservoirs (i.e., not within a valley) with piped transfers in and out of supply.

- **Transfers** – transfers include asset transfers, and bulk transfers within/into region, either of raw or treated water.

The broad demand management option package types that were considered include:

- **Metering consumption reduction** – involves reducing water consumption by installing meters in currently unmeasured properties. It can include compulsory metering for household and non-household uses, smart metering, and other metering such as optant metering.
- **Other consumption reduction** – involves reducing household and non-household consumption in ways other than metering.
- **Tariffs/fees** – introduction of special fees, changes to existing measured tariffs, introduction of special tariffs for specific users.
- **Water recycling** – rainwater harvesting/grey water re-use for new or existing household and non-household.
- **Water efficiency measures** – water use audit and inspection, awareness campaigns, sponsoring water efficiency enabling activities by others, home visits to reduce plumbing losses, and the promotion of water saving devices.
- **Loss reduction** – involves reducing distribution system leakage, including service reservoir losses and trunk main leakage, as well as reducing customer supply pipe leakage. Leakage reduction options include capital investments to both the company-side and customer-side assets and operational improvements and policy changes. Examples include pressure management, mains renewal, increasing efficiency of active leakage control, etc. Customer supply pipe leakage reduction typically includes increased customer engagement/education or incentives to repair their supply pipes between the distribution main and the property.
- **Non-household water efficiency activity** – comprises 13 water efficiency options within six categories:
 - Information Provision – Customer side leakage education, customer specific alerts, and free water efficiency assessment.
 - Infrastructure and Leak Investigation – Leak Investigation, rain/greywater reuse, find & fix leaky fixtures, toilet replacements, and landscaping redesign.
 - Water Efficiency Solutions for Domestic-Type Use – Domestic use self-serve, and individual tailored audits.
 - Water Efficiency Solutions for Mixed-Type Use – Free water efficiency visit.
 - Water Efficiency Consultancy for Industry – This option will start with the highest water users and work downward in order to better understand water use in industry, identify areas where water is not being used efficiently, and provide suggestions and solutions to reduce water waste.
 - Golf Course Water Efficiency – Supporting golf courses to use water more efficiently through introducing rainwater harvesting and other smart irrigation solutions to reduce consumption of potable use, supplying courses with an irrigation audit where options are explored to reduce their consumption, and undertaking water saving visits for clubs and hospitality venues.
- **Smart enhancement for water efficiency** – comprises eight water efficiency options:
 - Flow restrictor install along with smart meter install – compulsory/opt out.
 - Education through engagement on door step at point of meter install.
 - Education through leave behind at point of install.
 - Leak repair (toilet) at point of install.
 - Leak repair (taps, boiler overflow) at point of install.

- Leak check at point of install – no repair completed.
- Water saving product installation at point of install – tap inserts, shower timer etc.
- Water saving visit at point of install for high water using properties.

Environmental Baseline

The Scoping Report included a review of current baseline information for environment and socioeconomics within the broader Water Resources East (WRE) region, which contains the ESW WRMP24 geographical area. For this Environmental Report, we have amended the initial baseline review to include data more specific to the ESW WRMP24 supply region, where available. The complete baseline information with supporting maps is presented in Appendix D, however a summary of the baseline for each of the SEA Directive topics is provided below:

- **Biodiversity, flora, and fauna** – The ESW region overlaps with numerous sites designated and managed for their biodiversity values. This includes Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) in the UK's national site network (previously part of the Natura 2000 network under the European Union (EU) Habitats¹ and Birds² Directives), Ramsar sites (Wetlands of International Importance), Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs). Marine Protected Areas (MPAs) and Marine Conservation Zones (MCZs) are also present along the coast of areas covered by the Essex and Suffolk region. This region is rich in species and habitat diversity. Important biodiversity is present both within designated protected areas and priority habitats across the wider landscape including deciduous woodland, and wetland, coastal and estuarine habitats, and species.
- **Water** – WRE, and therefore the ESW supply region, is one of the driest areas in the UK and is classed as an area with serious water stress³. Local population growth, agriculture, and industry are expected to continue driving increases in demand, while climate change will pose challenges for the already limited supply. The region contains a number of nationally and internationally important wetlands and other water-dependent habitats. Most of the ESW supply area falls within the Anglian river-basin district, with a small area in the extreme west, predominantly the river Lea catchment, falling within the Thames River Basin District (RBD). Water bodies within the Anglian RBD are mostly affected by pollution from rural areas, pollution wastewater and pollution from towns, cities, and transport, as well as physical modifications. Within the Thames RBD, physical modifications, pollution from towns, cities and transport and pollution from wastewater affect the highest proportions of water bodies.
- **Flood risk** – Within the ESW region there is a risk of flooding from various sources, including coastal waters, surface water, groundwater, and reservoirs. The South Essex Flood Risk area is considered significantly at risk of local flooding. Climate change is expected to cause the flood risk to increase, due to more frequent extreme weather events and sea level rise. Nearly 30% of the land mass in the region already lies below sea level.
- **Soil** – The ESW region as part of the wider WRE region is a hub for agriculture with cereal and livestock grazing being the predominant type of farming. Agricultural land is classified on a scale of 1 to 5 where 1 is the highest quality and 5 is the lowest. The agricultural land

¹ The Council of the European Communities (1992). Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. *Official Journal of the European Communities*. Available at: [The Habitats Directive - Environment - European Commission \(europa.eu\)](#).

² The European Parliament and the Council of the European Union (2009). Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds. *Official Journal of the European Union*. Available at: [EUR-Lex - 32009L0147 - EN - EUR-Lex \(europa.eu\)](#).

³ Environment Agency (2013). Water Stressed Areas – Final Classification. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf

classification of the region is predominately of Grade 2 and Grade 3 with pockets of urban and non-agricultural land as shown in Appendix D. There are significant areas with Grade 1, particularly around north Cambridgeshire and South Lincolnshire. The East of England has a significant number of landfill sites with potential to contaminate soils. Currently, there are approximately 355 authorised landfill sites across the WRE region.

- **Air** – Air quality in the WRE area and therefore the ESW supply region is varied and there are certain areas with higher concentrations of air pollutants likely to be associated with urbanisation, transport, or business activities. Air Quality Management Areas (AQMAs) are declared where the national air quality objectives are not being met⁴. A high proportion of the local authorities within the ESW supply region contain at least one AQMA and are predominately designated for Nitrogen dioxide (NO₂) and Particulate Matter (PM¹⁰)⁵. There is a total of 42 AQMAs in the Essex and Suffolk supply area.
- **Climatic factors** – Like the rest of the UK, the East of England (which includes the ESW region) is expected to experience warmer temperatures under climate change, particularly in the summer months⁶. Annual precipitation is expected to decrease overall, with a small increase in winter but a larger decrease in summer⁷. These climate changes will exacerbate water stress in the ESW region. Extreme weather events are also predicted to occur more frequently as a result of climate change, increasing water-related risks such as flooding and drought. Based on information from the local authorities within the ESW region.
- **Population, human health and economy** – ESW is part of NWL and provides water services to 1.8 million people, operating in two areas: one serving parts of Norfolk and Suffolk, and the other serving parts of Essex and Greater London (see green areas in Figure 3.1 for complete WRE extent overview. The extent of the ESW region is shown on this figure). Human settlements in these counties are comprised of a few moderately large cities with many smaller towns, villages, and hamlets. Population age distribution within the ESW region is similar to the UK average – with an overall aging population trend predicted over the next 40 years – and ethnicity is predominately White with larger proportions of Black, Asian and Mixed ethnicities in urban areas compared to rural areas of the region. Public health in Eastern England is generally considered better than the UK average, reflected through various indicators including life expectancy. Eastern England contributes around 10% of the total UK economy, and as with the rest of the UK, the service sector dominates employment. Economic deprivation is considered low across most of the region, but with some small areas where it is higher.
- **Historic environment** – The WRE region and the ESW supply areas has a rich cultural heritage, with numerous designated heritage assets including listed buildings, scheduled monuments, conservation areas, registered parks and gardens, and registered battlefields. There is also potential for currently unidentified heritage assets and archaeological remains to be present within the region.
- **Landscape** – The landscape in the ESW region is comprised of lowlands, small hills, and a long stretch of coastline with picturesque seaside villages. Agriculture dominates the landscape in rural areas. In addition, the WRMP region contains some significant landscape areas. It partially overlaps The Broads National Park, and the Suffolk Coast and Heath Natural Character Area defines the entire coastal region of Suffolk.
- **Material assets** – Significant transport infrastructure in the ESW supply region includes London Stansted International Airport; the UK's busiest container port, Felixstowe; the Ports of Ipswich and Harwich; and the M1 motorway which passes through the wider WRE region.

⁴ Defra (2022), "National air quality objectives and European Directive limit and target values for the protection of human health", Available at: [National_air_quality_objectives.pdf \(defra.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/101049/national-air-quality-objectives.pdf)

⁵ Defra List of Local Authorities with AQMAs (2022). Available at: <https://uk-air.defra.gov.uk/aqma/list>

⁶ RMetS (2020). State of the UK Climate. Available at: <https://rmetsonline.wiley.com/doi/epdf/10.1002/joc.6726>

⁷ Met Office UKCP18 (2022). Available at: <https://ukclimateprojections-ui.metoffice.gov.uk/>

Several other main trunk routes and major roads are also present. In terms of resource use and waste, the recycling rate for Eastern England is the second highest of regions in England.

- **Natural capital** – The WRE region contains all eight of the broad habitat types included within the UK's National Ecosystem Assessment (NEA), with farmland comprising the largest land cover type (73.3%), and urban (13.5%) and woodland (6.2%) habitats also making up a substantial portion of the land cover. These stocks of natural capital support a broad range of ecosystem services, providing benefits to society such as hazard prevention, climate regulation and opportunities for recreation, among others.

It is recognised that the baseline conditions set out here could change in response to future key trends and decision-making. The key trends that have been identified, and are considered likely to continue, potentially resulting in changes to baseline conditions for the ESW region, are outlined in Section 3.4 'Future Baseline'.

Environmental Assessment Methodology

As part of the WRE plan-making and WRMP development processes, ESW undertook modelling to identify areas with a surplus or deficit of water supply. For areas with deficits, ESW 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 such as installing smart meters, reducing leakage, and investing in water efficiency.
- Supply options – options that will provide a water supply to customers such as transfers, maximising existing resources, trading, tankering, and new resources.

ESW has been working with regional stakeholders and neighbouring water companies to identify the best options to include as part of the WRE Regional Plan and in the company's WRMP24. The resulting final WRMP24 is a mix of supply and demand management option packages. Demand management options are likely to have the least significant environmental effects, however on their own are not sufficient to meet the water deficits forecast for the region. Therefore, supply options are also needed. The purpose of this Environmental Report is to review the feasible options for the final WRMP24 and reasonable alternatives, to identify any potential effects (positive and negative). This has been enabled through the following Environmental Assessment process:

- A high-level environmental screening assessment around ecology, historic environment, water, landscape and community environmental topics.
- Detailed options-level assessments
 - SEA
 - HRA
 - WFD
 - Natural Capital Approach (NCA)
 - BNG
 - INNS assessments.
- Programme Appraisal, including cumulative and in-combination effects for SEA, HRA, WFD, Natural Capital, BNG, and INNS.

All assessments have been undertaken on concept designs of options. The assessments had both a temporal and geographical scope. The temporal scale of effects was considered based on whether the effect would be permanent or temporary, and the duration of the effect across the entirety of the WRMP planning horizon, including the construction and operational phases

within the period. The assessments using GIS data included a buffer around the plan area to capture additional receptors (such as designated sites). For physical options, the ESW Region has been determined as the preferred geographical scope of the assessments, although impacts on receptors outside of the ESW region were also considered as/where identified.

The results of the assessments, including mitigation and monitoring currently proposed, are outlined in Sections 8 and 9 of the Environmental Report (this document). Such aspects will be re-visited at a project level, as the projects progress from concept, through detailed feasibility and detailed design.

Summary of Supply and Demand SEA Results

This section reports the findings of the assessment of the options selected as part of the Best Value Plan, Alternative Plans and Adaptive Programmes. Other feasible options have been assessed and the results of these assessments are summarised in Appendix E. This section reports the likely significant effects, on the SEA objectives, for construction and operation phases for all selected options.

Construction

During the construction phase, significant residual negative effects are anticipated for SEA objectives for 13 of the 18 options. None of the options have anticipated significant residual positive effects to SEA objectives during construction.

Nine options are anticipated to have significant residual negative effects to Biodiversity objectives during construction. At this stage, this is based on HRA Test of Likely Significance (ToLS) and Appropriate Assessment (AA) results. For some options, negative effects to the SEA objective for biodiversity cannot be ruled out and further investigation is required when a greater level of design detail is available. Additionally, further mitigation may be detailed at this future stage. Other construction phase significant effects are related to the Soil objective 2.1, with one option anticipated to have significant residual negative effects and are related to potential effects due to the permanent loss of Grade 1 agricultural land. It is anticipated as the option design for this option progresses, avoidance mitigation will be required. One option has the potential to have significant effects to landscape receptors during the construction phase due to permanent land-use change in a national park, The Broads National Park. Further, more detailed mitigation for such effects should be considered at project level. Three options are anticipated to have significant residual negative effects to Climatic Factors and Material Assets during construction, due to the embodied carbon emissions, resource use and waste production associated with the options.

Positive effects during the construction phase are anticipated mostly in relation to increased economic benefits to local communities resulting from the construction of each option. However, these effects are considered to be minor in nature and therefore not significant. More details of the construction phase effects of each option can be found in Section 5.6 and Appendix E.

Operation

During the operational phase, significant residual negative effects are anticipated to SEA objectives for eight of the 18 options. Significant residual positive effects are anticipated to SEA objectives for five of the options.

During the operational phase, significant potential negative effects are anticipated for biodiversity objectives for three options where there is possible abstraction or operational activities which affect Natura 2000s sites. HRA AAs have also been undertaken for all options discussed above and, in some cases, residual significant effects cannot be ruled out at this stage. Further investigation should be undertaken, and further mitigation may be detailed. There

are also potential negative operational effects to WFD waterbodies as detailed in the Level 1 and Level 2 WFD assessments undertaken. In some cases, further study with more detailed design information is required to confirm the risk and determine appropriate mitigation for the operational phase. Abstraction and effluent re-use options may have potential negative effects on the water environment during operation due to operational activities, such as changes to abstraction and outfall rates, occurring in proximity to water sources. Options with an increased permanent hardstanding footprint may result in significant negative effects to climate resilience objectives due to increase flood risk however there are also potential significant benefits to the resilience of the water supply resulting from options.

During the operational phase, the demand management options are likely to have significant positive effects across a number of SEA objectives due to increased awareness and reduced demand for water supply with minimal construction infrastructure. There are also likely to be positive effects during operation for the water supply, specifically for objective 3.5 to increase water efficiency and resilience of water supplies. There are also likely to be significant positive effects to the population and human health topic through options improving resilience and quality of the water supply for the health and wellbeing of the community. The reservoir option has the potential to create benefits for the local community through providing tourism opportunities. More details of the significant potential negative and positive operational phase effects of each option can be found in Appendix E.

In addition to the SEA, HRA, WFD, BNG, NCA and INNS assessments were undertaken for all supply options. Due to the lack of physical footprint and uncertainty around the exact timings and activities, the ESW-DMO-Preferred option has not been subjected to other environmental assessments. The results of these assessments are summarised in Section 5.7.

Assessment of the Alternatives

The supply and demand management options have been considered for alternative plans and Adaptive Programmes as indicated in Table 6-1, which indicates which plan or programme they are selected in. A definition of each alternative plan and Adaptive Programme can be found in Adaptives Programme within Section 2.6.

Alternative Plans

The SEA results of the alternative plans, as indicated in Table 6-4 to Table 6-7, are broadly comparable as a result of them being made up of similar groups of options. The following nine options are consistent among the plans:

- Linford water treatment works (ESW-ABS-003C)
- Lowestoft Re-use (ESW-EFR-002A)
- Barsham Nitrate Reduction Scheme (ESW-NIT-004)
- Abberton Raw Water Pumping Station & Langford Clarifiers (ESW-PMP-001A)
- Barsham to Saxmundham (ESW-TRA-001)
- Bungay wells to Broome water treatment works (ESW-TRA-018)
- Broome to Barsham water treatment works (ESW-TRA-023)
- Holton to Eye Pipeline (ESW-TRA-019)
- Demand Reduction (ESW-DMO-Preferred)

The BVP contains one additional option that is not included in the Ofwat Core Plan:

- North Suffolk reservoir (ESW-RES-002C1)

The Best Environment & Society Plan contains four additional options that are not included in the Least Cost Plan or Ofwat Core Plan:

- Caister Water Re-use and Ormesby Transfer (03b0478BB)
- Canvey Island Desalination 190 and Transfer (ESW-DES-001)
- Corton Desal Beach Well and Transfer (ESW-DES-008)
- Southend Water Re-use and Transfer (ESW-EFR-001) that are not included in the Least Cost Plan or Ofwat Core Plan.

Construction

During the construction phase, each of the plans are likely to have effects across a broad range of the SEA topics assessed. These effects are predominantly negative. The Ofwat Core Plan is considered to perform slightly better than the Best Environment & Society Plan when considering biodiversity objectives, and the Best Environment & Society Plan is considered to perform slightly better than the Ofwat Core Plan when considering water objectives. Performance between the two plans is considered similar when other SEA objectives are considered. Additionally, performance between the Least Cost Plan and the Ofwat Core Plan is considered to be very similar, however the Ofwat Core Plan does not include the ESW-RES-002C1 option, and as such this plan performs slightly better when considering biodiversity objectives.

Operation

During the operational phase, each of the plans are likely to have both positive and negative effects across many of the SEA topics assessed. The Ofwat Core Plan is considered to perform slightly better than the Best Environment & Society Plan when considering biodiversity objectives, and the Best Environment & Society Plan is considered to perform slightly better than the Ofwat Core Plan when considering water objectives. The Best Environment & Society Plan is considered to perform similarly to the Ofwat Core Plan when other SEA objectives are considered. Performance between the two plans is considered similar when other SEA objectives are considered. Additionally, performance between the Least Cost Plan and the Ofwat Core Plan is considered to be very similar, however the Ofwat Core Plan does not include the ESW-RES-002C1 option, and as such this plan performs slightly better when considering water objectives.

Adaptive Programmes

The following Adaptive Programmes have been considered in this Environmental Report and environmental assessments; i) High Environmental Destination, ii) High Per Capita Consumption (PCC), iii) North Suffolk Reservoir and iv) Habitats Regulations Sustainability Reductions. Compared to the BVP, the four Adaptive Programmes are broadly similar. The High Environmental Destination Programme removes ESW-RES-002C1 and contains ESW-DES-001, 03b0478B, ESW-EFR-001, and ESW-DES-008. The High PCC removes ESW-RES-002C1 and contains 03b0478B and ESW-DES-008. The North Suffolk Reservoir programme selects a smaller variant of ESW-RES-002C1, plus 03b0478B, and removes ESW_EFR-002A. The Habitats Regulations Sustainability Reductions Adaptive Programme selects, on different timescales, the medium variant of RES-002B, and ESW-TRA-019 with a slightly larger 9.13 Ml/d capacity. Where different variants of options are selected by plans, this assessment has utilised a consistent assessment of the largest size to present a “worst case scenario.”

Further detail on the four Adaptive Programmes can be found in Section 6.2 of this report.

Cumulative Effects

In order to appropriately consider the effects of this final WRMP24, it is important to not only consider the options in isolation, but also consider how the options might interact and combine to yield positive or negative effects on the SEA objectives.

The options which make up the BVP and the reasonable alternatives were reviewed against the SEA objectives. This approach is considered to be an efficient and proportionate approach to the cumulative effects assessment, which is cognisant of the work being undertaken for the Regional Plan and other WRMPs. There is no standard approach to the assessment of interrelationships between effects. Effects are very rarely additive, but rather a collection of impacts on a receptor that need to be drawn together. Consideration also needs to be given to the potential for 'synergistic' effects whereby different types of impact affecting a receptor may interact together and increase their effect.

The results of the cumulative effects assessment can be found in Table 7-1 for the BVP, Table 7-2 for the Ofwat Core Plan, and Table 7-3 for Best Environment and Society Plan.

Potential intra-plan BVP cumulative effects during construction were identified for eight SEA Topics: Biodiversity, Soil, Water, Climatic Factors, Landscape, Historic Environment, Population and Human Health and Material Assets. Potential intra-plan cumulative effects were identified during operation for five SEA Topics: Biodiversity, Water, Climatic Factors, Population and Human Health and Material Assets.

Mitigation and Monitoring

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 mitigation and monitoring measures are based on the current concept design of options. It is anticipated that these measures will be revisited during the detailed feasibility and design stages of each project.

These measures have also been collated into a register (see Table 8-1). Where possible mitigation measures have been incorporated into the options development process. 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. ESW is committed to delivering all necessary mitigation measures identified by the SEA and HRA where they are determined necessary by more detailed assessment during future feasibility and design stages.

Monitoring the negative effects of implementing this final WRMP24 is an essential ongoing 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 WRMP24 is being successfully implemented. The Department for Communities and Local Government (DCLG) guidance states that it is inappropriate to monitor everything, but that 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 9-1 presents the SEA monitoring proposals for this final WRMP24.

Note that the selected options are those which at this stage of option development have the lowest or acceptable environmental impacts. Any options with unacceptable environmental impacts were considered unfeasible. However, as detailed design progresses for the selected options and more information becomes available, if HRA or WFD compliance issues emerge, and identified mitigation is not considered sufficient then previously rejected, alternative supply side options would be re-visited.

Next Steps and Consultation

A draft version of this Environmental Report was published for consultation to the Department for Environment Food and Rural Affairs (Defra) in October 2022 and to the public in December 2022, allowing interested stakeholders and customers to review and comment upon the proposals. Following the closure of the consultation period, all consultation responses were recorded in a log (Appendix B) and have been carefully reviewed and considered. The Environmental Report was updated where appropriate to reflect these comments, as well as any proposed changes to the draft WRMP24. The feedback received from the consultation process played a significant role in shaping the rdWRMP24.

A revised version of the Environmental Report was then issued for the next stage of the WRMP process alongside the rdWRMP24 and ESW's Statement of Response.

Following further feedback from Defra in February 2024 on the rdWRMP24 and associated documents, including the revised draft Environmental Report and Appendices, this final Environmental Report has been prepared for issue, in April 2024, alongside our final WRMP24.

Following adoption of our final WRMP24, a Post-Adoption statement will be produced which outlines how the SEA process has influenced the development of the final WRMP24, how consultation comments were taken into consideration and how the WRMP will be monitored. This summary will provide enough information to make it clear how the WRMP24 was influenced as a result of the SEA process and consultation.

Stage E 'Monitoring implementation of the plan' of the SEA process will be carried out by ESW. It is likely that monitoring of the WRMP24 will be incorporated with the annual monitoring process. Monitoring proposals will be developed as part of the SEA process and presented in the Environmental Report.

1 Introduction

1.1 Introduction

1.1.1 ESW is part of NWL and provides water services to 1.8 million people, operating in two areas: one serving parts of Norfolk and Suffolk, and the other serving parts of Essex and Greater London. The ESW supply area and raw water network is shown in Figure 1.1.

Figure 1.1: Essex & Suffolk Water raw water network



Source: Essex & Suffolk Water Drought Map (WTR0332)

- 1.1.2 Water companies have a statutory obligation to produce a 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 WRPG. 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.
- 1.1.3 The WRPG states that in developing a WRMP in England and Wales, water companies should screen for a Strategic Environmental Assessment (SEA) and carry out a full SEA if required.
- 1.1.4 According to the SEA Regulations Part 2 (5) SEA Regulations:

'the responsible authority shall carry out, or secure the carrying out of, an environmental assessment, in accordance with Part 3 of these Regulations, during the preparation of that plan or programme and before its adoption or submission to the legislative procedure.'

1.1.5 And Schedule 2 (6) confirms that the list of topics to be considered includes

'The likely significant effects on the environment, including short, medium, and long term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects, on issues such as—

(a) biodiversity;

(b) population;

(c) human health;

(d) fauna;

(e) flora;

(f) soil;

(g) water;

(h) air;

(i) climatic factors;

(j) material assets;

(k) cultural heritage, including architectural and archaeological heritage;

(l) landscape; and

(m) the inter-relationship between the issues referred to in sub-paragraphs (a) to (l).'

1.2 Water Resource Planning Guideline

1.2.1 The WRPG sets out the framework and requirements for developing a WRMP with the objective 'to efficiently deliver resilient, sustainable water resources for your customers and the environment, both now and in the long term'⁸.

1.2.2 The WRPG highlights the following key environmental considerations:

- Reflect the government's 25-year Environment Plan including:
 - Setting out ambitions for environmental sustainability and resilience.
 - Supporting nature recovery.
 - Using natural capital in decision-making.
 - Using a catchment approach.
 - Delivering net gain for the environment.
- Considering the impact of climate change with regard to river flows and groundwater recharge, and any future supply options.
- Considering the issue of the spread of invasive non-native species (INNS) and proposed measures to mitigate that risk.

⁸ EA, NRW, Defra and Ofwat, 2021, "Water resources planning guideline, section 1.1.1

- 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.
- Considering whether abstractions are truly sustainable, looking across a catchment as a whole.
- Considering the requirement to demonstrate Biodiversity Net Gain (BNG) for options and the plan.
- A stronger focus and detailed guidance on natural capital including the five minimum ecosystem services to be considered and natural capital metrics.
- Improved guidance on approaches to integrate environmental outputs into options decision-making and programme appraisal.

1.2.3 The draft supplementary guidance note 'Environment and society in decision-making'⁹ provides additional detail on how to integrate environmental and social considerations into decision-making in the WRMP process through SEA, biodiversity net gain assessment and natural capital assessment.

1.2.4 The WRPG states there is a need to comply with environmental legislation, SEA and Habitats Regulations Assessments. The results of the SEA and other environmental assessments aids decision-making on mitigation requirements, options development, and selection of preferred options for the WRMP, with the aim of developing a WRMP that meets legislative environmental requirements and provides environmental net gain.

1.3 WRMP Environmental Assessment and the Regional Planning Process

1.3.1 Regional water resource plans taking a long term view of water planning to 2100 have been prepared for each region. The final WRMP24 SEA was undertaken in the context of these plans and falls within the Water Resources East (WRE) Regional Plan (2023). WRE is focused on developing robust strategic supply side options for the region's water users, and adopted a Multi-Objective Robust Decision-Making process, alongside stakeholder participation, to achieve this.

1.3.2 The proposed approach to the SEA aligns with the regional methodologies and provides efficiencies through use of regional environmental assessments as a basis for further assessment work as part of this final WRMP24 development.

1.3.3 Environmental assessments including SEA are being undertaken for both the Regional Plans and for the final WRMP24. However, rather than having two separate processes that duplicate effort, the regional planning assessments provide much of the assessment work for the final WRMP24 – further described below and outlined in Figure 1.2. The water resource options within the final WRMP24 largely come from the options selected in the WRE Regional Plan (2023), therefore efficiencies between the regional planning process and WRMP process can be achieved.

1.3.4 This report is the Environmental Report prepared specifically for the Essex & Suffolk final WRMP24 to meet legislative requirements and provide the local level details for WRMP24 including the local level plans and programmes review, baseline information and key issues and opportunities specific to ESW, which was included in the Scoping Report. The SEA framework including objectives and assessment criteria has been largely taken from the WRE SEA

⁹ Environment Agency, 2022, Water resources planning guideline supplementary guidance – Environment and society in decision-making Version 2 (England). External guidance: 18643. Available at: [Water resources planning guideline - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/111111/water-resources-planning-guideline-supplementary-guidance-environment-and-society-in-decision-making-version-2-2022.pdf)

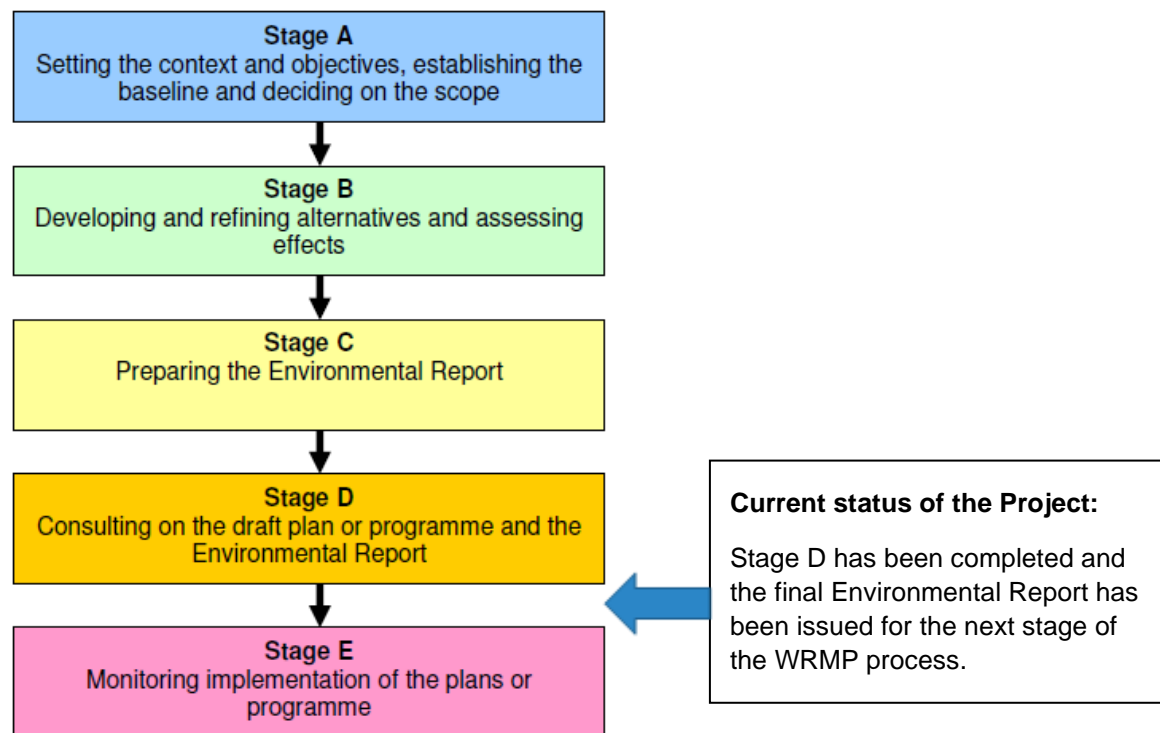
methodology to ensure consistency and allow use of SEA results from the Regional Plan in the wider final WRMP24.

1.4 The SEA Process

- 1.4.1 As a precursor to the SEA, high-level environmental screening (HLS) assessments for the dWRMP24 options were completed in January and February 2022. These were undertaken to highlight environmental risks and constraints at an early stage in the options development process. The HLS assessments were completed using an online GIS tool (AStRO) which automatically generates Red-Amber-Green (RAG) outputs by cross analysing each option's footprint with relevant feature geospatial datasets sourced from data.gov.uk. Key environmental topics explored included: Ecology, Historic Environment, Water, Landscape, Geology and Soils, and Air. Following HLS assessments, the results were fed back to the design team for review, with findings used to inform rejection of options to avoid potentially significant environmental effects, and to identify suitable mitigation measures and/or minor amendments to option design to be incorporated into option development. Subsequently, the HLS results were also taken forward into subsequent iterations of the WRMP SEA and HRA assessments. This is outlined further in Section 4.2, which provides more detailed information on the HLS approach and methodology, and in Section 4.3, which provides a description as to how the SEA process, which the HLS assessments feed into, has contributed to the development of the plan through the Best Value Planning approach.
- 1.4.2 This SEA is required for the final WRMP24 under the European Union (EU) 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 ('SEA Regulations') and retained following withdrawal from the EU. This requires an assessment of the effects of certain plans and programmes on the environment. Part 2 (5) (2) of the SEA Regulations states that an SEA is required for plans and programmes which are prepared for water management plans and options and sets the framework for development consents.
- 1.4.3 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 1.2 shows the different stages in the SEA process. Appendix A presents the different tasks involved in each of the SEA stages.
- 1.4.4 The SEA process follows current and emerging guidance on the application of SEA within water resource planning including incorporating best practice within the proposed approach. The current and emerging guidance documents include:
- Strategic Environmental Assessment: Core Objective Identification, 2020, All Company Working Group.
 - Strategic Environmental Assessment and Habitats Regulations Assessment – guidance for water resources management plans and drought plans, 2012, UK Water Industry Research.
 - Strategic Environmental Assessment and Habitats Regulations Assessment – guidance for water resources management plans and drought plans, Update ongoing, UK Water Industry Research.
 - WRPG, 2021, Environment Agency, Offices of Water Services (Ofwat), Natural Resources Wales.
 - Best practice topic guidance on SEA and biodiversity, climate and heritage from Natural England, the Environment Agency, Historic England and Norfolk County Council, delivered by way of consultation on the SEA Scoping Report (see Appendix B).

- Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (UKWIR 2021).
- Environment Agency, 2021, Water resources planning guideline draft supplementary guidance – Environment and society in decision-making (England).
- Office of the Deputy Prime Minister (ODPM) (now the Department for Levelling Up, Housing and Communities (DLUHC)) (2005). A Practical Guide to the Strategic Environmental Assessment Directive.

Figure 1.2: SEA Process Steps



1.5 Purpose of the Environmental Report

1.5.1 Article 5 (1) of the SEA Directive requires that an environmental report is prepared as part of the assessment (Stage C in Figure 1.2). The environmental report should address ‘the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives...’. This environmental report has been prepared in accordance with the requirements of the SEA Directive.

1.5.2 The purpose of this Environmental Report is to review the feasible options for the final WRMP24 and reasonable alternatives, to identify any potential effects (positive and negative). This has been enabled through the following Environmental Assessment process:

- A high-level environmental screening assessment.
- Detailed options-level assessments:
 - SEA
 - Habitats Regulations Assessment (HRA)
 - Water Framework Directive (WFD)
 - Natural Capital Approach (NCA)
 - Biodiversity Net Gain (BNG)

- Invasive Non-Native Species (INNS) assessments

- Programme Appraisal, including cumulative and in-combination effects for SEA, HRA, WFD, Natural Capital, BNG, and INNS.

1.5.3 The draft WRMP and Environmental Report were issued for formal consultation to Defra in October 2022, and to the public in December 2022. Following such consultation, responses were reviewed, and this Environmental Report has been updated appropriately. A log of consultation comments is provided in Appendix B.

1.5.4 To produce this Environmental Report, Mott MacDonald has relied on published data and information provided by WRE, ESW and from third party organisations. The baseline information collected is the most up-to-date available at the time of writing, 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 Regulations

1.6.1 The Environmental Report has been prepared in accordance with the requirements of the SEA Regulations. Table 1-1 indicates where the specific requirements in the SEA Regulations relating to the Environmental Report (SEA Regulations Schedule 2) can be found within this report.

Table 1-1: SEA Regulations Requirement Signposting Table

SEA Regulations	Environmental Report Requirements	Section of Environmental Report where Requirement is addressed
An outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes		Section 2, 5, 6 and 7
The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme		Section 3 and Appendix D
The environmental characteristics of areas likely to be significantly affected		Section 5
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 5, 6, 7 and Appendix D
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 3
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, landscape and the interrelationship between the above factors		Section 5 and 6
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 8
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		Section 6
A description of the measures envisaged concerning monitoring in accordance with Article 10		Section 9
A non-technical summary of the information provided under the above headings		Executive Summary

1.7 Environmental Report Structure

1.7.1 This Environmental Report is structured as follows:

- Section 1 – Introduction to WRMPs and SEA process and requirements
- Section 2 – Description and context of the final WRMP24
- Section 3 – Scoping summary and relationships with other plans

- Section 4 – Environmental assessment methodology, effects beyond the final WRMP24 boundary and how this plan influences the development of the WRE Regional Plan
- Section 5 – Assessment of the emerging final WRMP24 and options assessment
- Section 6 – Assessment of alternative programmes and final WRMP24 decision-making
- Section 7 – Cumulative Effects (Intra-plan and Inter-plan) of the Preferred Plan and reasonable alternatives
- Section 8 – Mitigation measures and enhancement opportunities
- Section 9 – Monitoring proposals
- Section 10 – Consultation and next steps
- Section 11 – References
- Appendix A – SEA Process Tasks
- Appendix B – Scoping Report Consultation Log
- Appendix C – Policies, Plans and Programmes Review
- Appendix D – Baseline Review and Baseline Maps
- Appendix E – Integrated Environmental Assessment – Information Packs
- Appendix F – Habitat Regulations Assessment Appendix
- Appendix G – Water Framework Directive Appendix
- Appendix H – Biodiversity Net Gain and Natural Capital Approach Appendix
- Appendix I – Invasive and Non-Native Species Appendix
- Appendix J – High Level Screening Methodology
- Appendix K – SEA Assessment Matrices

2 Description and Context of Essex & Suffolk Water's Final WRMP24

2.1 Background and Purpose

- 2.1.1 As outlined in Section 1, water companies have a statutory obligation to produce a 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 ESW is due to publish its next WRMP in 2024 (WRMP24), which is the subject of this Environmental Report.
- 2.1.2 ESW is part of NWL and provides water services to 1.8 million people, operating in two areas: one serving parts of Norfolk and Suffolk, and the other serving parts of Essex and Greater London (See Figure 1.1 above for an outline of the ESW supply area and network). The scope of this final WRMP24 and accompanying documents refer specifically to the two ESW supply areas in the East of England. A separate WRMP has been produced for the Northumbrian Water region.
- 2.1.3 The East of England is one of the driest regions in the UK, with low rainfall (receiving only two thirds of the national average rainfall each year, approximately 600mm) and high evaporation losses¹⁰. Water supply is under pressure from population growth, climate change, sustainability reductions and the need to increase resilience of water supplies to severe drought.¹¹

2.2 Essex & Suffolk Water's WRMP24

- 2.2.1 A WRMP is required to set out how a company intends to maintain the balance between supply and demand for water over a minimum 25-year period. It forecasts supply and demand from 2025 to 2100 to identify appropriate solutions to meet future pressures, albeit with a focus on the statutory minimum 25-year planning period (2025 to 2050). This statutory minimum planning period aligns to the long term planning period that Ofwat uses when appraising water company business plans into which WRMPs feed.
- 2.2.2 The final WRMP24 has been developed as part of ESW's Price Review 2024 process (PR24). Ofwat is the economic regulator of the water industry and every five years it sets the investment and service package that customers receive including the price water companies charge their customers. As part of the Price Review process, water companies submit a business plan which sets out the investment and outcomes for customers and the environment that they are required to deliver and how this would impact customer bills. The business plan will include the investment needed to deliver the WRMP24 Best Value Plan (BVP) (ESW's preferred plan).
- 2.2.3 ESW has adopted a planning approach to develop both its Best Value and alternative plans for WRMP24 that uses least-cost optimisation through an Economics of Balancing Supply and Demand (EBSO) optimiser model. The EBSO model considers the supply-demand balance for each water resource zone (WRZ) at annual timesteps and selects options to address deficits based on a cost per M/d and the earliest available date of supply for relevant options.

¹⁰ Anglian Water Official Website, (2022), "Fast Facts" [Accessed 04.07.22], Available at [Fast facts \(anglianwater.co.uk\)](https://www.anglianwater.co.uk)

¹¹ Anglian Water Official Website, (2022), "Water resources management plan" [Accessed 04.07.22], Available at: [Water resources management plan \(anglianwater.co.uk\)](https://www.anglianwater.co.uk)

- 2.2.4 This tool does not consider other monetised criteria such as carbon or other societal and environmental impacts and benefits. As such the model results represent a least-cost plan with no optimisation.
- 2.2.5 Best Value Planning aims to determine whether the inclusion of further monetised and non-monetised criteria would identify a plan that delivers the best value, defined by the WRPG as 'one that considers factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and overall society.'
- 2.2.6 Using least-cost optimisation as well as broader criteria, ESW have developed a BVP (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.
- 2.2.7 In producing their BVP, ESW have considered government policy as set out in the WRMP Direction 2022 and in a regulatory document called Government Expectations for Water Resources Planning (Defra, 2022) including the requirements to:
- Provide a secure and clean water supply as expected by customers in a way that provides value for customers, society, and the environment over the long term.
 - Improve supply resilience by planning to raise customer levels of service for a Level 4 drought plan restrictions (stand pipes and rota cuts) from 1 in 200 years to 1 in 500 years by 2040.
 - Reduce household PPC (Per Property Consumption) to 110l/head/day by 2049/50 as well as working with retailers to implement actions to assist non-household users to sustainably reduce their water use.
 - Reduce leakage by 40% from 2017/18 levels by 2049/50 with water companies helping customers reduce water demand and water lost through leaks by adopting consistent approaches to support repair and replacement of supply pipes.
 - Install smart meters as standard.
 - Consider compulsory metering in regions assessed by the Environment Agency (EA) to be a Serious Water Stressed Area.
 - Adapt to climate change.
 - Demonstrate a step change in rectifying overreliance on unsustainable water sources.
- 2.2.8 Demand management is a priority for ESW. In developing the WRMP24, ESW 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 WRMP24 have been developed following industry and regulator guidance.

2.2.9 The strategy for water resource management in the Essex and Suffolk region:

- 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 ESW 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.

2.2.10 ESW has set the following objectives to be achieved through their BVP:

- Achieve a secure, resilient, and sustainable supply of water for their customers, moving to a 1 in 500 level of resilience by 2049/50.
- Protect and enhance the environment, ensuring their abstractions are sustainable both in the short and long term.
- Reduce leakage from their network and from customer's homes, contributing to a national target of 40% reduction from 2017/18 levels by 2049/50.
- Reduce customer demand to 110l/head/day by 2049/50.
- For all their meters to be smart meters by 2035.

2.3 Baseline Supply Forecast

2.3.1 ESW is required to produce a final plan with no supply deficits in any of their WRZs over the planning period. They have undertaken a Baseline Supply Forecast to confirm the amount of Water Available For Use (WAFU) in Ml/d in each WRZ across the planning period. This was then compared against forecast demand to present a supply demand balance. Where demand is greater than supply in a given year, then a supply deficit is forecast. If demand management options to deliver government targets for leakage reduction and per capita consumption do not restore a supply surplus, then new supply schemes may be required.

2.3.2 WAFU is the deployable output (DO) of each source (or group of sources) totalled for the WRZ, adjusted to account for any changes to deployable output, transfers, operational use, and outage. A baseline DO should be resilient in a drought with a 1 in 200-year return period until 2039/40, and thereafter to a 1 in 500-year return period, i.e., a 0.5% and 0.2% annual chance of failure, respectively, caused by drought.

2.3.3 A summary of results for ESW's WAFU components is shown for context in Table 2-1, for further information refer to the sections listed of ESW's final WRMP24 report where these components are defined.

Table 2-1 WAFU Components and WMP24 Outcomes

WAFU Component	Description	WRMP24 outcome	Final WRMP24 report section reference
Groundwater DO	In line with the EA's WRPG (December 2021) we need to be able to plan to be resilient to a 1 in 200-year drought up to 2039 and to a 1 in 500-year drought to the remainder of the planning horizon.	The total groundwater baseline annual average DO of our Essex and Suffolk area reduced by 1.35 MI/d from PR19 to PR24, from 56.32 MI/d to 55.00 MI/d	Section 3.2.4
Sustainable abstraction	<p>The sustainability reductions we are including in our WRMP24 are significantly higher than those included in our WRMP19 and derive from four sources:</p> <p>Delivery of agreed licence reductions for some groundwater licences during AMP8, arising from AMP7 WINEP investigations and options appraisals.</p> <p>Application of EA advised licence caps to groundwater sources by March 2030, or earlier for expiring time limited licences, licences with expiring time limited clauses or on licence variation, to reduce the risk of waterbody deterioration under the Water Framework Directive (WFD) (so-called 'No Deterioration' caps).</p> <p>Implementation of new Hands-off Flow (HoF) conditions on some surface water abstractions during AMP8, arising from AMP7 WINEP investigations, to achieve Environmental Flow Indicator (EFI) compliance at full licence abstraction.</p> <p>Application of EA advised sustainability reductions and/or stricter HoF conditions for up to eleven groundwater and surface water sources by 2026/27 to meet the requirements of the Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations).</p>	<p>The reductions arising from the first three sources have been included within our baseline and/or preferred plan, the total reduction in groundwater licence by March 2030 being 49.06 MI/d.</p> <p>The potential sustainability reductions for up to 11 groundwater and surface water sources by 2026/27 to meet the requirements of the Habitats Regulations, have been included as an adaptive programme within our WRMP24.</p>	Section 3.3
Long term Environmental Destination	While the sustainability reductions identified in the previous section are to meet our current WFD and Habitats Regs obligations in the shorter term, we are also working with our regional water resources group, WRE, to identify a longer term Environmental Destination for our region, to deliver longer term sustainability and environmental resilience.	<p>Under the BAU+ scenario, a total reduction of 39.72 MI/d is forecast as follows:</p> <ul style="list-style-type: none"> Essex WRZ=2 MI/d Blyth WRZ=1.72 MI/d Hartismere WRZ=0.65 MI/d Northern Central WRZ = 35.35 <p>This represents an 8% reduction in baseline DO. We have assumed that half of the reductions will be met from 2040/41, and the total reductions from 2045/46.</p>	Section 3.4
Climate change	The UK Climate Projections 2018 (UKCP18) Regional Climate Model (RCM) data have been selected as the most appropriate climate change data set as it supersedes the UK Climate Projections 2009 (UKCP09) data used for WRMP19 climate change analysis.	<p>Total company level DO for 1:500-year scenarios with medium climate change pre and post 2030 EA licence caps:</p> <p>Groundwater:</p> <ul style="list-style-type: none"> Pre 2030 – 73.76 MI/d Post 2030 – 47.41 MI/d <p>Surface water:</p> <ul style="list-style-type: none"> 2050 – 26.97 MI/d 2080 – 43.58 MI/d 	Section 3.5
Water transfers	We have an agreement to supply Anglian Water with an export of 3.05 MI/d from seven locations	The total contractual export for all NAVs in our area is 8.68MI/d.	Section 3.6

WAFU Component	Description	WRMP24 outcome	Final WRMP24 report section reference
	<p>of our Essex WRZ, which has been included in our plans.</p> <p>In Northern Central WRZ we have an export agreement with Anglian Water as well for two bulk supplies totalling 0.73MI/d.</p> <p>Our contractual agreement is for 1 MI/d import at Cressing, Essex, which has been included within our plans.</p> <p>A total of 19 New appointments and variations (NAVs) are either already in place or expected in the near future, served by a total of four appointees. The majority (95%) of NAV's are for new housing developments within specific areas. The agreed exports for these schemes have been included within our plans.</p>	<p>Both the import and export are seen as secure in all circumstances and so no amendments to them are necessary under drought conditions.</p>	
Outage allowance	<p>For WRMP19, the outage allowance was based on Monte Carlo simulations using a normal distribution to reflect the possible outages at each Water Treatment Works (WTW). For WRMP24 this has been updated to a 'histogram approach' where actual outages for each WTW were used to create a discrete distribution, based on bins, for each WTW that was then ran through a Monte Carlo simulation.</p>	<p>DYAA outage allowances for each WRZ under 1 in 200 and 1 in 500 LOS scenarios are as follows:</p> <p>1 in 200 year</p> <ul style="list-style-type: none"> • Essex WRZ:5.7 MI/d • Blyth WRZ 0.68 MI/d • Hartismere WRZ 0.04 MI/d • Northern Central 8.83 MI/d <p>1 in 500 year</p> <ul style="list-style-type: none"> • Essex WRZ:0 MI/d • Blyth WRZ 0.68 MI/d • Hartismere WRZ 0.04 MI/d • Northern Central 8.83 MI/d 	Section 3.7
Losses from process and treatment	<p>In-line with Environment Agency (2021) supporting guidance, we have considered the following components as part of our determination of total raw water and treated water process losses:</p> <ul style="list-style-type: none"> • Raw water losses • Raw water operational use • Treatment works losses • Treatment works operational use 	<p>All treatment works losses and operational use at WTWs in the Essex WRZ are incorporated into our Essex WRZ Aquator® system model. There are losses accounted for at our East London groundwater fed WTWs at Stifford and Roding and the process loss at Langford WTWs. Process losses at all other WTWs are returned to source waters and are re-abstractable. Therefore, there are no losses required to be incorporated into the WAFU calculation in line 8BL as a reduction in deployable output.</p> <p>The process losses for each of the Suffolk WRZs, as a percentage of total WRZ deployable output, are 3.7% for Blyth, 4.5% for Hartismere, and 11.8% for Northern Central.</p>	Section 3.8

2.4 Baseline Supply Demand Balance

2.4.1 The baseline supply demand balance calculation is used to identify whether a WRZ is predicted to have a supply deficit at any point over the planning horizon (from 2025/26 until 2049/50).

- 2.4.2 A summary of ESW's baseline supply demand balance forecasts for the final WRMP24 is only provided for context below. This should be read alongside Section 6 of ESW's final WRMP24 for more detailed information.
- 2.4.3 The baseline Dry Year Annual Average (DYAA) supply demand balance for the Essex WRZ forecasts a deficit for the whole planning horizon. The baseline dry year critical period (DYCP) supply demand balance for the Essex WRZ is forecast to be in deficit for most of the planning horizon.
- 2.4.4 The baseline DYAA supply demand balance for the Blyth WRZ forecasts an initial supply surplus but only in the first year of the planning horizon. From 2026/27 the WRZ falls into deficit as a result of Water Framework Directive (WFD) No Deterioration Sustainability Reductions. This is because two of ESW's time limited abstraction licences expire in 2026 and the Environment Agency has indicated that the annual licensed quantity will be capped to a recent actual utilisation level. This removes all supply headroom until ESW's BVP demand management and supply options are operational. The zone goes further into deficit in 2030/31 when AMP7 abstraction licences sustainability reductions are implemented. This deficit is forecast to increase further as a result of expected increases in demand, such as from when ESW will start supplying Sizewell C from 2032, as well as from two further steps down in supply demand balance in 2040 and 2045 from Business as Usual Plus (BAU+) Environmental Destination (ED) licence reductions being made. However, it should be noted that this is a baseline deficit and that ESW's final plan forecasts a supply surplus. ESW's BVP is presented in Section 5.1 and confirms how they will reduce demand and increase supplies to meet all forecast demand whilst meeting their obligation to implement required sustainability reductions on their current groundwater sources. The baseline DYCP supply demand balance for the Blyth WRZ is forecast to be in a surplus for the whole planning period.
- 2.4.5 The baseline DYAA supply demand balance for the Hartismere WRZ forecasts a supply deficit for the whole planning horizon. The zone is in deficit from the start of the planning period due to the inclusion of new requests for water from non-household businesses on Eye Industrial Estate. Additionally, there are three further steps down in WAFU, the first because of Sustainability Reductions which are due to be implemented from the start of the planning horizon. This is because all of the Hartismere sources are covered by time limited abstraction licences, which expire before the start of AMP8, and the Environment Agency has indicated that these will be capped to recent utilisation levels on renewal. Additionally, there are a further two steps down in WAFU because of BAU+ Environmental Destination licence reductions in 2040 and 2045. ESW's BVP will enable them to meet all forecast demand and their obligation to implement abstraction licence sustainability reductions. However, for Hartismere WRZ, this will require a moratorium on new non-household demand until 2032 to maintain abstraction below recent actual utilisation levels. The baseline DYCP supply demand balance for the Hartismere WRZ shows that there is no additional headroom until there is a small increase in 2032/33 resulting from a 0.67 MI/d step down in Target Headroom. This step results from moving from the 95th percentile to the 90th percentile in the low resilience risk profile used for this WRZ, and also reflects the risk associated with the vulnerable groundwater sources early in the planning horizon.
- 2.4.6 The baseline DYAA supply demand balance for the Northern Central WRZ forecasts a small surplus until 2031/32 and a deficit thereafter. Forecast demand includes future increases in demand from food processing and cosmetics businesses. There are five steps down in the Total WAFU, reflected in the supply demand balance, the first in 2027/28 is because of an increase in non-household demand, the next two in 2030/31 and 2032/33 because of Sustainability Reductions and then a further two because of BAU+ Environmental Destination licence reductions in 2040 and 2045. The baseline DYCP supply demand balance for the Northern Central WRZ is forecast to be in a surplus for the whole planning period.

2.5 Uncertainties and Future Scenarios

- 2.5.1 The final WRMP24 includes 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 ESW needs to develop a plan which identifies thresholds beyond which ESW need to take further action.
- 2.5.2 The WRMP process sets out how a company intends to maintain the balance between supply and demand for water over a minimum 25-year period. It forecasts supply and demand from 2025 to 2100 to identify appropriate solutions to meet future pressures, albeit with a focus on the statutory minimum 25-year planning period (2025 to 2050), with new WRMPs being produced every five years.

Assumptions and Limitations

- 2.5.3 As the options set out in the WRMP are still in the early stages of development, a precautionary approach has been exercised because of residual uncertainty. Due to the dynamic nature of the environment, conditions may change in the period between the preparation of this report, and the undertaking of the proposed works. 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.
- 2.5.4 It is acknowledged that the requirement for mitigation may change as design of the BVP Options progresses. This is expected to be through an increased level of available detail at later stages of option development. This could result in necessary additional project level assessments. Any uncertainties surrounding, and limitations of, the environmental assessment process are acknowledged and highlighted in the respective appendices.
- 2.5.5 This assessment is at a strategic plan level and the assessments have been undertaken based on reasonable professional judgment at this stage, the mitigation identified is generic or best practice in nature, so is understood to have a reasonable level of confidence that it can be applied at a project level.
- 2.5.6 Assessments have been carried out for options shortlisted under the 'Best Value' planning process, with all options belonging to one or more of the Alternative plans and Adaptive Programmes. The environmental assessment and the assessment of cumulative effects provided primarily focuses on schemes up to 2040, with schemes post-2040 given lighter touch consideration. This is because post-2040 there is less certainty in predicted status or condition of the environment and any assessments undertaken would be in an overly precautionary manner.
- 2.5.7 Note that the selected options are those which at this stage of option development have the lowest (most acceptable) environmental impacts. Any options with unacceptable environmental impacts were considered unfeasible. However, as detailed design progresses for the selected options and more information becomes available, or if HRA or WFD compliance issues emerge, and identified mitigation is not considered sufficient then previously rejected, alternative supply side options would be re-visited.

Sustainability Changes/Reductions

- 2.5.8 Sustainable abstraction is essential to support healthy ecology and the natural resilience of rivers, wetlands, and aquifers. The sustainability reductions ESW are including in their WRMP24 will prevent deterioration of a water body's condition and support the achievement of water body status and environmental objectives for water resources as set out in the Anglian River Basin

Management Plan. The sustainability reductions included in ESW's WRMP24 are significantly higher than those that were included in ESW's WRMP19, and derive from four sources:

- Delivery of agreed licence reductions for some groundwater licences arising from Water Industry National Environment Programme (WINEP) investigations and options appraisals.
- Application of EA advised licence caps to groundwater sources by March 2030, or earlier for expiring time limited licences, licences with expiring time limited clauses or on licence variation, to reduce the risk of waterbody deterioration under the Water framework Directive.
- Implementation of new Hands-off Flow (HoF) conditions on some surface water abstractions, arising from WINEP investigations, to achieve Environmental Flow Indicator (EFI) compliance at fully licence abstraction.
- Application of EA advised sustainability reductions and/or stricter HoF conditions for up to 13 groundwater and surface water licences by 2026/27 to meet the requirements of the Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations), due to the effects of abstraction on the Broads SAC and the Waveney and Little Ouse Valley Fens SAC.

2.5.9 Where the confirmed or likely sustainability reductions cause WRZ's to fall into deficit, ESW has included options in their WRMP24 to move the WRZ back to surplus.

2.5.10 The total sustainability reduction in groundwater licence across all of ESW's WRZ's by March 2030 is substantial. For a breakdown of groundwater sustainability reductions split by WRZ and the likely timings of these reductions, see Section 3.3 of ESW's final WRMP24.

Long Term Environmental Destination

2.5.11 In 2020 the Environment Agency published a policy document titled 'Meeting our Future Water Needs: a National Framework for Water Resources'. This framework identifies that significant changes are needed to improve the water environment and address unsustainable abstractions from it to improve resilience to drought and climate change, and increase environmental protection, by 2049/50. To help deliver the changes needed, the policy document also outlines a range of Environmental Destination scenarios that Regional Water Resource Groups and their constituent water companies need to build into their WRMP24s.

2.5.12 ESW have worked with their regional water resources group, WRE, to identify Environmental Destination for the region, to deliver longer term sustainability and environmental resilience. The ambitious abstraction licence reductions proposed under Environmental Destination are to achieve sustainable abstraction by 2050 (and beyond), accounting for future climate change impacts. ESW have used WRE's BAU+ Environmental Destination scenario in the baseline supply forecast for their three Suffolk WRZ's. For their Essex WRZ, ESW have used the WRE Environmental Destination scenario groundwater licence reductions and developed an alternative BAU+ scenario for surface water abstraction reductions which protects the aquatic environment through the implementation of Hands-off Flow conditions on their Essex river abstractions. Using this combined approach (i.e., using the WRE groundwater ED reductions with HoFs for surface-water abstractions), ESW have created their own 'ESW BAU+' ED scenario. This scenario was used in their WRMP24 preferred plan and provided to WRE for use in their least cost modelling at the regional level. These ED reductions are in addition to sustainability reductions already arising from ESW's WINEP and the EA's WFD 'no deterioration' licence capping process, which is covered within the Sustainable Changes / Reductions of Section 2.2 above.

2.5.13 The BAU+ ED scenario results in a total reduction of 39.72 MI/d across ESW by 2050, which is 8% of deployable output, in addition to the reductions arising from the WINEP and EA licence capping processes. In some cases, the BAU+ scenario represents a severe or complete loss of abstraction at several of ESW's key surface water abstractions in Suffolk and Norfolk. For a

breakdown of Environmental Destination BAU+ scenario deployable output reductions by WRZ, see Table 24 in ESW's final WRMP24.

- 2.5.14 In terms of timings of the abstraction reductions proposed under ED, the National Framework assumption is by 2050. ESW have taken a two-phase approach to implementing the ED reductions: half by 2040/41, and the remaining half by 2045/46. This allows time for WINEP investigations in AMP8 to increase certainty in the reductions required, and for WRMP24 new supply side options to become available.
- 2.5.15 The detail of the licence changes that are needed to achieve ESWs' Environmental Destination, and the consequent reduction in DO, is set out in the Environmental Destination ESW WRMP24 Technical Report.

2.6 Alternative Plans

- 2.6.1 The development of a WRMP is a complex process involving the generation and assimilation of many different types of information and data, and the application of modelling and decision-making. As part of the WRMP24 plan-making process and a requirement of the SEA Regulations, ESW were required to generate and assess alternative plans (as summarised above).
- 2.6.2 ESW's alternatives consider the WRMP24 from different perspectives, considering different expectations, information, and scenarios. It is important to note that BVP and alternative plans all solve supply deficits that have been calculated using an agreed set of baseline planning assumptions.
- 2.6.3 The formation of alternative plans begins by structuring the multiple inputs to supply demand forecasting to determine scale of the supply demand balance deficit. Once this is determined an initial most likely scenario is generated. From this initial most likely scenario modelling is used to develop the alternative plans. Within the final WRMP24, ESW present four plans:
- Preferred Best Value Plan (the preferred final plan).
 - Alternative 1: Least Cost Plan.
 - Alternative 2: Ofwat Core Plan.
 - Alternative 3: Best Environment & Society Plan.
- 2.6.4 The three alternative plans to the BVP are, therefore, for the purposes of SEA, considered to be the reasonable alternatives. Descriptions of the three alternative plans are outlined below. Each alternative was assessed under the SEA framework, as part of the WRMP24 process. The SEA results of these assessments are provided in Section 6.

Least Cost Plan

- 2.6.5 A Least Cost Plan has been prepared as a benchmark to appraise other programmes against including ESW's Preferred BVP, the Ofwat Core Plan, and the Best Environment & Society Plan. Whereas the BVP considers wider metrics, the Least Cost Plan is determined using only economic cost information and as its name suggests, is the plan with the lowest cost to restore a supply surplus in all years of the planning period should there be a baseline supply deficit forecasted. The Least Cost Plan and the BVP (the preferred final plan) include the same options selected in the same years and therefore the costs are the same in these two plans.

Ofwat Core Plan

- 2.6.6 The Ofwat Core Plan represents the options needed to meet government expectations on demand management and sustainable abstraction as well as any no or low regret options that are required to maintain a supply surplus in all years of the planning period. The Ofwat Core

Plan does not include options that are driven by Environmental Destination abstraction sustainability reductions in the 2040s. This is because there is a low level of certainty regarding the size of the abstraction licence sustainability reductions, thus why they will be included in AMP8 WINEP for further investigation. The Ofwat Core Plan has a lower cost than the BVP as it reflects the inclusion of ESW's no/low regret options and exclusion of the option planned in the longer term to resolve the deficits resulting from the implementation of Environmental Destination.

Best Environment & Society Plan

2.6.7 The Best Environment & Society Plan presents a plan with the lowest level of abstraction from existing sources (high Environmental Destination scenario) and a consistent level of leakage (40% reduction by 2050). Despite the marginal savings by reducing leakage by 40% by 2050, the high ED scenario abstraction licence sustainability reductions result in a loss of over 70% of ESW's deployable output. This means that in addition to all the Best Value options, a large desalination plant and an effluent re-use scheme would be required in Essex; and in Suffolk, the North Suffolk Reservoir is replaced by a desalination plant and an additional effluent re-use scheme, to resolve the deficit resulting from the implementation of the Enhanced scenario Environmental Destination licence reductions. As a result, ESW do not believe this would be a good outcome for the Environment or their customers, as the desalination schemes have the highest carbon and operational costs given the process would have the highest electricity demands (KWh/MI/d of water produced) of all the supply options, would produce a large brine effluent that would need to be discharged to sea, and would have a significant capital cost exceeding £1 billion.

Consultation Period

2.6.8 ESW's Draft WRMP24 was published for consultation to Defra in October 2022 and to the public in December 2022, 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 subsequent iterations of the WRMP24.

Adaptive Programmes

2.6.9 The WRMP24 plan-making has to deal with significant uncertainty related to the scale and location of reductions related to Environmental Destination, the deliverability of complex supply side options and reliance on forecast benefits from behavioural changes that result from interventions to reduce demand. To address these uncertainties and test them ESW have produced a number of adaptive programmes. For the purposes of SEA, these are not considered to be a 'reasonable alternative' as the adaptive pathways represent the implementation phase of the plan (and therefore could apply to any plan that was selected).

2.6.10 ESWs Adaptive Programmes Comprise:

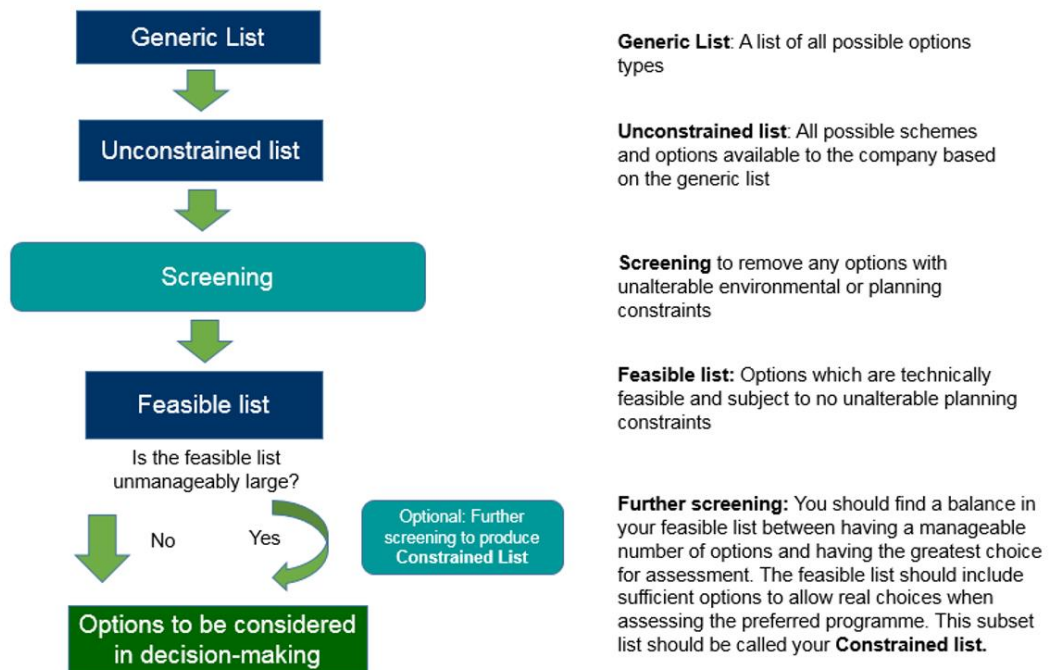
- **High Environmental Destination Adaptive Programmes** - uses the Enhanced Environmental Destination Scenario, whereas the BVP uses the BAU+ scenario.
- **High PCC Adaptive Programmes** - based on the scenario that PCC does not reduce as far or as quickly as forecast in the BVP.
- **North Suffolk Reservoir Adaptive Programmes** - same as the BVP in AMP8, but in AMP9 Lowestoft Re-use is replaced with a smaller variant of the option ESW-RES-002C1.
- **Habitats Regulations Sustainability Reductions Adaptive Programme** - included to address the uncertainty around the scale of abstraction licence reductions required to meet the requirements of the Habitats Regulations in the Broads area.

2.6.11 A more detailed description of how the options selected within these Adaptive Programmes differs from the BVP is provided in Section 6.2, as is an assessment of their likely environmental effects.

2.7 ESW's Decision-making Process

2.7.1 The decision-making process developed and used by ESW is based on the approach for WRE and is considered to be fully compliant with both the EA Water Resources Planning Guidance, and the modelling processes and tools described within the UKWIR Decision-making Method guidance. The WRPG requires water companies to review all possible options that could contribute to deficit reduction and if they are likely to be technically feasible, they should be included on an unconstrained list. This list is screened to remove options with unalterable constraints that make them unsuitable for promotion. Options on the resulting feasible list are further assessed to feed into programme appraisal and optimisation of a BVP. A summary of the decision-making process used is provided in Figure 2.1.

Figure 2.1: WRPG Options Appraisal Process



Generic Screening

2.7.2 A generic option list was developed using UKWIR guidance¹² to identify all possible options available to each WRZ. To identify viable options, the generic option list was screened using the following criteria:

1. Can the option be practically deployed i.e., is the source of water available in the WRZ?
2. Is it possible to define the option spatially?
3. Does the technology exist to develop the option (assumed to be post pilot study stage in the UK or a country with a similar regulatory regime)?
4. Does the supply chain exist to deliver the option?
5. Are there any other technical issues that prevent deployment of this option in the WRZ?

¹² Table 5 - Report Ref. No 12/WR/27/6 – Economics of Balancing Supply and Demand (EBSD) report

6. Are there any environmental issues that prevent deployment of this option in the WRZ? (Utilising our Environmental High-level Screening, Section 4.2).
7. Are any rejection reasons in previous WRMPs¹³ or regional Water Resource Plans still valid?

2.7.3 Options that failed to satisfactorily meet these criteria were rejected and added to the rejection register, which is provided as Appendix 2 of ESW's WRMP24 Options Appraisal Technical Report.

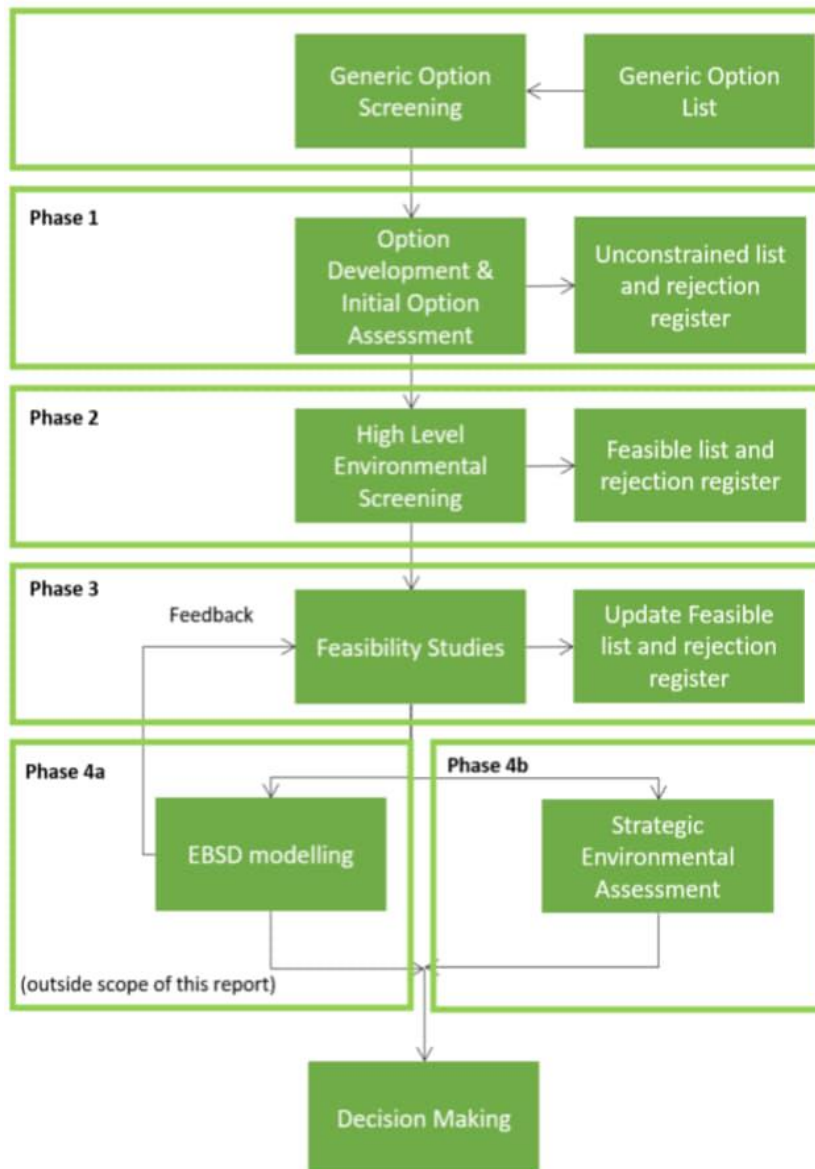
2.7.4 As highlighted within Figure 2.2, High Level Environmental Screening was used during Phase 2, which is discussed in Section 4 of this report. Following this methodology, 41 supply side options were identified for inclusion within the Economics of Balancing Supply and Demand (EBSA) modelling.

2.7.5 The summary of options presented in Table 61 in ESW's final WRMP24¹⁴, outlines the number of options that were assessed and that progressed to the least cost and best value plan decision-making process, along with the number that have been rejected because they were not considered feasible.

¹³ Including adjacent water company WRMPs

¹⁴ Final WRMP Main Report (2024). Available at: <https://www.nwg.co.uk/responsibility/environment/wrmp/>

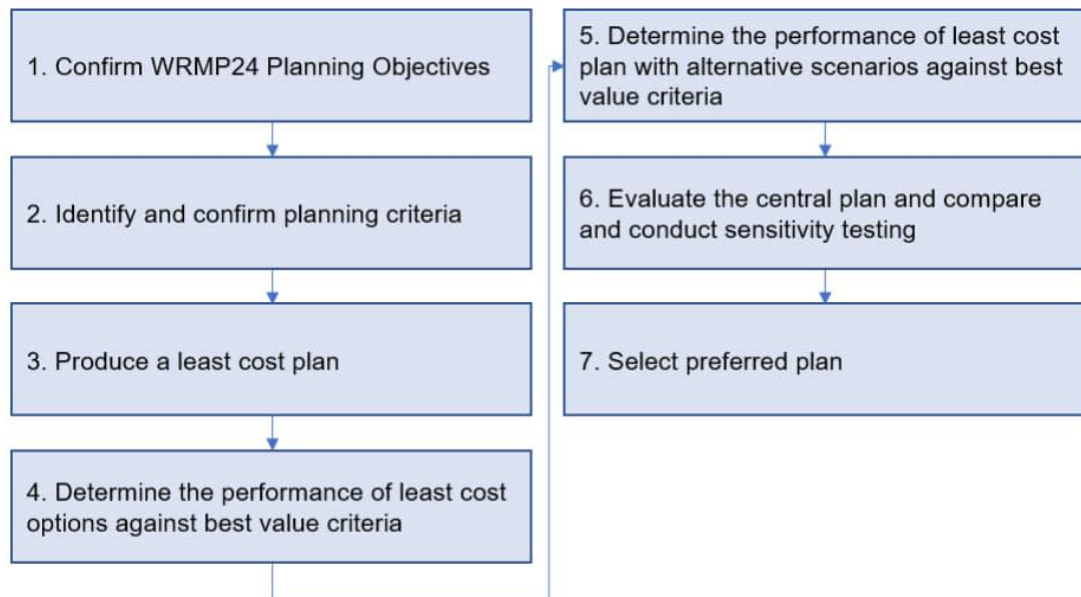
Figure 2.2: Phased approach of the WRPG Options Appraisal Process



Development of the Preferred Plan – Influence of the SEA

2.7.6 Figure 2.3 was developed with consideration of the Best Value Planning steps as set out in the WRPG and with consideration of the process and methodologies in the UK Water Industry Research (UKWIR) (2020) methodology ‘Deriving a best value water resources management plan’.

Figure 2.3: Summary of Best Value Planning Methodology



2.7.7 The Best Value Plan criteria used within Water Resources East regional planning have been reviewed by ESW and their suitability considered for use at a company plan level. The ESW Best Value Plan WRMP24 Technical Report outlines the methodology and results of a BVP assessment for ESW WRMP24.

2.7.8 The ESW SEA provided metrics for the environmental effects of construction and operation of the strategic supply options – these were positive and negative scores against SEA objectives. The following SEA derived criteria were used:

- SEA Overall – Net cumulative impact of construction and operation (Plan total).
- Food risk management.
- Impact upon designated sites.
- Multi abstractor benefit.
- Human and social wellbeing.

2.8 Final WRMP24 Option Types

2.8.1 The final WRMP24 includes supply side options and those which focus on demand management. The broad option types considered include:

Supply side Option Types:

- **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).
- **Borehole abstraction** – usually a borehole which abstracts water from an aquifer which then goes to a treatment works.
- **Effluent re-use** – effluent is treated and discharged into rivers 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 banded reservoirs (i.e., not within a valley) with piped transfers in and out of supply.
- **Transfers** – transfers include asset transfers, and bulk transfers within/into region, either of raw or treated water.

Demand Management Options:

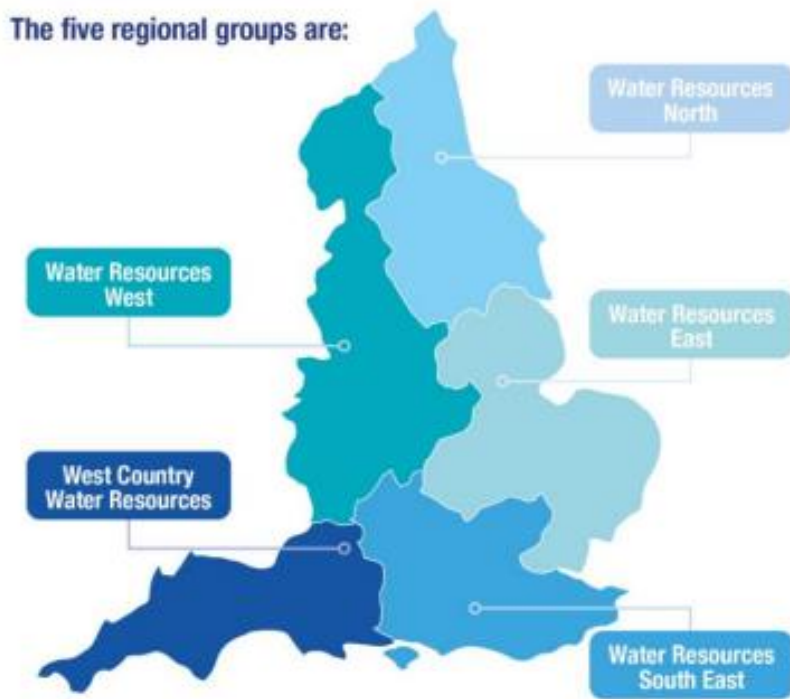
- **Metering consumption reduction** – involves reducing water consumption by installing meters in currently unmeasured properties. It can include compulsory metering for household and non-household uses, smart metering, and other metering such as optant metering.
- **Other consumption reduction** – involves reducing household and non-household consumption in ways other than metering.
- **Tariffs/fees** – introduction of special fees, changes to existing measured tariffs, introduction of special tariffs for specific users.
- **Water recycling** – rainwater harvesting/grey water re-use for new or existing household and non-household.
- **Loss reduction** – involves reducing distribution system leakage, including service reservoir losses and trunk main leakage, as well as reducing customer supply pipe leakage. Leakage reduction options include capital investments to both the company-side and customer-side assets and operational improvements and policy changes. Examples include pressure management, mains renewal, increasing efficiency of active leakage control, etc. Customer supply pipe leakage reduction typically includes increased customer engagement/education or incentives to repair their supply pipes between the distribution main and the property.
- **Non-household water efficiency activity** – comprises 13 water efficiency options within six categories:
 - Information Provision – Customer side leakage education, customer specific alerts, and free water efficiency assessment.
 - Infrastructure and Leak Investigation – Leak Investigation, rain/greywater re-use, find and fix leaky loos, toilet replacements, and landscaping redesign.
 - Water Efficiency Solutions for Domestic-Type Use – Domestic use self-serve, and individual tailored audits.
 - Water Efficiency Solutions for Mixed-Type Use – Free water efficiency visit.
 - Water Efficiency Consultancy for Industry – This option will start with the highest water users and work downward in order to better understand water use in industry, identify areas where water is not being used efficiently, and provide suggestions and solutions to reduce water waste.
 - Golf Course Water Efficiency – Supporting golf courses to use water more efficiently through introducing rainwater harvesting and other smart irrigation solutions to reduce consumption of potable use, supplying courses with an irrigation audit where options are explored to reduce their consumption, and undertaking water saving visits for clubs and hospitality venues.
- **Smart enhancement for water efficiency** – comprises eight water efficiency options:
 - Flow restrictor install along with smart meter install – compulsory/opt out.
 - Education through engagement on door step at point of meter install.
 - Education through leave behind at point of install.
 - Leak repair (toilet) at point of install.
 - Leak repair (taps, boiler overflow) at point of install.

- Leak check at point of install – no repair completed.
- Water saving product installation at point of install – tap inserts, shower timer etc.
- Water saving Visit at point of install for high water using properties.

2.9 Relationship to Water Resources East Regional Plan

- 2.9.1 Regional Plans for water resources are now a requirement for the five regional groups in England under Defra’s National Framework, with WRE representing the strategic, multi-sector water needs of the East of England WRZs. Collaboration with WRE and the developing Regional Plan was therefore required throughout the development of ESW’s WRMP24 to enhance environmental outcomes, improve the resilience of water supplies to drought, and ensure security of supply.
- 2.9.2 Traditionally, water company WRMPs have focussed primarily on the supply needs of public water supply within their supply areas. However, given long term water resources pressures, particularly in the South and East of the country, the Water Resources National Framework (WRNF) confirmed the need for consideration of regional and inter-regional solutions to support national water resources resilience. Consequently, the WRNF set out the EA’s expectations for five regional water resources planning groups with respect to solving regional supply deficits and increasing abstraction sustainability.
- 2.9.3 The final WRMP24 is undertaken in the context of the WRE regional planning that was carried out. WRE is one of the five regional water resource planning groups that have been set up in England to deliver the National Framework for water resources. WRE’s core water company members include ESW, Affinity Water, Anglian Water and Cambridge Water, as well as environmental, energy, and agricultural sector representatives. A map of the five regional water resource planning groups is provided in Figure 2.4.

Figure 2.4: The five regional water resource planning groups



Source: ESW final WRMP24

- 2.9.4 Unlike the other regional planning groups, which are water-company led, WRE has been established as a not-for-profit company limited by guarantee with a wide variety of interests represented on its Board and within the company. These include public water supply, drainage, local authorities, agri-food, environment, industrial and energy sectors, academia, and the National Parks.
- 2.9.5 Key linkages with WRE in the development of water supply options have been as follows:
- Development of the generic option list – this has been undertaken with a review of previous WRE options to consider relevance to ESW.
 - Inclusion of new water supply options within WRE modelling – as water supply options have been developed and refined these have been included within the WRE regional option list for inclusion within the WRE model.
- 2.9.6 WRE has developed a Regional Plan (published December 2023), which was consulted on at the same time as the water company rdWRMP24's, which supports the Government's 25-year environment plan, and which has an objective to '...leave the environment in a better condition than we found it'.
- 2.9.7 The main objectives, as presented in the WRE Regional Plan (2023), are to:
- Ensure there is enough water for a growing population and to support economic growth.
 - Improve the environment by leaving more water in the region's rivers, streams and underground sources.
 - Increase the region's resilience to severe drought and other extreme shocks and stresses.
 - Address the impacts of climate change on demand for water and how much is available.
- 2.9.8 WRE's vision is to provide an integrated long term strategy, prepared through multi-sector collaboration and planning, that takes account of the needs of all of those in the WRE region with an interest in the management and use of water. The ambition is that water companies in the region will collaborate with others and agree a long term water resource strategy which will then be used to guide the development of the WRMP24s. WRE's overall aim is to deliver a reliable, sustainable, and affordable system of water supply to meet multi-sector requirements (including the environment) across the East of England for the next 50 years and beyond towards the end of the century. Whilst WRE's Regional Plan informs the water companies' WRMP24s, it has also allowed them to refine smaller, local level solutions that are not strategically significant at a regional level.
- 2.9.9 An overview of how WRE's Regional Plan has informed this WRMP24 is presented below.

Baseline and Final Plan Supply Demand Balance

- 2.9.10 For public water supply, individual water companies have prepared their own baseline supply demand balance forecasts and have provided them to WRE for use in regional modelling. For consistency, the same baseline forecasts have therefore been used for both the regional and water company plans. As a result, baseline supply demand balance forecasts covering the planning period 2025 to 2100 have been prepared at a regional level to determine when there is a supply deficit or a supply surplus at any point across the planning period.

Per Capita Consumption (PCC)

- 2.9.11 Government requires water companies to plan to reduce PCC to 110/litres/head/day by 2050. Along with WRE, ESW have adopted this planning assumption and have developed demand management options accordingly.

Leakage

- 2.9.12 Whilst water companies within WRE plan to reduce leakage to different levels reflecting their local positions, these plans and their anticipated demand savings have been shared with WRE. The national water industry target is to reduce leakage by 50% from 2017/18 levels by 2050. This is a target for the industry as a whole and not for individual water companies. ESW's current leakage performance is near industry leading and so they do not believe that it is fair to their customers to reduce leakage by a further 50% as they have already exhausted the cheaper leakage reduction options, and so would need to replace significant parts of their distribution network, placing a larger cost burden on their customers. They also do not believe that it is technically feasible to reduce their leakage by 50% by 2050.

Environmental Destination

- 2.9.13 The Government's 25 Year Environment Plan aims to improve the environment for the next generation with specific targets for sustainable abstraction. The WRNF builds on this, setting clear expectations for achieving and maintaining sustainable abstraction to 2050 and beyond. Some abstraction licences have annual licensed quantities which are already considered unsustainable and so will be reduced through the application of "sustainability reductions" either on renewal of time limited abstraction licences, or else by 2030. Other abstraction licence annual licensed quantities are considered unsustainable in the longer term (e.g., 2040 to 2050) and may need to have sustainability reductions applied then in order to leave more water in the environment to ensure it is resilient to the effects of future climate change. The EA provided regional groups with an initial assessment of long term abstraction sustainability under a number of scenarios. WRE has then undertaken further analysis and assessed what the sustainability reduction should be at a water company abstraction licence level. Along with other WRE water companies, ESW have applied WRE's Business-As-Usual Plus sustainability reductions to their baseline supply forecasts. ESW have also undertaken sensitivity analysis to see how the other scenarios impact their final BVP.

Intra and Inter-regional Water Transfer Options

- 2.9.14 A baseline supply deficit has been forecast in both of ESW's supply areas from 2025, and so as a result ESW has not been considered as a donor water company. The opportunity for inter-regional transfers between WRE and Water Resources South East (WRSE), and WRE and Water Resources North (WReN), were assessed by the regional groups. However, it was agreed at national reconciliation workshops that these would not provide best value. As a result, neither WRE's or ESW's BVPs include new transfers to other water companies or regions.

Environmental and In-combination Effects Assessment's

- 2.9.15 The WRE Regional Plan¹⁵ suggests the environmental assessments, including the SEA, can be used as a framework for the WRE member water companies such as ESW when undertaking their WRMP24 statutory environmental assessments.
- 2.9.16 The regional SEA results were reviewed and where relevant local information was included in the assessments as part of the ESW WRMP24. The regional SEA results may also flag where mitigation is needed, which would help inform further options development by ESW for the final WRMP24. Any new options not included in the Regional Plans would need full assessment using the defined SEA framework as part of the WRMP24.
- 2.9.17 To meet legislative requirements, an in-combination effects assessment, specific to the final WRMP24, has also taken place, the results from which are included in this report. The final

¹⁵ WRE (2021). WRE Regional Plan Integrated Environmental Assessment Scoping Report. January 2021. 123 pages. Available online at: [Statement of resource need \(wre.org.uk\)](https://www.wre.org.uk)

WRMP24 in-combination effects assessment has considered transfers which are outside the ESW area, or in proximity to the plan boundary, with potential pathways affecting receptors outside the plan area. Further details on the environmental assessment approach including the SEA method can be found in Section 4 of this Environmental Report, with methodologies for other environmental assessment disciplines, i.e., HRA, WFD, BNG and NCA, and INNS, detailed in Appendix F through I, respectively.

3 Scoping Summary

3.1 Introduction

3.1.1 The scoping stage of the SEA process (Stage A in Figure 1.2) sets the context and scope for the SEA and Environmental Report. Specifically, the scoping stage aims to:

- Review relevant international, European, national, and local policies, plans and programmes and their implications for the WRMP24.
- Establish the baseline environmental and socio-economic information and key sustainability issues and opportunities for the WRMP24 area.
- Set the context and objectives of the SEA.
- Decide on the scope for the SEA, ensuring that it covers all the likely significant environment effects of the WRMP24.
- Provide an opportunity to engage and collaborate with the Consultation Bodies.

3.1.2 The SEA Scoping Report was issued for consultation and responses were received from the Environment Agency, Natural England, Historic England, and Norfolk County Council during the 5-week consultation period which ran from March to April 2022.

3.1.3 This section of the Environmental Report summarises the outcomes from the scoping stage, including the contents of the scoping report.

3.2 Relationship with other Plans, Policies and Programmes

3.2.1 A review of the policies, plans, and programmes relevant to the WRMP24 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 ESW supply region.

3.2.2 A review of these documents is required to identify potential inconsistencies or constraints, and consistencies between these documents and the WRMP24 to inform the development of the SEA Framework. Table 3-1 lists current relevant policies, plans, and programmes which were considered during the SEA scoping stage. Appendix C presents the policies, plans, and programmes review in full.

Table 3-1: Relevant international, national, and regional policies, plans and programmes

Policies, Plans and Programmes

International	
<ul style="list-style-type: none"> • Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979) • Bonn Convention on the Conservation of Migratory Species of Wild Animals (1983) • Convention on Biological Diversity (1992) • Ramsar Convention – The Convention on Wetlands of International Importance (1971) • Convention Concerning the Protection of the World Cultural and Natural Heritage (1972) 	<ul style="list-style-type: none"> • Commitments arising from the World Summit on Sustainable Development, Johannesburg (2002) • Paris Agreement (2015) • Charter for the Protection and Management of Archaeological Heritage (1990) • The World Heritage Convention (1972) • Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) (1998)

<ul style="list-style-type: none"> • Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1973) • UN Framework Convention on Climate Change (1992) • Kyoto Protocol to the UN Framework Convention on Climate Change (1997) • Convention on the Protection of Underwater Cultural Heritage (2001) • Framework Convention on Climate Change (1992) 	<ul style="list-style-type: none"> • Children’s Environmental and Health Action Plan for Europe (2004) • Convention for the Protection of the Architectural Heritage of Europe (2009) • Doha Agreement (2012) • World Health Organisation (WHO) Global Air Quality Guidelines (2021)
European¹³	
<ul style="list-style-type: none"> • Ambient Air Quality Directive (2008/50/EC) • Thematic Strategy on Air Pollution (2005) • Establishing measures for the recovery of the stock of European eel 2007 (1100/2007) • Our life insurance, our natural capital: an EU biodiversity strategy to 2020 (2011) • Fresh Water Fish Directive (2006/44/EC) • Directive on the Conservation of Wild Birds (79/409/EEC) (as amended) • Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (92/43/EEC) • Directive on Animal health requirements for aquaculture animals and products thereof, and on the prevention and control of certain diseases in aquatic animals (2006/88/EC) • Limiting Global Climate Change to 2 degrees Celsius – The way ahead for 2020 and beyond (2007) • A Clean Planet for all: A European strategic long term vision for a prosperous, modern, competitive and climate neutral economy (2018) • Promotion of the use of energy and renewable sources Directive (2009/28/EC) • Energy Act 2013 • Mainstreaming sustainable development into EU policies: 2011 • European Commission Environmental Liability Directive (2004/35/EC) • Directive on the assessment of the effects of certain plans and programmes on the environment (2001/42/EC) 	<ul style="list-style-type: none"> • The Convention for the Protection of the Architectural Heritage of Europe (Granada Convention) (1985) • The European Convention on the Protection of Archaeological Heritage (Valletta Convention) (1992) • The European Landscape Convention (2006) • The Environmental Noise Directive (2002/49/EC) • European Soils Charter (2003) • Thematic Strategy for Soil Protection (2006) • The Nitrates Directive (91/676/EEC) • The Water Framework Directive (WFD) (2000/60/EC) • Urban Wastewater Treatment Directive (91/271/EEC) • Drinking Water Directive (1998/83/EC) • Directive on Bathing Water (76/160/EEC); and Directive 2006/7/EC repealing Directive 76/160/EEC (from 2014) • Groundwater Directive (2006/118/EC) • Marine Strategy Framework Directive (2008/56/EEC) • Directive on the Assessment and Management of Flood Risks (2007/60/EC) • Blueprint to Safeguard Europe’s Water Resources (2012)
National	
<ul style="list-style-type: none"> • The Eels (England and Wales) Regulations 2009 (as amended) • Salmon and Freshwater Fisheries Act 1975 • UK Post-2010 Biodiversity Framework, JNCC and Defra (2012) • Making Space for Nature – A review of England’s Wildlife Sites and Ecological Network (2010) • Biodiversity 2020: A strategy for England’s wildlife and ecosystem services, Defra (2011) • The Conservation of Habitats and Species Regulations (2017) • The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations (2019) 	<ul style="list-style-type: none"> • Strategic Environmental Assessment, Sustainability Appraisal and the Historic Environment, Historic Environment (2016) • The Setting of Heritage Assets, Historic Environment Good Practice Advice in Planning 3, Historic Environment (2017) • Ancient Woodland and Veteran Trees: Protecting them from development, Forestry Commission and Natural England (2014) (Updated 2017) • Our Waste, Our Resources: A Strategy for England, HM Government (2018) • Safeguarding our Soils – A strategy for England, Defra (2009)

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- Delivering a healthy natural environment. Ecosystem approach action plan, Defra (2010)
 - The Great Britain Invasive Non-Native Species Strategy, Defra (2015)
 - Conservation 21 – Natural England's Conservation Strategy for the 21st Century, Natural England (2016)
 - State of Natural Capital Annual Report 2020, Natural Capital Committee (2020)
 - Standing Advice on Protected Species, Natural England (2022)
 - Nature for People Climate and Wildlife policy paper (2021) – includes the England Peat Action Plan
 - Climate Change Act 2008 (2050 Target Amendment) Order (2019)
 - UK Climate Projections (2018)
 - The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting, Defra (2018)
 - National Planning Policy Framework (NPPF) (2021)
 - A Green Future: Our 25 Year Plan to Improve the Environment, UK Government (2018)
 - Securing the Future – Delivering the UK Sustainable Development Strategy (2005)
 - The Natural Choice: Securing the Value of Nature, Defra (2012)
 - Marine and Coastal Access Act (2009)
 - The Wildlife and Countryside Act 1981 (as amended)
 - Environment Protection Act 1990
 - Countryside and Rights of Way (CROW) Act (2000)
 - The Natural Environment and Communities Act 2006 (NERC Act)
 - Creating a better place: Our ambition to 2020, Environment Agency (2018)
 - UK National Ecosystem Assessment Follow-on (2014)
 - National Infrastructure Strategy 2020
 - Fixing the foundations: Creating a more prosperous nation, HM Government (2015)
 - Environment Act 2021 (including Environmental Targets)
 - The Environmental Damage (Prevention and Remediation) (England) Regulations 2015
 - Environmental Assessment of Plans and Programmes Regulations 2004
 - Creating a great place for living: together we are building a green and healthy future (2018)
 - Planning (Listed Buildings and Conservation Areas) Act 1990
 - The Ancient Monuments and Archaeological Areas Act 1979
 - Climate Change and the Historic Environment, English Heritage (2008)
 - Culture White Paper (2016)
 - Diffuse Water Pollution Theme Plan
 - Water Resources Act 1991
 - Water Industry Act 1991
 - Water Act 2003 (as amended)
 - Preparing for a drier future: England's water infrastructure needs, National Infrastructure Commission (2018)
 - National Policy Statement for Water Resources Infrastructure, Defra (2023)
 - Water for Life White Paper, Defra (2011)
 - The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (as amended)
 - Protect groundwater and prevent groundwater pollution, Environment Agency (2017)
 - The Groundwater (Water Framework Directive) (England) Direction (2016)
 - Flood and Water Management Act 2010
 - Flood Risk Regulations (2009)
 - National Flood and Coastal Erosion Risk Management Strategy for England, Environment Agency (2020)
 - The Flood and Coastal Erosion Risk Management Policy Statement, Defra (2020)
 - Flood risk assessments: climate change allowances, Environment Agency (2016)
 - The Water Resources Management Plan Regulations 2007
 - Water Resources Planning Framework (2015-2065), Water UK (2016)
 - Water Supply (Water Quality) Regulations 2016 (as amended)
 - National Policy Statement for Wastewater (2012)
 - Climate change approaches in water resources planning – Overview of new methods, Environment Agency (2013)
 - Drought response: our framework for England, Environment Agency (2017)
 - Future Water: The Government's water strategy for England, Defra (2008)
 - Environment Agency, 2021, Water resources planning guideline draft supplementary guidance – Environment and society in decision-making (England).
 - British Standard for Biodiversity Net Gain BS8683
 - The Urban Waste Water Treatment (England and Wales) Regulations 1994
 - The Nitrate Pollution Prevention Regulations 2015
 - Managing Water Abstraction, Environment Agency (2021)
 - Marine Plans – South East Inshore, South Inshore, South Offshore (Marine Management Organisation)
 - Net Zero Strategy: Build Back Greener (2021)
 - Norfolk and Suffolk Broads Act 1988
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- Environmental Improvement Plan (2023)
 - Environmental Permitting (England and Wales) Regulations (2016)
 - Environmental Principles Policy Paper (2023)
 - Environment Act (1995)
 - Energy Act (2013)
 - Energy White Paper: Meeting the Energy Challenge (2007)
 - Government Food Strategy (2022)
 - Heritage Protection for the 21st Century (2007)
 - Invasive Alien Species (Enforcement and Permitting) Order (2019)
 - Lakes and Water Features, Technical Guidance (2023)
 - Mainstreaming Sustainable Development (2011)
 - Marine Plans – Northeast Inshore, Northeast Offshore (2021)
 - Meeting our future water needs: a national framework for water resources (March 2020)
 - Narrative for Conserving Freshwater and Wetlands in England, Natural England (2016)
 - Standing Advice on Protected Species, Natural England (2022)
 - Sustainable Farming and Food Strategy – Facing the future (2002)
 - Air Pollution: Action in a Changing Climate Defra (2010)
 - Air Quality Standards Regulations (2010)
 - Air Quality Strategy (2023)
 - Air Quality Plan for Nitrogen Dioxide (NO₂) in UK (2017)
 - Ancient woodland, ancient trees and veteran trees: advice for making planning decisions (2022)
 - Build Back Better: our plan for growth (2021)
 - Conservation of Habitats and Species Regulations (2010) ‘the Habitats Regulations’ (amended 2011) – check it’s there
 - National Food Strategy (2020)
 - National Heritage Act (2002)
 - Clean Air Strategy (2019)
 - National Parks and Access to the Countryside Act 1949
 - UK Biodiversity Action Plan (1994)
 - UK Renewable Energy Roadmap (2011)
 - Peatlands and the Historic Environment, An Introduction to their Cultural and Heritage Value (2021)
 - Planning our electric future: A White Paper for secure, affordable and low carbon electricity (2011)
 - Protection of Wrecks Act (1973)
 - Restoring Sustainable Abstraction Programme (undated)
 - Rural Strategy (2004)
 - Scheduled Monuments & Nationally Important but Non-Scheduled Monuments (2013)
 - Securing a healthy natural environment: An action plan for embedding an ecosystems approach (2007)
 - Site Improvement Plans for England’s Natura (IPENS) 2000 sites: East of England (2012)
 - Soil Action Plan for England (2004)
 - The Levelling Up and Regeneration Bill (2022)
 - Third UK Climate Risk Independent Assessment (CCRA3) (2021)
 - Understanding the Risks, Empowering Communities, Building Resilience: The National Flood and Coastal Erosion Risk Management Strategy for England (2011)
 - Water Framework Directive (Standards and Classification) Directions (England and Wales) (2015)
 - UK Flood risk and coastal erosion management: Policy Statement (2020)
 - UK Geodiversity Action Plan (UKGAP) (2011)
 - UK Net Zero Growth Plan (2023)
 - UK Peat Strategy (2018-2020) (2018)
 - UK Powering Up Britain – Energy Security Plan (2023)
 - UK Renewable Energy Strategy (2009)
 - UK Sustainable Development Strategy (2005)
 - Government Statement on the Historic Environment (2015)
 - Infrastructure Act (2015)
 - Living Waterways – Transform Places & Enrich Lives: Our 10 Year Strategy (2015)
 - Managing Significance in Decision-Taking in the Historic Environment (2015)
 - Ozone-Depleting Substances Regulations (2015)
 - The Historic Environment and Site Allocations in Local Plans, Historic England Advice Note 3, Historic England (2015)

Regional and Local

- Site Improvement Plans for Natura 2000 sites: London & South East, Natural England
 - Local Development Plans (Various)
 - Public Rights of Way Improvement Plans (ROWIPs) (Various)
 - WRSE Regional Plan (2023)
 - WRSE SEA Scoping Report (2020)
 - WRSE Natural Capital and Biodiversity Net Gain Method Statement (2020)
 - WRSE Regional Plan Environmental Assessment Methodology (2020)
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- Local level Green Infrastructure Plans and Strategies (Various)
- AONB Management Plans (Various)
- National Character Area (NchA) Profiles, Natural England
- Chalk-Streams First: A Permanent and Sustainable Solution to the Chilterns Chalk-Streams Crisis, Various (2020)
- National Natural Capital Atlas: Mapping Indicators, Natural England (2020)
- South East River Basin Management Plan (2022)
- Anglian River Basin Management Plan (2022)
- Humber River Basin Management Plan (2022)
- Thames River Basin Management Plan (2022)
- Severn River Basin Management Plan (2022)
- Catchment Flood Management Plans: Anglian River Basin (2019); South East River Basin (2022); and Thames River Basin (2009)
- Catchment Abstraction Management Strategies (CAMS) (2016) (Various)
- Suffolk Local Transport Plan 2011-2031 (2011)
- Joint Norfolk and Suffolk County Council Natural Capital Assessment (2020)
- Anglian Water's Drainage and Wastewater Management Plan (2023)
- Anglian Water Revised Draft Water Resource Management Plan 2024 (2023)
- Affinity Water Revised Draft Water Resource Management Plan 2024 (due 2024)
- Thames Water Revised Draft Water Resource Management Plan 2024 (2023)
- Yorkshire Water Draft Water Resource Management Plan 2024 (2022)
- Developing our 'Best Value' multi-sector regional resilience plan, a consultation on our objectives, value criteria and metrics, WRSE (2021)
- WRE Regional Plan Method Statement, WRE (2020)
- WRE Draft Integrated Environmental Assessment Scoping Report, WRE (2021)
- WRW Regional Plan (2023)
- Draft South East Marine Plan, Marine Management Organisation (2020)
- Water Resources Planning Guideline, Various (2021)
- Draft Flood Risk Management Plans (FRMPs) summary of consultation responses (2022): Anglian River Basin; South East River Basin; and Thames River Basin
- Meeting our Future Water Needs: A National Framework for Water Resources, Environment Agency (2020)
- Long term water resources environmental destination, Environment Agency (2020)
- Forward programme 2021-22, RAPID (2021)

Essex and Suffolk Water Plan and Strategies

- Environment Strategy (2021)
- Pollution Incident Reduction Plan (2020)
- PR19 Business Plan (2020)
- Emission Possible Plan to achieve net zero by 2027 (2021)
- Water Environment Improvements / Blue spaces Scheme (2021)
- Biodiversity Strategy (2012)
- Drought Plan (2022)
- Safety, Health and Environment (SHE) Statement (2020)
- Leakage Target (2020)

3.3 Scoping Baseline Review

3.3.1 Alongside the Plans, Policies and Programmes review, discussed in Section 3.2, a comprehensive set of baseline data was gathered to be used within the SEA Scoping, as well as throughout the SEA Assessments and reporting. The Scoping Report included a review of current baseline information for environment and socioeconomics within the broader WRE region, as shown in Figure 3.1, which contains the ESW WRMP24 geographical area. For this Environmental Report, we have amended the initial baseline review to include data more specific to the ESW WRMP supply region, where available. The complete baseline information with supporting maps is presented in Appendix D, however a summary of the baseline for each of the SEA Directive topics is provided below:

- Biodiversity, flora and fauna** – The ESW region overlaps with numerous sites designated and managed for their biodiversity values. This includes Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) in the UK’s national site network (previously part of the Natura 2000 network under the EU Habitats¹⁶ and Birds¹⁷ Directives), Ramsar sites (Wetlands of International Importance), Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs). Marine Protected Areas (MPAs) and Marine Conservation Zones (MCZs) are also present along the coast of areas covered by the WRMP24. The WRMP24 region is rich in species and habitat diversity. Important biodiversity is present both within designated protected areas and priority habitats across the wider landscape including deciduous woodland, and wetland, coastal and estuarine habitats and species.
- Soil** – The ESW region as part of the wider WRE region is a hub for agriculture with cereal and livestock grazing being the predominant type of farming. Agricultural land is classified on a scale of 1 to 5 where 1 is the highest quality and 5 is the lowest. The agricultural land classification of the region is predominately of Grade 2 and Grade 3 with pockets of urban and non-agricultural land as shown in Appendix D. There are significant areas with Grade 1, particularly around North Cambridgeshire and South Lincolnshire. The East of England has a significant number of landfill sites with potential to contaminate soils. Currently, there are approximately 355 authorised landfill sites across the WRE region.
- Water** – WRE, and therefore the ESW supply region, is one of the driest areas in the UK and is classed as an area with serious water stress¹⁸. Local population growth, agriculture, and industry are expected to continue driving increases in demand, while climate change will pose challenges for the already limited supply. The region contains a number of nationally and internationally important wetlands and other water-dependent habitats. Most of the ESW supply area falls within the Anglian river basin district, with a small area in the extreme west, predominantly the river Lea catchment, falling within the Thames River Basin District (RBD). Water bodies within the Anglian Water RBD are mostly affected by pollution from rural areas, pollution wastewater and pollution from towns, cities, and transport, as well as physical modifications. Within the Thames RBD, physical modifications, pollution from towns, cities and transport and pollution from wastewater affect the highest proportions of water bodies.
- Flood risk** – Within the WRMP24 region there is a risk of flooding from various sources, including coastal waters, surface water, groundwater, and reservoirs. The South Essex Flood Risk area is considered significantly at risk of local flooding. Climate change is expected to cause the flood risk to increase, due to more frequent extreme weather events and sea level rise. Nearly 30% of the land mass in the region already lies below sea level.
- Covid-19 Impacts on Water Demand** – data collated for this report indicate that demand and PCC were impacted by the Covid-19 pandemic. Namely, household demand increased, non-household demand decreased with an overall increase of total demand. These impacts are anticipated to continue to affect PCC and demand in the next few years with potential for permanent changes.
- Air** – Air quality in the WRE area and therefore the ESW supply region is varied and there are certain areas with higher concentrations of air pollutants likely to be associated with

¹⁶ The Council of the European Communities (1992). Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. *Official Journal of the European Communities*. Available at: [The Habitats Directive - Environment - European Commission \(europa.eu\)](https://eur-lex.europa.eu/eli/dir/1992/43/oj).

¹⁷ The European Parliament and the Council of the European Union (2009). Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds. *Official Journal of the European Union*. Available at: [EUR-Lex - 32009L0147 - EN - EUR-Lex \(europa.eu\)](https://eur-lex.europa.eu/eli/dir/2009/147/oj).

¹⁸ Environment Agency (2013). Water Stressed Areas – Final Classification. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf

urbanisation, transport, or business activities. Air Quality Management Areas (AQMAs) are declared where the national air quality objectives are not being met¹⁹. A high proportion of the local authorities within the ESW supply region contain at least one AQMA and are predominately designated for Nitrogen dioxide (NO₂) and Particulate Matter (PM₁₀)²⁰. There is a total of 42 AQMAs in the Essex and Suffolk supply area.

- **Climatic factors** – Like the rest of the UK, the East of England (which includes the WRMP24 region) is expected to experience warmer temperatures under climate change, particularly in the summer months²¹. Annual precipitation is expected to decrease overall, with a small increase in winter but a larger decrease in summer²². These climate changes will exacerbate water stress in the WRMP24 region. Extreme weather events are also predicted to occur more frequently as a result of climate change, increasing water-related risks such as flooding and drought.
- **Population, human health and economy** – ESW is part of NWL and provides water services to 1.8 million people, operating in two areas: one serving parts of Norfolk and Suffolk, and the other serving parts of Essex and Greater London (see green areas in Figure 3.1 for complete WRE WRMP extent overview. The extent of the ESW region is shown on this figure). Human settlements in these counties are comprised of a few moderately large cities with many smaller towns, villages, and hamlets. Population age distribution within the ESW region is similar to the UK average - with an overall aging population trend predicted over the next 40 years - and ethnicity is predominately White with larger proportions of Black, Asian and Mixed ethnicities in urban areas compared to rural areas of the region. Public health in Eastern England is generally considered better than the UK average, reflected through various indicators including life expectancy. Eastern England contributes around 10% of the total UK economy, and as with the rest of the UK, the service sector dominates employment. Economic deprivation is considered low across most of the region, but with some small areas where it is higher.
- **Historic environment** – The WRE region and the ESW supply areas has a rich cultural heritage, with numerous designated heritage assets including listed buildings, scheduled monuments, conservation areas, registered parks and gardens, and registered battlefields. There is also potential for currently unidentified heritage assets and archaeological remains to be present within the region.
- **Landscape** – The landscape in the ESW region is comprised of lowlands, small hills, and a long stretch of coastline with picturesque seaside villages. Agriculture dominates the landscape in rural areas. In addition, the WRMP region contains some significant landscape areas. It partially overlaps The Broads National Park, and the Suffolk Coast and Heath Natural Character Area defines the entire coastal region of Suffolk.
- **Material assets** – Significant transport infrastructure in the ESW supply region includes London Stansted International Airport; the UK's busiest container port, Felixstowe; the Ports of Ipswich and Harwich; and the M1 motorway which passes through the wider WRE region. Several other main trunk routes and major roads are also present. In terms of resource use and waste, the recycling rate for Eastern England is the second highest of regions in England.
- **Natural capital** – The WRE region contains all eight of the broad habitat types included within the UK's National Ecosystem Assessment (NEA), with farmland comprising the

¹⁹ Defra (2022), "National air quality objectives and European Directive limit and target values for the protection of human health", Available at: [National_air_quality_objectives.pdf \(defra.gov.uk\)](https://www.defra.gov.uk/national-air-quality-objectives.pdf)

²⁰ Defra List of Local Authorities with AQMAs (2022). Available at: <https://uk-air.defra.gov.uk/aqma/list>

²¹ RMetS (2020). State of the UK Climate. Available at: <https://rmets.onlinelibrary.wiley.com/doi/epdf/10.1002/joc.6726>

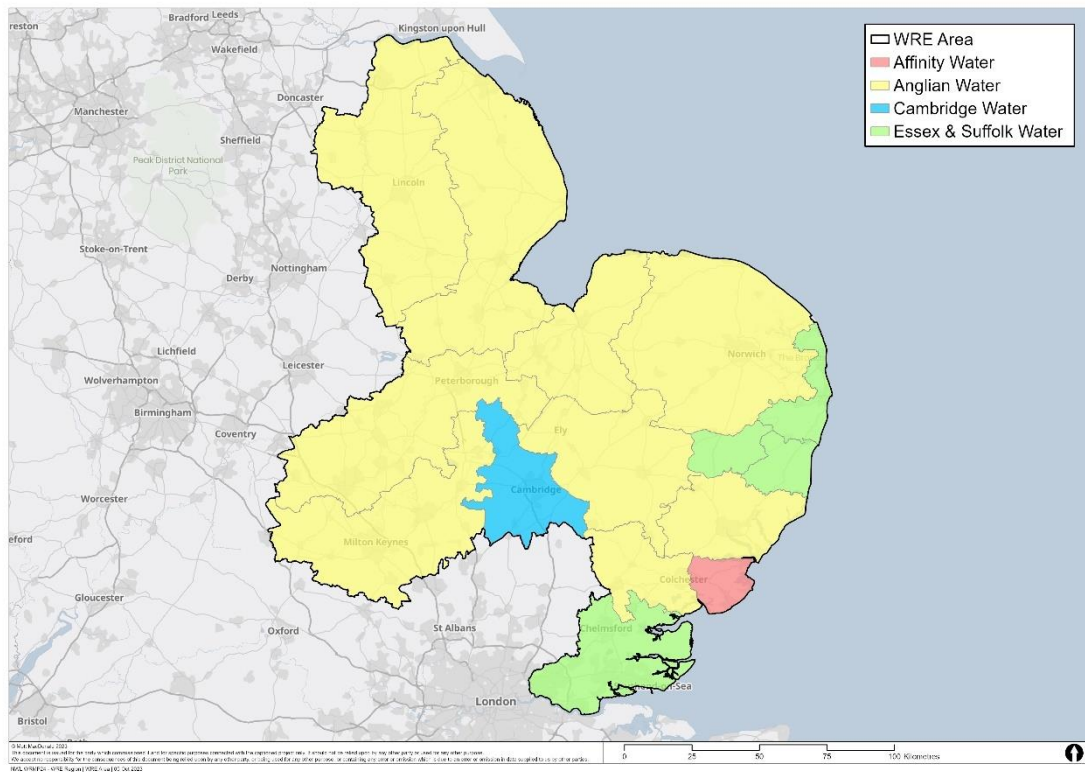
²² Met Office UKCP18 (2022). Available at: <https://ukclimateprojections-ui.metoffice.gov.uk/>

largest land cover type (73.3%), and urban (13.5%) and woodland (6.2%) habitats also making up a substantial portion of the land cover. These stocks of natural capital support a broad range of ecosystem services, providing benefits to society such as hazard prevention, climate regulation and opportunities for recreation, among others.

Resource Use and Waste – In 2019/20 the total amount of local authority managed waste was 25.6 million tonnes. Eastern England managed 1.2 million tonnes of waste in 2019/20, with 36.2% of this collected waste sent for recycling, 56.9% sent to incineration, 5.6% sent to landfill and the remaining 1.2% fell within the ‘other’ category. The recycling rate for Eastern England (47.6%) was the second highest in the nation, with only the South West (49.3%) performing better.

- 3.3.2 The baseline review identified two major influencers of future change in the ESW region: climatic factors and material assets. Climate change is being driven by emissions of greenhouse gases at a global scale, with impacts in the WRMP region expected to continue intensifying through its 25-year period. Concurrently, investment in the region is expected to increase the amount and quality of material assets such as housing, transport infrastructure, waste facilities and community facilities. This change has the potential to exacerbate key issues in the ESW region, for example related to impacts on biodiversity, population growth, loss of agricultural land to development, and water availability.
- 3.3.3 While not identified as key issues in the ESW region, consideration should also be given to potential implications (positive and negative) for wider issues such as air quality, the historic environment, and the quality and character of landscapes.
- 3.3.4 Beyond the environmental topics listed above, it is recognised that the baseline can change over time, Appendix D: *Baseline Review and Baseline Maps*, contains information on the evolution of the future baseline which can be relevant to the SEA process.
- 3.3.5 The baseline environmental information was used in the SEA scoping to determine the SEA Objectives, Assessment Questions and Sub-Themes of the SEA, as outlined in Table 3-2.

Figure 3.1: WRE region



Source: Mott MacDonald (2023)

3.4 Future Baseline

3.4.1

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. However, after initial review, the following key trends have been identified, and are considered likely to continue, potentially resulting in changes to baseline conditions for the Essex and Suffolk region:

- **Biodiversity, flora, and fauna** – habitats and species are likely to continue to be protected through European and UK legislation. 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 (2010) recognises that future climate change, demographic change, economic growth, new technologies, societal preferences and changes in policy and regulatory environments may all have profound consequences²³. However, new legislation such as The Environment Act 2021 is likely to continue protection of biodiversity by providing a framework for a legally binding target of net gain within the planning system.
- **Soil** – as the population increases, this is likely to lead to more development and thus brownfield land will be remediated and developed. Also, greenfield land is likely to be at risk

²³ Lawton (2010). Making Space for Nature: A review of England’s Wildlife Sites and Ecological Network. Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20130402170324mp_/http://archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf

of development, leading to potential new soil quality issues. Additionally, there is potential for future loss of agricultural land through development pressures.

- **Water** – water quality is likely to continue to be maintained and improved through legislation such as the WFD, however there is potential for development pressures through brownfield remediation and greenfield development which could lead to water quality issues. The ESW region is one of the driest areas in the UK and is classed as an area with serious water stress¹⁸. Future economic and population growth could place increased pressure on the region's water resources and water dependent environments, especially during drier periods or drought. It is likely there will be an increased need for wastewater treatments as a result of WFD water quality standards combined with population increase.
- **Flood risk** – climate change is expected to cause the flood risk to increase, due to more frequent extreme weather events and sea level rise combined with the low ground levels across the region.
- **Air Quality** – new development, economic growth and tourism may lead to increased car journeys and congestion within the area leading to localised air quality effects. Public transport improvements, national air quality targets and European emissions standards for new vehicles should contribute to reducing future air quality effects from motor vehicles.
- **Climatic factors** – the climate is expected to continue to change with annual average temperatures projected to increase, particularly in summer. Winters are projected to be wetter and summers drier. Climate change is projected to result in more extreme weather events, potentially causing or exacerbating periods of drought which alongside population and economic growth could impact water availability. Carbon and other Greenhouse Gas (GHG) emissions will continue to be emitted, and given the energy intensity of wastewater treatment, and the building of additional water assets and infrastructure, water industry GHG emissions may increase and further contribute to climate change. However, regulations and legislation will likely continue to promote the reduction in emissions through commitments to net zero. The water industry in the UK is aiming to become net zero by 2030²⁴.
- **Historic Environment** – Historic England recently reported that heritage assets at risk are decreasing. There are now 58 fewer heritage assets at risk than in 2021 with successes in buildings and structures and archaeology²⁵. Historic assets will likely continue to be protected through European and UK legislation. However, development could put pressure on heritage assets and their setting.
- **Landscape** – changing and continued development will affect the quality and character of landscapes.
- **Population and human health** – water available for consumptive use may be affected by climate change whereby access to water is limited through more frequent droughts or floods. Population is projected to increase in the region and life expectancy is also higher than the nation average meaning that the numbers of elderly residents are likely to increase. As such, water demand will increase, and further pressure will be placed on water resources within the region.
- **Material assets** – regeneration and future investment and demand are likely to increase the number and quality of material assets such as housing, transport infrastructure, waste facilities, and community facilities.

²⁴ Water UK (2020), Water industry plans to reach net zero carbon by 2030. Available at: <https://www.water.org.uk/news-item/water-industry-plans-to-reach-net-zero-carbon-by-2030/>

²⁵ Historic England (2023). Heritage at Risk. Available at: <https://historicengland.org.uk/advice/heritage-at-risk/findings/>

- **Natural capital** – an increase in population and development will likely result in the urban habitat increasing, placing further demand on infrastructure and transport development throughout the region.

3.5 Scoping Consultation

3.5.1 Following the Scoping Report consultation period, all consultation responses received from the EA, WRE and internal ESW stakeholders were reviewed and considered as appropriate (see Appendix B for the full Scoping Consultation Log). A total of 56 comments were received, encompassing agreement with aspects of the proposed approach, sources to assist in its application, methodological questions and clarifications, and suggested modifications and enhancements to the proposed approach and SEA assessment framework.

3.5.2 Key themes arising from the Scoping Report consultation included:

- **Consistency between approaches**, that is aligning with, and where necessary building on/ refining, previous work and regional-level plans (including Water Resources East's Integrated Environmental Assessment approach), as well as relevant guidance, planning and policy frameworks.
- **Coverage of a full range of socio-environmental issues including interactions and synergistic impacts** in both construction and operation, including but not limited to air quality, climate change, pollution, biodiversity, and aesthetic/character values.
- **Mitigating potential impacts on the historic environment and heritage assets**, including designated and non-designated heritage sites, and recognising that some heritage assets may currently be unknown.
- **Representativeness** across locations, customers, and stakeholders, and engagement of experts including local groups and advisors.
- **Opportunities to have positive impacts**, including in relation to biodiversity, responsible recreation and engagement with the natural and historic environments, climate resilience, and development of green infrastructure.

3.5.3 Where changes to the approach were suggested, these were considered in detail by the WRMP24 project team. Recommendations were incorporated based on factors such as:

- The extent to which they were already addressed by the SEA framework.
- Their specific applicability and relevance (including level of detail) to the purpose and scope of the final WRMP24.
- The feasibility of carrying out realistic and informative assessments.
- Proportionality in the context of the existing SEA framework for water resources planning.
- The significance of the expected effects on assessment results.

3.5.4 As part of the best practice approach to the SEA, an exercise was undertaken to review scoping consultation comments across all the WRMPs. As a result of this process, adjustments were made to two proposed SEA objectives as detailed below:

- **Historic Environment** – SEA objective 18 was updated to reflect wording requested by Historic England, to 'To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting'.
- **Material Assets** – SEA objective 21 was updated to include green infrastructure based on consultation feedback from Natural England, and an additional two assessment questions/sub-themes were added, 'Will the option avoid negative impacts on existing green

infrastructure?’ and ‘Will the option create opportunities for enhancing existing green infrastructure?’

3.5.5 The draft WRMP Environmental Report was produced to accompany the draft WRMP (Stage C in Figure 1.2). The Environmental Report set out the context of the draft WRMP, assessment methodology, findings of the assessments of draft WRMP24, cumulative effects, mitigation and monitoring. The draft plan and Environmental Report were made available for public consultation via Essex and Suffolk’s website and provided to a number of consultees including Natural England, Suffolk Wildlife Trust and the Environmental Agency. At the end of the consultation period (in April 2023) 28 comments had been received in relation to the environmental assessments. A log of these comments, alongside responses, is provided in Appendix B in the Environmental Report.

3.6 Post-consultation SEA Framework

3.6.1 The full SEA assessment framework, with changes from the Scoping Report consultation incorporated, is shown in Table 3-2. The scoping report considered natural capital as a separate objective however due to the qualitative nature of the metric and its inclusion in the programme decision-making as a separate indicator (see Table 4-4: Best Value Planning Environmental Metrics), it is not considered here. This aligns with the approach taken for other WRMPs.

3.6.2 Note the purpose of the assessment questions is to prompt consideration of specific issues when assessing effects related to each topic and objective.

3.6.3 The changes made to the SEA framework following the scoping consultation were not anticipated to significantly change the findings from previous SEA assessments in the ESW region, for example relating to WRE strategic option assessments. Nevertheless, for confirmation and completeness, the WRMP24 environmental assessments reviewed the findings against the amended SEA objectives. The scoping report considered natural capital as a separate objective however due to the qualitative nature of the metric and its inclusion in the programme decision-making as a separate indicator (see Table 4-4: Best Value Planning Environmental Metrics), it is not considered here. This aligns with the approach taken for other WRMPs.

Table 3-2: Post-consultation SEA Methodology Assessment Framework

SEA Topic	Proposed SEA Objectives	Assessment Questions/Sub-Themes
1. Biodiversity, flora and fauna	1.1 – To protect and enhance biodiversity, ecological functions, capacity and habitat connectivity, including protecting designated sites and their qualifying features, priority species and priority habitats.	<ul style="list-style-type: none"> Is the option likely to affect, directly or indirectly, the conservation status of any SPA, SACs, Ramsar sites, SSSI or locally designated sites in accordance with S28 of the Wildlife and Countryside Act and Habitats Regulations? Will the option provide opportunities to enhance and provide climate change resilience of water dependent protected and priority sites, including Natura 2000 sites/features? Will the option meet the 25 Year Environment Plan objectives, Protected Site and Protected Species objectives relating to biodiversity? Will the option protect and enhance aquatic habitats and species, including freshwater fisheries, chalk rivers and marine environment they are linked to?
	1.2 – To provide opportunities for habitat creation or restoration and deliver a net benefit/gain for biodiversity (BNG).	
	1.3 – To avoid introducing or spreading and, where feasible, manage invasive non-native species (INNS).	

SEA Topic	Proposed SEA Objectives	Assessment Questions/Sub-Themes
	1.4 – To meet WFD objectives relating to biodiversity.	<ul style="list-style-type: none"> • Will the option affect the marine environment, habitats and species (including Marine Conservation Areas (MCZ) and Marine Protection Areas (MPA))? • Is the option likely to affect ancient woodland, Section 41 of the NERC act habitats and species of principal importance for the purpose of conserving biodiversity? • Will the option affect any habitats that support legally protected species or species of conservation concern? • Is there potential for contribution to achieving 'favourable' conservation status, as defined by Natural England, or for creation of new priority habitats? • Is the option likely to have an impact on a current or future Nature Recovery Network and Local Nature Recovery Strategies? • Are there any opportunities for habitat creation or restoration? • Will the option contribute to the loss or gain in habitat connectivity? • Is there a possibility for INNS to be spread/introduced or for algal blooms to occur? • Is there an opportunity to improve biodiversity value through removal of INNS?
2. Soil	2.1 – To protect geological and geomorphological features, and the functionality and quality of soils, including the protection of high-grade agricultural land.	<ul style="list-style-type: none"> • Will the option affect high grade agricultural land? • Will the option promote the efficient use of land? • Will the option prevent soil erosion and retain soil stocks as a natural resource? • Will the option promote soil health in the context of the local area? • Will the option involve use of brownfield or greenfield land? • Will the option prevent mineral sterilisation? • Will the option affect soil contamination or involve remediation? • Is the option likely to affect geodiversity, including SSSIs of geological importance? • Will the option prevent nutrient loading in water bodies?
3. Water	3.1 – To reduce or manage flood risk, taking climate change into account.	<ul style="list-style-type: none"> • Is the option vulnerable to flood risk? • Will the option contribute to or reduce the risk of flooding? • Can the option help contribute to the mitigation of flood risk? (i.e., attenuation of flows through NFM, catchment storage

SEA Topic	Proposed SEA Objectives	Assessment Questions/Sub-Themes
		etc.) (Flooding include fluvial, marine, surface and groundwater)
	3.2 – To enhance or maintain the quality of surface and groundwater waterbodies.	<ul style="list-style-type: none"> • Will the option affect surface water quality or quantity? • Will the option affect ground water quality or quantity? • Is the option likely to contribute to or conflict with the achievement of WFD objectives?
	3.3 – To enhance or maintain surface water flows and quantity and groundwater resources.	<ul style="list-style-type: none"> • Will the option affect bathing waters? • Will the option affect shellfish water protected areas? • Will the option affect chalk rivers and streams? • Will the option affect raw water quality? • Will the option reduce the flashy nature of surface waters? • Will the option slow the flow in upper catchments and reduce soil losses to river systems? • Will the option comply with flow targets?
	3.4 – To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	<ul style="list-style-type: none"> • Does the option provide a reliable and sustainable water supply which meets changing demand? • Will the option protect and enhance the environmental resilience of the water environment to climate change, flood risk and drought?
	3.5 – To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	<ul style="list-style-type: none"> • Does the option reduce the presence of containments in waterbodies, and make more water available to the environment?
4. Air	4.1 – To reduce and minimise air emissions during construction and operation.	<ul style="list-style-type: none"> • Is the option in an air quality management area (AQMA)? • Will the option affect local air quality?
5. Climatic Factors	5.1 – To minimise or reduce embodied and operational carbon and greenhouse gas emissions.	<ul style="list-style-type: none"> • Will the option affect carbon or other greenhouse gas (GHG) emissions? • Is there potential for the option to incorporate climate mitigation measures to reduce its carbon footprint, such as lower embodied carbon or incorporating renewable energy? • Will the option affect carbon sequestration?
	5.2 – To introduce climate mitigation where required and improve the climate resilience of assets and natural systems to the threats of climate change.	<ul style="list-style-type: none"> • Is the option vulnerable to climate change effects? • Does the option include climate resilience measures? • Will the option create catchment resilience to drought?
6. Landscape & Visual Amenity	6.1 – To conserve, protect and enhance landscape and townscape character and visual amenity.	<ul style="list-style-type: none"> • Will the option have an effect on the character of the landscape, townscape or seascape, including tranquillity and views? • Will the option improve responsible access to the countryside?

SEA Topic	Proposed SEA Objectives	Assessment Questions/Sub-Themes
7. Historic Environment	7.1 – To conserve / protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting	<ul style="list-style-type: none"> • Will the option create or improve green infrastructure which contributes to access to the landscape? • Will the option protect and enhance designated landscapes and features? • Will the option affect designated or non-designated historic assets, sites and features? • Will the option affect the setting and/or significance of a historic asset? • Will the option affect archaeology (including unknown archaeology)? • Will the option affect heritage assets at risk? • Will the option affect conservation areas or historic landscape/townscape areas? • Will the option alter the hydrological conditions of water-dependent heritage assets, including organic remains?
8. Population and Human Health	8.1 - To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	<ul style="list-style-type: none"> • Does the option promote water efficiency and encourage a reduction in water consumption? • Will the option secure resilient water supplies for the health and wellbeing of customers? • Will the option allow for economic development?
	8.2 - To secure resilient, high quality, sustainable and affordable water supplies over the long term for the health and wellbeing of the community.	<ul style="list-style-type: none"> • Will the option allow for economic diversity? • Will the option have an effect on active lifestyles, such as impacts on active travel through disruption to pedestrian and cycle routes?
	8.3 - To increase responsible access and connect customers to the natural environment, provide education or information resources for the public.	<ul style="list-style-type: none"> • Will the option affect Public Rights of Way? • Will the option affect road or rail infrastructure? • Will the option minimise disturbance from noise, light, visual, and transport? • Will the local communities have been actively engaged to foster an inclusive environment and participate in decision-making?
	8.4 - To maintain and enhance the water environment for other users including recreation, tourism and navigation.	<ul style="list-style-type: none"> • Will the option maintain or enhance tourism? • Does the option improve access to the natural environment for recreation, including those living within deprived areas? • Will the option have an effect on freshwater fisheries for recreational purposes? • Will the option have an effect on marine fisheries for recreational purposes?
9. Material Assets	9.1 - To reduce, and make more efficient, the consumption of	<ul style="list-style-type: none"> • Will the option re-use existing infrastructure?

SEA Topic	Proposed SEA Objectives	Assessment Questions/Sub-Themes
	resources, and minimise the generation of waste.	<ul style="list-style-type: none"> • Will the option minimise the use of resources? • Will the option reduce the production of waste?
	9.2 - Avoid negative effects on built assets and infrastructure.	<ul style="list-style-type: none"> • Will the option affect built assets and infrastructure, including transport infrastructure? • Will the option avoid negative impacts on existing green infrastructure? • Will the option create opportunities for enhancing existing green infrastructure?

3.7 Environmental Protection Objectives and Opportunities

3.7.1 Drawing on the findings of the baseline review (Appendix D) the following environmental protection objectives and opportunities were identified as having relevance to the final ESW WRMP24 BVP (Table 3-3). Table 3-3 outlined the key objectives and opportunities relevant to each SEA topic, which were identified during the Scoping process, are also presented in the table. This was assessed by reviewing baseline conditions, current environmental issues for the ESW WRMP24 regional plan area and an assessment of the likelihood of potential impacts occurring.

Table 3-3: Environmental Protection Objectives and Opportunities

SEA Topic	Environmental Protection Objectives	Environmental Opportunities
Biodiversity, Flora and Fauna	<ul style="list-style-type: none"> • Conserve flora and fauna and their habitats (increase tree and woodland cover). • Conservation and wise use of wetlands and their resources. • Protection of wild birds and their habitats. • Halt overall biodiversity loss (decline in species populations). • Creation of green infrastructure. • Adapt to the impacts of climate change. • Support the Lawton recommendation for planning the management of water resources to: <ul style="list-style-type: none"> - Make space for water and wildlife along rivers and around wetlands. - Recovering nature and enhancing the beauty of landscapes. - Securing clean, healthy and productive and biologically diverse seas and oceans 	<ul style="list-style-type: none"> • BNG opportunities include habitat creation or enhancement, support Nature Recovery Networks and Strategies, connectivity of ecological networks to increase species resilience and introduction of vegetation to slow runoff and reduce flood risk, amongst others. In seeking to optimise the opportunity for biodiversity improvements, the regional planning process seeks to align with Local Nature Recovery Strategies as they become further developed.

SEA Topic	Environmental Protection Objectives	Environmental Opportunities
Population, Communities and Human Health	<ul style="list-style-type: none"> • Promote sustainable and healthy communities. • Promote social inclusion and community participation. • Monitor and provide information to consumers on drinking water quality. • Adapt to the impacts of climate change. • Support the Lawton recommendation for planning the management of water resources particularly connecting people to the environment to improve health and wellbeing. 	<ul style="list-style-type: none"> • The Regional Plan can engage with the local communities and look to maximise opportunities for recreation through enhancing access and the condition of the water environment, greenspaces or areas of the natural environment, alongside opportunities for recreation and tourism through future infrastructure investments, such as the two Strategic Regional Option (SRO) projects in plan area. • The plan will also help ensure a resilient and reliable water supply for our stakeholders now and in the future, ensuring there is enough water for a growing population and to support sustainable economic growth.
Water	<ul style="list-style-type: none"> • In line with the National Framework for Water Resources deliver sustainability reductions as defined by WRE’s environmental destination. • Conservation and wise use of wetlands and their resources. • Improve water quality and to avoid deterioration so all waters achieve their status objective as set out in the Water Framework Directive. • Prevent or limit inputs of pollutants to water bodies and groundwater. • Monitor and provide information to consumers on drinking water quality. • Promote efficient use of water. • Reduce and manage the risks of flooding. • Support the Lawton recommendation for planning the management of water resources to: <ul style="list-style-type: none"> - 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. - Secure clean, healthy and productive and biologically diverse seas and oceans. 	<ul style="list-style-type: none"> • The plan as a whole has the potential to reduce pressures on the water environment through sustainability changes to abstractions, and by developing options that lead to WFD improvements.
Soil	<ul style="list-style-type: none"> • Protect best quality soils and agricultural land. • Support the Lawton recommendation for planning the management of water resources, particularly using and managing land sustainably. 	<ul style="list-style-type: none"> • The WRE Regional Plan may provide opportunities to positively affect agriculture, including options to increase raw water storage and supply and by partnering to support the development and implementation of the Environmental Land Management Scheme (ELMS), and related schemes.
Air	<ul style="list-style-type: none"> • Protect air quality and improve it in those areas that are above legally defined pollutant limits (most harmful air pollutants to human health). 	<ul style="list-style-type: none"> • The WRE Regional Plan may provide opportunities to help improve air quality in the plan area.

SEA Topic	Environmental Protection Objectives	Environmental Opportunities
Climatic Factors	<ul style="list-style-type: none"> • Adapt to the impacts of climate change. • Reduce and manage the risks of flooding. • Support the Lawton recommendation for planning the management of water resources particularly to restore natural processes in river catchments, including in ways that support climate change adaptation and mitigation. 	<ul style="list-style-type: none"> • The plan considers the impact of climate change within option selection and thus incorporates measures to increase the resilience of options to a changing climate. • The plan has the potential to influence the impacts of climate change on demand for water and how much is available to the environment, increasing the resilience to severe drought and other extreme events and stresses.
Historic Environment	<ul style="list-style-type: none"> • Protect designated and non-designated cultural heritage assets including archaeology and built heritage and their related setting. 	<ul style="list-style-type: none"> • The plan may provide opportunities to protect archaeology and reduce effects on heritage assets and their setting.
Landscape	<ul style="list-style-type: none"> • Protection of landscape character and quality. • Creation of green infrastructure. • Support the Lawton recommendation for planning the management of water resources to: <ul style="list-style-type: none"> - Use and manage land sustainably by embedding an “environmental net gain” principle into development (as supported by the Environment Act, 2021). • Recover nature and enhance the beauty of landscapes. 	<ul style="list-style-type: none"> • Consideration of the impacts of the landscape should be considered as part of the option development. There is potential for the plan to enhance the landscape. This may involve selecting certain materials or colours for the option or through planting or habitat creation.
Material Assets	<ul style="list-style-type: none"> • Creation of green infrastructure. • Promote efficient use of water. • Increase resource efficiency and reduce natural resource use and waste sent to residual treatment. • Create a green economy and promote sustainable growth: <ul style="list-style-type: none"> - Support the Lawton recommendation for planning the management of water resources, particularly increasing resource efficiency and reducing pollution. 	<ul style="list-style-type: none"> • The plan has the opportunity to consider the use of resources within the option development and reduce the use of energy, materials and prevent waste generation.
Broader Objectives	<ul style="list-style-type: none"> • Support the Lawton recommendation for planning the management of water resources to: <ul style="list-style-type: none"> - Support the UK Government's 25 Year Plan to Improve the Environment. • Protect and improve the global environment. 	<ul style="list-style-type: none"> • Consideration of implications for enhancing natural, social and human capital through the plan.

4 Environmental Assessment Methodology

4.1 Introduction

Overall SEA Framework

- 4.1.1 Essex & Suffolk Water's SEA Assessment Framework is grounded in the SEA topics set out in Schedule 2(6) of the 2004 SEA Regulations. The framework is derived from its own scoping process (see Section 3), which utilised the framework that underpins the Integrated Environmental Assessment (IEA) for the WRE Regional Plan. Minor edits were made to Essex & Suffolk Water's SEA Objectives following feedback received during scoping.
- 4.1.2 The SEA Objectives are the component of the SEA assessment framework against which likely significant effects on the environment are identified, described and evaluated. The SEA Objectives are accompanied by a list of assessment questions, which are used to assist those undertaking the assessment. The questions are presented such that it allows the assessor to retain a broad view of issues that are relevant to the SEA Objectives they are associated with. This is particularly useful where the framework is applied to different types of options. Table 3-2 above sets out the framework, including its SEA topics, SEA Objectives and assessment questions.
- 4.1.3 In addition to influencing the plan process, one of the outcomes of the SEA is to identify the likely significant effects of the plan. In the assessment of the final WRMP24 the findings by SEA Objective are evaluated and assigned to one of four categories, which provide the rating of the scale of effect. The four ratings are identified as Major, Moderate, Minor and Neutral. Effects that are rated as **Major** or **Moderate** (be it positive or negative) are classified as 'significant effects'.
- 4.1.4 The assessment rating is informed by the assessment questions for each SEA topic, as well as the context of the existing baseline. Effects are separated between construction and operation phases, where construction is considered to relate to *short* and medium term effects whereas operation is considered *long* term effects. Within each of these, a rating is provided for positive effects and for negative effects. As such, every SEA objective considers whether likely significant effects will occur in relation to four distinct areas: Construction Negative, Construction Positive, Operation Negative, Operation Positive. This format of assessment helps to avoid trade-offs, by avoiding the potential 'cancelling out' of effects, which can occur when reporting an average in cases where both positive and negative effects are present.
- 4.1.5 The effects of each option were also assessed pre-mitigation and post-mitigation (residual effects). During the option assessment the post-mitigation (residual effects) assumed that all options would include standard environmental controls, often referred to as 'best practice'. The mitigation measures (which include measures which are standard environmental controls/best practice) are collated in Section 8 and provided in full in the SEA Assessment Matrices in Appendix K. The standard environmental controls that were assumed to apply to all options are set out below:
- No surface water (river) abstractions will be able to reduce the water levels below the minimum flow and level 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 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.
- Health of construction 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 consented to be 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, ESWs policy on compensation and 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.

4.1.6 SEA Assessment Matrices for options within the BVP and alternative plans are provided in Appendix K: *SEA Assessment Matrices*. These matrices outline the above assessment and also provide pre- and post-mitigation score, so the reader is able to determine the efficacy of mitigation.

4.1.7 Options that have been included within the ESW final WRMP24 BVP are those which at this stage of option development have the lowest/acceptable environmental impacts. Any options with unacceptable environmental impacts were considered unfeasible. However, as detailed design progresses for the selected options and more information becomes available, if HRA or WFD compliance issues emerge, and identified mitigation measures are not considered significant, then previously rejected, alternative supply side options would be re-visited.

Applying the SEA Framework

- 4.1.8 ESW have been working with regional stakeholders and neighbouring water companies to identify the best options to include as part of the WRE Regional Plan and in the company's WRMP24. The resulting final WRMP24 is a mix of supply and demand management option packages. Demand management options are likely to have the least significant environmental effects, however on their own are not sufficient to meet the water deficits forecast for the region. Therefore, supply options are also needed.
- 4.1.9 As part of the WRE plan-making and WRMP development processes, ESW undertook modelling to identify areas with a surplus or deficit of water supply. For areas with deficits, ESW 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 such as installing smart meters, reducing leakage, and investing in water efficiency.
 - Supply options – options that will provide a water supply to customers such as transfers, maximising existing resources, trading, tinkering, and new resources.
- 4.1.10 These options are assembled to form plans as indicated in:
- BVP (Preferred Plan).
 - Three alternative plans (Least Cost Plan, Ofwat Core Plan, Best Environment & Society Plan).
- 4.1.11 The three alternative plans are, for the purposes of SEA, considered to be the reasonable alternatives. Adaptive programmes were also developed to consider how the BVP would respond during implementation of specific future changes. These pathways are not alternative plans in themselves, rather they are to test the BVP's response to change.
- 4.1.12 The SEA Assessment Framework has been applied to the components of the BVP, its reasonable alternatives and the adaptive programmes. The results for the individual options are reported in Section 5, in the form of SEA matrices which are also provided in Appendix K – SEA Assessment Matrices. The SEA's likely significant effects findings for the final WRMP24's BVP are reported in Section 6, which also includes the assessment findings related to the BVP's alternative plans and adaptive programmes.
- 4.1.13 ESW also derived impacts on carbon outside of this integrated environmental assessment (IEA) process. As the UK water sector moves towards defining a pathway to net zero by 2030, further supplementary analysis will be required to assess the scheduling of options relative to the strategy for decarbonisation (e.g., energy and offsets). This process is running in parallel to the IEA, looking to quantify and cost the impact and capex and opex carbon using the government Business, Energy and Industrial Strategy's most recent valuations.
- 4.1.14 For consistency, these changes were applied to all options assessed as part of the final WRMP24 SEA.
- 4.1.15 The findings for the four plans are based on residual effects post-mitigation. This means that where the option has potential to result in significant effects, relevant mitigation measures have been identified. The options are then reassessed with the mitigation measures applied. Any remaining significant effects after the mitigation is applied are 'residual effects'. Therefore, the findings reported in Section 5 and Section 6 assume that the identified mitigation measures have been applied. The mitigation measures for each option are identified in the individual option assessment and a summarised collation of these measures is presented in Section 9's Table 9-1. As aforementioned in Section 4.1.4 SEA Assessment Matrices for options within the BVP and alternative plans are provided in Appendix K – SEA Assessment Matrices. These

matrices outline the above assessment and also provide a pre- and post-mitigation score, so the reader is able to determine the efficacy of mitigation.

- 4.1.16 Options that have been included within ESW final WRMP24 BVP are those which at this stage of option development have the lowest/acceptable environmental impacts. Any options with unacceptable environmental impacts were considered unfeasible. However, as detailed design progresses for the selected options and more information becomes available, if HRA or WFD compliance issues emerge, and identified mitigation measures are not considered significant, then previously rejected, alternative supply side options would be re-visited.
- 4.1.17 The application of SEA Assessment Framework to the four plans includes the consideration of interactions between the various components of the options in each plan and environmental baseline conditions. This ensures that the SEA considers where different components may combine with each other to create a different or additional effect on a receptor.
- 4.1.18 The context and scope for the SEA and other Environmental Assessments forming part of the options appraisal are set out in Section 3 of this report. Additionally, these assessments have both a temporal and geographical scope, and these are outlined, along with their potential limitations, below.

Temporal Scope

- 4.1.19 The temporal scale of effects was considered based on whether the effect would be permanent or temporary, and the duration of the effect for the entirety of the WRMP period including both construction and operational phases. The time horizon for the SEA is therefore the same as that for WRMP24, i.e., to 2050. Where particular elements of the WRMP are time-related and relevant to the assessment, this will be identified. Permanent, long term, 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 operational road traffic). Temporary effects were considered as those which are short and medium term, and which are reversible, these are generally related to construction (e.g., construction traffic).
- 4.1.20 The assessments of option effects for both construction and operation are undertaken for defined timescales within the WRMP. For physical options, each option has a defined construction period in which potential effects, both permanent and temporary, are assessed. Operational phase effects are assessed (where possible) up to the end of the plan period, that is 2050. Nevertheless, demand management options, however, are assumed to have an operational phase for 75 years and effects were considered within the SEA for this duration. There is a requirement for a WRMP to be produced every 5 years, and so similar assessments are likely to be undertaken during future WRMP cycles, ensuring that positive and negative effects are regularly assessed, and the impact of changes to the proposed WRMP are understood.

Geographical Scope

- 4.1.21 The Essex & Suffolk WRMP24 and its options have been assessed at a strategic level and an assessment of cumulative effects has been undertaken as part of this process as indicated in Section 7. There is potential for selected options and plan alternatives in Essex & Suffolk's WRMP24 plan-making process to have effects outside the company's water supply area – the boundary of the plan. The assessments using GIS data included a buffer around the plan area so that additional receptors (such as designated sites) were captured in the assessment.
- 4.1.22 Assessments of option effects were undertaken using current baseline information, forming an evidence base against which environmental issues or opportunities resulting from the WRMP24 can be predicted and assessed. Baseline information was collected for each SEA topic. The

WRMP24 covers a substantial geographical area, within the ESW region, therefore the baseline is currently a high-level review of conditions within the WRE region.

- 4.1.23 A baseline GIS was developed to facilitate undertaking the assessments and reporting. Baseline maps are available in Appendix D. The baseline GIS included buffer zones of 500m, 2000m, 5000m, and 10000m to help categorise direct and indirect effects, i.e., within 500m being direct, and any designated sites or environmental constraints lying outside this zone potentially being indirectly affected. This differs for different types of specialist assessments.
- 4.1.24 Some key receptors and assets were only considered if there was a direct intersection (such as allotments and woodland), other key receptors and assets were considered within 500m of the option (works) location in the assessment. The exception to this was European and National ecological designated sites such as SPAs, SACs, Ramsar sites, and SSSIs, which were considered up to 2000m away.
- 4.1.25 For physical options, geographical scope is easier to consider using these defined buffer zones, and included areas outside of these where potential effects from options are likely to occur. For Demand Management options, geographical scope is difficult to consider as these options have no footprints as specific locations of works for these options are not yet known. Therefore, the geographical scope of the assessment of the demand management options is considered to be the ESW Region and any areas outside of the ESW region where potential effects from options are likely to occur.

4.2 Assessment Stage Methods

- 4.2.1 As part of the development of the WRMP24 options the following assessment were undertaken: High Level Screening, Options Level Assessment, Programme Appraisal and Plan Appraisal.

High Level Screening

Introduction

- 4.2.2 As a precursor to the SEA, high-level environmental screening (HLS) assessments for the WRMP24 options were completed in January and February 2022. These were undertaken to highlight environmental risks and constraints at an early stage in the options development process, in accordance with UK Water Industry Research (UKWIR) guidance²⁶. The environmental screening findings were used to inform rejection of options to avoid potentially significant environmental effects, and to identify suitable mitigation measures to be incorporated into option development. The results were also taken forward into the WRMP24 SEA and HRA assessments.

Methodology

- 4.2.3 The screening was structured around the following key environmental topics which have the potential to be significantly affected:

- Ecology.
- Historic Environment.
- Water.
- Landscape.
- Community.

²⁶ UK Water Industry Research (UKWIR) (2021). Environmental Assessments for Water Resources Planning (21/WR/02/15) Available at: [Environmental Assessments for Water Resources Planning \(ukwir.org\)](https://www.ukwir.org)

4.2.4 The potential negative environmental impacts on the designations/receptors listed in Table 4-1 were considered. Given the high-level nature of the screening, it was limited to national, European, and other regional and international designations/receptors. Local designations/receptors were considered later in the SEA process.

Table 4-1: Environmental Designations/Receptors used in the High-Level Environmental Screening

Key Topic	Designations/Receptors	Sources
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)), 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
Water	River Basin Management Plan (RBMP) and Water Framework Directive (WFD) river water quality and flow indicators, shellfish waters, bathing water	RBMP and WFD – Environment Agency website 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	GIS datasets available from data.gov.uk

4.2.10 GIS layers and data sourced from the websites referenced in Table 4-1 were used to map baseline information on the identified designations and receptors. Baseline maps were overlaid 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.

4.2.11 Each option was screened using the scoring system presented in Table 4-2, the full high-level screening scoring methodology and rating criteria is found within Appendix J. Along with the RAG colour category, a risk narrative, high level mitigation measures, and how these were incorporated into the option development were provided as output from the high-level screening.

Table 4-2: High-Level Screening Scoring Definitions

Score	Definition
3	Recommend rejecting option – major effects on designated features. Option would cause irreversible loss to a sensitive designated feature.
2	Take option forward but further assessment and mitigation required – moderate effects on designated features. Option would cause loss of designated features but could be mitigated.
1	Take option forward – minor/no effect on designated features.

Options Level Assessment

4.2.12 ESW’s detailed options-level assessment approach is aligned with WRE’s IEA process. This is aligned with regulator expectations around regional and water company planning, as well as to ensure consistency and efficiency in the assessment process.

Option Assessment Pre-Mitigation Effects

- 4.2.13 Each option was assessed against the SEA objectives using defined effect assessment and evaluation criteria based on relevant spatial datasets and professional judgement. 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. The assessment focused on high-level issues as identified through the objectives, sub-objectives, and key receptors and assets. Note that it was not undertaken to the level of detail that an Environmental Impact Assessment (EIA) would be.
- 4.2.14 The assessment was split into construction effects and operational effects. An option may have both positive and negative effects under a SEA objective, and rather than combining these effects to cancel each other out, both positive and negative effects were reported separately.
- 4.2.15 The level of effect was assigned using a qualitative scale ranging from positive effects (minor, moderate, major) to negative effects (minor, moderate, major), with neutral used for no or negligible effects. A narrative justification was provided to support the assessment using this scale. A significant effect is defined as one scoring either moderate or major effects. The datasets used and descriptions of scale of effect are presented in Table 4-3.
- 4.2.16 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.
- 4.2.17 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 then these harms were reported to ensure no potential effects were missed).
- 4.2.18 The temporal scale of effects was considered based on whether it would be permanent or temporary, and the duration of the effect. 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). Temporary effects were considered as those which are reversible and are generally related to construction (e.g., construction traffic).

Option Assessment Post-Mitigation (Residual) Effects

- 4.2.19 Where potential negative effects were revealed, mitigation measures (measures to avoid, reduce or offset negative effects) were identified as part of the assessment process and fed back into iterative option development. Options with major and moderate negative effects were required to include appropriate mitigation or be flagged for rejection. Enhancement opportunities were also identified where the option could be used for the benefits of people and/or wildlife, e.g., reservoirs provide an opportunity to establish wetland habitats, or for recreational benefits. The findings of the options assessment based on residual effects, were fed into the plan-making process and informed the development of Essex & Suffolk's feasible options list and its reduction down to the constrained list used within modelling. The findings also informed option design, with some options modified as a result of the findings of this work (e.g., location of abstraction points, routing of transfer pipelines), in addition the mitigation identified was reviewed to ensure the option's costing information took account of the measures identified.
- 4.2.20 The effects of each option were assessed pre-mitigation and post-mitigation (residual effects). It was assumed that all options would include standard environmental controls set out in Section 4.1.5. Other mitigation measures that are assumed to be applied are collated in Section 8.

- 4.2.21 The SEA process produced a series of four metrics for each option that summarise the output information. The four metrics were positive construction, negative construction, positive operation, and negative operation.
- 4.2.22 Other assessments and studies being undertaken as part of the wider WRMP24 IEA were also used to inform the SEA options assessment. These are outlined in Section 4.4.
- 4.2.23 The full methodology for the SEA is outlined within Appendix A and the assessment information packs, detailing the assessment outcomes, are compiled within Appendix E.
- 4.2.24 Table 4-3 shows how the significance and different scales of effects are determined for the SEA. This includes the numerical scoring system and the thresholds for differing levels of effects.

Table 4-3: SEA Datasets and Definitions of Scale

SEA Objective	Datasets/Key Themes	Effect	Description
Biodiversity, Flora, Fauna:	SPA SAC Ramsar site SSSIs MPA MCZ NNR LNR Priority habitats and species	+++	Major Positive The option would result in a major enhancement on the quality of designated sites/habitats due to changes in flow or groundwater levels, water quality or habitat quality and availability. The option would result in a major increase in the population of a priority species. Effects could be caused by beneficial changes in water flows/water quality, or large amounts of creation or enhancement of habitat, promoting a major increase in ecosystem structure and function. The option would result in a major reduction or management of INNS. The option delivers BNG of +30%. The option contributes to addressing failure of WFD Good Ecological Status/Good Ecological Potential.
	Non-designated sites Terrestrial, aquatic and marine habitats, species and protected sites	++	Moderate Positive The option would result in a moderate enhancement on the quality of designated and/or non-designated sites/habitats due to changes in flow or groundwater levels, water quality or habitat creation and enhancement measures. The option would result in a moderate increase in the population of a priority species. Effects could be caused by beneficial changes in water flows/water quality, or moderate amounts of creation or enhancement of habitat, promoting a moderate increase in ecosystem structure and function. The option would result in a moderate reduction or management of INNS. The option delivers BNG of +20%. The option contributes to addressing failure of WFD Good Ecological Status/Good Ecological Potential.
	Green networks and corridors (e.g., foraging areas and commuting routes, migration routes, hibernation areas etc. at all scales)	+	Minor Positive The option would result in a minor enhancement of the quality of designated and/or non-designated sites/habitats due to changes in flow or groundwater levels, water quality or habitat creation and enhancement measures. The option would result in a minor increase in the population of a priority species. Effects could be caused by beneficial changes in water flows/water quality, or small amounts of creation or enhancement of habitat, promoting a minor increase in ecosystem structure and function. The option would result in a minor reduction or management of INNS. The option delivers BNG of +10%.
		0	Neutral The option would not result in any effects on designated or non-designated sites including habitats and/or species). It will not have an effect on INNS or BNG.
		-	Minor Negative The option would result in a minor negative effect on the quality of designated and/or non-designated sites/habitats due to changes in flow or groundwater levels, water quality or habitat loss or degradation. The option would result in a minor decrease in the population of a priority species. Effects could be caused by detrimental changes in flows/water quality, or small losses or degradation of habitat leading to a minor loss of ecosystem structure and function. The option would result in a minor increase or spread of INNS. The option results in BNG loss of <10%.
		--	Moderate Negative The option would result in a moderate negative effect on the quality of designated and/or non-designated sites/habitats due to changes in flow or groundwater levels, water quality or habitat loss or degradation. The option would result in a moderate decrease in the population of a priority species. Effects could be caused by detrimental changes in flows/water quality, or moderate loss or degradation of habitat leading to a moderate loss of ecosystem structure and function.

SEA Objective	Datasets/Key Themes	Effect	Description
			The options would result in a moderate increase or spread of INNS. The option results in BNG loss of 10% to 20%. The option results in the likely deterioration of WFD classification.
		Major Negative	The option would result in a major negative effect on the quality of designated and/or non-designated sites/habitats due to changes in flow or groundwater levels, water quality or habitat loss or degradation. The option would result in a major decrease in the population of a priority species. Effects could be caused by detrimental changes in flows/water quality, or large losses or degradation of habitat leading to a major loss of ecosystem structure and function. The option results in BNG loss of 20% or more. The option would result in a major increase or spread of INNS. The option results in the deterioration of WFD classification.
		?	Uncertain From the level of information available the effect that the option would have on this objective is uncertain.
Soil:	Agricultural Land Classification Landfill sites – authorised and historic	Major Positive	The option would result in a major enhancement on the quality of soils through the implementation of remediation or other measures.
		Moderate Positive	The option would result in a moderate enhancement on the quality of soils through the implementation of remediation or other measures.
		Minor Positive	The option is located on a brownfield site and has no effect on soils or existing land use. The option results in the remediation of contaminated land.
		0	Neutral The option would not result in any effects on soils or land use.
		Minor Negative	The option is not located on a brownfield site and/or results in a minor loss of best and most versatile agricultural land or is in conflict with existing land use. The option results in land contamination.
		Moderate Negative	The option will result in a moderate loss of best and most versatile agricultural land or is in substantial conflict with existing land use. The option results in land contamination.
		Major Negative	The option will result in a major loss of best and most versatile agricultural land or is in substantial conflict with existing land use. The option results in land contamination.
		?	Uncertain From the level of information available the effect that the option would have on this objective is uncertain.
Water:	Environment Agency Flood Defences Environment Agency Main Rivers Flood Zones 2 and 3 Surface Water Features WFD River Waterbody	Major Positive	The option results in addressing failure of WFD Good Ecological Status/Good Ecological Potential. The option would result in a major improvement to flood risk. The option would result in a major improvement(s) in water efficiency, reduces demand and improves resilience.
		Moderate Positive	The option achieves savings through demand management and does not require abstraction to achieve yield. The option contributes to addressing failure of WFD Good Ecological Status/Good Ecological Potential. The option would result in a moderate improvement to flood risk. The option would result in moderate improvements in water efficiency, reduces demand and improves resilience.

SEA Objective	Datasets/Key Themes	Effect	Description
	Catchments WFD River Waterbodies Cycle 2 Bathing Waters (for desal options) Shellfish Waters (desal options) Source Protection Zones WFD Groundwater bodies	+	Minor Positive The option achieves savings through demand management and does not require abstraction to achieve yield. The option would result in a minor improvement to flood risk. The option would result in a minor improvement(s) in water efficiency, reduces demand and improves resilience.
		0	Neutral The option would have no discernible effect on river flows or surface/coastal water quality or on groundwater quality or levels. The option would not have an effect on or be affected by flood risk.
		-	Minor Negative The option would result in minor decreases in river flows. River and/or coastal water quality may be affected and lead to short term or intermittent effects on receptors (e.g., designated habitats, protected species or recreational users of rivers and the coastline) that could not be avoided but could be mitigated. The option would result in minor decreases in groundwater quality or levels. The option is located in Flood Zone 2. The option would result in minor decreases in water efficiency, increases demand and reduces resilience.
		--	Moderate Negative The option would result in moderate decreases in river flows. River and/or coastal water quality may be affected and lead to long term or continuous effects on receptors (e.g., designated habitats, protected species or recreational users of rivers and the coastline) that could not reasonably be mitigated. The option results in the likely deterioration of WFD classification. The option would result in moderate decreases in groundwater quality or levels. The option is located in Flood Zone 3. The option would result in moderate decreases in water efficiency, increases demand and reduces resilience.
		---	Major Negative The option would result in major decreases in river flows. River and/or coastal water quality may be affected and lead to long term or continuous effects on receptors (e.g., designated habitats, protected species or recreational users of rivers and the coastline) that could not reasonably be mitigated. The option results in the deterioration of WFD classification. The option would result in major decreases in groundwater quality or levels. The option is located in Flood Zone 2 or 3 and further contributes to flood risk. The option would result in major decreases in water efficiency, increases demand and reduces resilience.
		?	Uncertain From the level of information available the effect that the option would have on this objective is uncertain.
		Air:	Air Quality Management Areas Air quality monitoring sites
++	Moderate Positive The option would result in a moderate enhancement of the air quality within one or more AQMAs.		
+	Minor Positive The option would result in an enhancement of the air quality.		
0	Neutral The option would not result in any effects on Air Quality and AQMAs.		
-	Minor Negative The option would result in a decrease of the air quality.		

SEA Objective	Datasets/Key Themes	Effect	Description
Climate Factors:	Option Carbon data UKCP18 climate data Sea level rise projections	--	Moderate Negative The option would result in a decrease of the air quality within one or more AQMAs.
		---	Major Negative The option would result in a major decrease in the air quality within one or more AQMAs.
		?	Uncertain From the level of information available the effect that the option would have on this objective is uncertain.
		+++	Major Positive The option will generate significant additional zero carbon energy that can be fed back into the grid/reduce carbon emissions. The option will increase resilience/decrease vulnerability to climate change effects. The option will reduce operational carbon emissions by more than 1,000 tonnes CO ₂ e/year
		++	Moderate Positive The option will increase resilience/decrease vulnerability to climate change effects. The option will reduce operational carbon emissions by between 100 and 1,000 tonnes CO ₂ e/year
		+	Minor Positive The option will increase resilience/decrease vulnerability to climate change effects. The option will reduce operational carbon emissions by up to 100 CO ₂ e/year.
		0	Neutral The option would have no discernible effect on greenhouse gas emissions, nor would the option increase resilience/decrease vulnerability to climate change effects.
		-	Minor Negative The option will have a minor impact on resilience/decrease vulnerability to climate change effects. The option will generate carbon emissions of between 100 and 500 tonnes CO ₂ e during construction. The option will generate operational carbon emissions of between 100 and 500 tonnes CO ₂ e/year.
		--	Moderate Negative The option will have a moderate impact on resilience/significantly decrease vulnerability to climate change effects. The option will generate carbon emissions of greater than of between 500 and 1000 tonnes CO ₂ e during construction. The option will generate operational carbon emissions of between 500 and 1,000 CO ₂ e/year.
		---	Major Negative The option will have a major impact on resilience/significantly decrease vulnerability to climate change effects. The option will generate carbon emissions of greater than 1,000 tonnes CO ₂ e during construction. The option will generate operational carbon emissions of more than 1,000 tonnes CO ₂ e/year.
Landscape:	Areas of Outstanding Natural Beauty National Character Areas Green Belt land National Park	?	Uncertain From the level of information available the effect that the option would have on this objective is uncertain.
		+++	Major Positive The option results in new, above ground infrastructure that significantly enhances the local landscape, townscape or seascape.
		++	Moderate Positive The option results in new, above ground infrastructure that has a moderate positive effect on the local landscape, townscape or seascape.
		+	Minor Positive The option results in new, above ground infrastructure that has a minor positive effect on the local landscape, townscape or seascape.
		0	Neutral The option would not result in any effects on the local landscape, townscape or seascape.

SEA Objective	Datasets/Key Themes	Effect	Description
		-	Minor Negative The option results in new, above ground infrastructure that has a minor negative effect on the local landscape, townscape or seascape.
		--	Moderate Negative The option would have a moderate negative effect on a designated landscape or feature (i.e., significant visually intrusive infrastructure) whose effects could not be reasonably mitigated. The option results in new, above ground infrastructure that has a moderate negative effect on the local landscape, townscape or seascape.
		---	Major Negative The option would have a negative effect on a designated landscape or feature (i.e., significant visually intrusive infrastructure) whose effects could not be reasonably mitigated. The option results in new, above ground infrastructure that has a major negative effect on the local landscape, townscape or seascape.
		?	Uncertain From the level of information available the effect that the option would have on this objective is uncertain.
Historic Environment	Listed buildings: - Grade I listed structures - Grade II* listed structures - Grade II listed structures	+++	Major Positive The option will result in enhancements to designated heritage assets and/or their setting, fully realising the significance and value of the asset, such as: - Securing repairs or improvements to heritage assets, especially those identified in the Historic England Buildings/Monuments at Risk Register. - Improving interpretation and public access to important heritage assets.
	Registered Parks and Gardens: - Grade I Registered Parks and Gardens - Grade II* Registered Parks and Gardens - Grade II Registered Parks and Gardens	++	Moderate Positive The option will result in enhancements to designated heritage assets and/or their setting. Improving interpretation and public access to important heritage assets.
		+	Minor Positive The option will result in enhancements to non-designated heritage assets and/or their setting.
		0	Neutral The option will have no effect on cultural heritage assets or archaeology.
		-	Minor Negative The option will result in the loss of significance of undesignated heritage assets and/or their setting, notwithstanding remedial recording of any elements affected. There will be limited damage to known, undesignated archaeology important sites with a consequent loss of significance only partly mitigated by archaeological investigation.
	Protected Wrecks Registered Battlefields Scheduled Monuments Conservation Areas World Heritage Sites	--	Moderate Negative The option will result in the loss of significance of undesignated heritage assets and/or their setting, notwithstanding remedial recording of any elements affected. The option will diminish of significance of designated heritage assets and/or their setting, notwithstanding remedial recording of any elements affected.
		---	Major Negative The option will diminish the significance of designated heritage assets and/or their setting such as: - Demolition or further deterioration in the condition of designated heritage assets especially those identified in the Historic England Buildings/Monuments at Risk Register. - Loss of public access to important heritage assets and lack of appropriate interpretation. - There will be major damage to known, designated archaeology important sites with a consequent loss of significance only partly mitigated by archaeological investigation.
		?	Uncertain From the level of information available the effect that the option would have on this objective is uncertain.

SEA Objective	Datasets/Key Themes	Effect	Description
Population, Human Health	Noise action important area Indices of Multiple Deprivation 2015	+++	Major Positive The option leads to major positive effect on the health of local communities and will ensure that surface water and bathing water quality is maintained within statutory limits. The option creates new, and significantly enhances existing, recreational facilities, publicly accessible greenspace and/or tourism within the operational area.
	Functional site: - Schools - Medical facilities	++	Moderate Positive The option leads to positive effect on the health of local communities and will ensure that surface water and bathing water quality is maintained within statutory limits. The option enhances existing, recreational facilities, publicly accessible greenspace and/or tourism within the operational area.
	OS Greenspace dataset: - Allotments	+	Minor Positive The option has a temporary positive effect on the health of local communities and will ensure that surface water and bathing water quality is maintained within statutory limits.
	- Bowling green	0	Neutral The option would not result in any effects on human health and existing recreational facilities and/or tourism.
	- Cemetery	-	Minor Negative The option has a temporary effect on human health (e.g., noise or air quality). The option reduces the availability and quality of existing recreational facilities and/or tourism within the operational area.
	- Golf course	--	Moderate Negative The option results in the permanent removal of existing recreational facilities, publicly accessible greenspace and/or tourism within the operational area.
	- Sports facility	---	Major Negative The option has a significant long term effect on human health (e.g., noise or air quality). The option results in the removal of existing recreational facilities, publicly accessible greenspace and/or tourism within the operational area.
	- Play space - Playing field - Public park or garden - Religious grounds - Tennis courts		
Natural England - Country Parks National Parks Section 15 open access areas CRoW S4 Conclusive Registered Common Land	?	Uncertain From the level of information available the effect that the option would have on this objective is uncertain.	
Material Assets	Transport: - Major roads – A roads - Major roads motorway - Railway line - National cycle route - National trails	+++	Major Positive The option will re-use or recycle substantial quantities of waste materials and any new infrastructure will incorporate substantial sustainable design measures and materials. There will be no increase in energy consumption. The option involves reducing leakage from the supply network or is a water efficiency option with a yield of >5 MI/d.
		++	Moderate Positive The option will re-use or recycle moderate quantities of waste materials and any new infrastructure will incorporate some sustainable design measures and materials. There will be no increase in energy consumption. The option involves reducing leakage from the supply network or is a water efficiency option with a yield of <5 MI/d.
		+	Minor Positive The option will re-use or recycle a limited quantity of waste materials and any new infrastructure will incorporate some limited sustainable design measures and materials. There will be no increase in energy consumption. The option involves reducing leakage from the supply network or is a water efficiency option with a yield of <5 MI/d.

SEA Objective	Datasets/Key Themes	Effect	Description
		0	Neutral The option would not result in any effects on material assets.
		-	Minor Negative The option will require new infrastructure with only limited opportunities for the re-use or recycling of waste materials. There are limited opportunities for sustainable design or the use of sustainable materials. The option results in a minor increase in energy consumption with no renewable energy options. The option results in a minor disruption on built assets and infrastructure, including transport.
		--	Moderate Negative The option will require new infrastructure with only limited opportunities for the re-use or recycling of waste materials. The option results in a moderate increase in energy consumption with no renewable energy options. The option results in a moderate disruption on built assets and infrastructure, including transport links.
		---	Major Negative The option will require significant new infrastructure that cannot be provided through the re-use or recycling of waste materials. There are no opportunities for sustainable design or the use of sustainable materials. The option results in a major increase in energy consumption with no renewable energy options. The option results in a major disruption on built assets and infrastructure, including transport links.
		?	Uncertain From the level of information available the effect that the option would have on this objective is uncertain.

Programme Appraisal

- 4.2.25 This Section provides a summary of ESW's programme appraisal process and explains how the findings of the SEA for the constrained options were used to inform decisions on the development of the final WRMP24. In line with the EA's definition, ESW's Best Value Planning approach considered other factors alongside economic cost to seek to achieve an outcome that increases the overall net benefit to customers, the wider environment, and overall society.
- 4.2.26 Traditionally, companies have used the Economics of Balancing Supply and Demand (EBS D) approach to guide decision-making. EBS D allows planners to meet a supply-demand deficit with the lowest overall cost, or 'least cost' solution. 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. Fundamentally, the aim of the programme appraisal process is to find the 'best value' programme of supply and/or demand management options to secure a supply-demand balance across the ESW supply region. A Least Cost Plan performs better in terms of cost as it has lower overall capital and operating costs. When moving from the Least Cost Plan to the BVP a number of factors were evaluated including cost; adaptability and flexibility; alignment to WRE; risk and resilience; customer preferences; and environmental and social impacts.
- 4.2.27 Once alternative programmes/portfolios of options were chosen, a cumulative effects assessment was undertaken to consider the effects of each selected programme as a whole, and its in-combination effects with other plans and programmes. Programme-level approaches to mitigation and enhancement were identified where required. This was an iterative process to develop the BVP. The cumulative effects for the preferred options and the alternatives are presented in Section 6.1.

Integration of SEA into the Programme Appraisal

- 4.2.28 The Best Value Planning approach incorporated eight metrics generated by the environmental assessment process. These metrics cover all the objectives listed in Table 3-2, however, they have been amalgamated to show how options contribute to certain topics, as specified by ESW. The metrics enabled the environment to be directly considered in analysis and selection of portfolios/programmes of options at an early stage in the planning process. For incorporation of the environmental assessments into Best Value Planning, it was assumed that recommended mitigation measures will be applied.
- 4.2.29 ESW in conjunction with Mott MacDonald (SEA Consultants), developed an integrated approach to programme modelling for this WRMP. In line with guidance, it is important to ensure that the SEA effectively influences the decision-making process of the final WRMP24. As detailed in Section 4, each option considered (including supply side and demand management) were assessed against the full SEA Framework of objectives. The SEA results alongside selected other assessment results were utilised to create metrics to support the Best Value Planning modelling. The environmental assessment metrics are outlined in Table 4-4. The values for each metric were determined using the SEA scores, with minor amounting to +/- 1, moderate amounting to +/-4 and major amounting to +/-8. These scores were input to the modelling alongside other metrics to guide WRMP decision-making.
- 4.2.30 Table 5-3 and Table 5-4 summarise the results of the SEA for both the construction phase and the operational phase for the options considered in the BVP, the reasonable alternatives and the adaptive programmes. The tables show the scores allocated for each option against the objectives outlined in Table 3-2, using the scoring system outlined in Table 4-3. Residual post-mitigation scores are displayed, and both the positive and negative scores have been shown rather than an amalgamation of the two scores.

Plan Assessment

- 4.2.31 The SEA has assessed the BVP and the Adaptive Programmes scenarios. This assessment considers the environmental and social effects of implementing the final WRMP24 options and plan as a whole. The results are reported in Section 5.
- 4.2.32 For the purposes of the SEA, the Least Cost Plan, Ofwat Core Plan and Best Environment & Society Plan are considered to be the reasonable alternatives, collectively referred to as the alternative plans. These plans were used for comparative purposes as part of the final WRMP24 development process. Adaptive programmes were developed to consider how the BVP would respond during implementation of specific future changes. These pathways are not alternative plans in themselves, rather they are to test the BVP's response to change.

Table 4-4: Best Value Planning Environmental Metrics

Best Value criteria description	How will it be measured	SEA Objective(s)
Cost of the plan	Total cost (Totex) of the programme £net present value (NPV)	N/A
Public Water Supplies (PWS) Drought resilience	Number of years over the planning period the PWS drought resilience to 1 in 500 is achieved	N/A
Biodiversity Net Gain	Change in biodiversity units	<ul style="list-style-type: none"> BNG Units from BNG Assessment.
Biodiversity impact	Qualitative assessments based on SEA objectives relating to impacts to protected sites and species	<ul style="list-style-type: none"> SEA Topic: Biodiversity, Objective: To protect designated sites and their qualifying features; To meet WFD objectives relating to biodiversity.
Natural Capital	Monetised (£NPV) impact of the option on natural capital e.g., change to land use, recreation	<ul style="list-style-type: none"> NCA Monetised Value from NCA Assessment.
Leakage reduction	Volume of leakage reduction achieved over the planning period (Ml/d)	N/A
Per Capita Consumption (PCC) reduction	Volume of PCC reduction achieved over the planning period (litres/head/day)	N/A
Flood risk management (non-drought resilience)	Qualitative assessment based on SEA objective to reduce and manage flood risk	<ul style="list-style-type: none"> SEA Topic: Water, Objective: To reduce or manage flood risk, taking climate change into account. Row 16
Multi-abstractor benefit	Qualitative assessment based on SEA objectives to maintain or improve the quality of waterbodies and to avoid adverse impact on surface and groundwater levels and flows	<ul style="list-style-type: none"> SEA Topic: Water, Objective: To enhance or maintain surface water quality, flows and quantity; To enhance or maintain groundwater quality and resources; To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans; To increase water efficiency and increase resilience of water supplies and natural systems to droughts. SEA Topic: Climatic Factors, Objective: To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.
Carbon	Capital/embedded and operational total tCO ₂ e of programme	N/A
Customer preferred option type	Options to be ranked based on customer preference survey data	N/A
Human and social well-being	SEA objectives associated with human and social well-being	<ul style="list-style-type: none"> SEA Topic: Air, Objective: To reduce and minimise air emissions during construction and operation.

Best Value criteria description	How will it be measured	SEA Objective(s)
		<ul style="list-style-type: none"> SEA Topic: Population and Human Health, Objective: To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing; To secure resilient water supplies for the health and wellbeing of customers; To increase access and connect customers to the natural environment, provide education or information resources for the public; Maintain and enhance tourism and recreation.
Option deliverability	Options scored for deliverability / cost confidence	N/A
Remaining SEA Objectives	Remaining SEA Objectives not covered in metrics accounted for above	<ul style="list-style-type: none"> SEA Topic: Soil, Objective: To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity. SEA Topic: Climatic Factors, Objective: To minimise/reduce embodied and operational carbon emissions. SEA Topic: Landscape, Objective: To conserve, protect and enhance landscape and townscape character and visual amenity. SEA Topic: Historic Environment: To Conserve/protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting SEA Topic: Material Assets, Objective: Minimise resource use and waste production; Avoid negative effects on built infrastructure.
SEA Overall Cumulative Score	All SEA Objectives	N/A

4.3 Effects outside the Final WRMP24 Boundary

- 4.3.1 The Scoping Report defined the Essex and Suffolk Water operational area as the core study area for the SEA. The SEA also identifies effects outside of the core study area where these may occur as a result of the effects originating within the study area, or where they may occur when the effects of the WRMP combine with effects from plans or projects in neighbouring water company areas. The horizon for the SEA is the same as that for WRMP24, i.e., to 2050. Where particular elements of the WRMP are time-related and relevant to the assessment, this will be identified. Where individual effects are likely to persist over a long period or benefits are not likely to accrue for a long period following the intervention, these short, medium and long term effects are noted in the description of the effect on a particular SEA objective.
- 4.3.2 As outlined above, there is potential for programmes and plans in the final WRMP24 to have effects outside the direct plan region. For example, options that transfer water between other regions and options close to the boundary could affect change in adjacent areas. As such, our GIS data base included a buffer around the plan area so that additional receptors (such as designated sites) could be captured in the assessments. The buffers were applied based on the final WRMP24 options and expected impact pathways.
- 4.3.3 Options both wholly and partially covered by the ESW region were included in the assessments. For those options only partially within the region, the whole option was assessed using GIS data with suitable coverage.

4.4 Other Environmental Assessments (HRA, WFD, BNG, NCA, INNS)

- 4.4.1 To support the SEA, and inform the option selection, several other environmental assessments were undertaken as part of the final WRMP24 development. This section summarises the approach taken for each assessment. The full methodologies for each environmental assessment discipline are included in their corresponding appendices, and a summary of the key assessment outputs for each option is presented within the Information Packs in Appendix E.
- 4.4.2 Changes to the SEA Framework resulting from the Scoping Consultation feedback are outlined previously in Section 3. Furthermore, since the scoping consultation was submitted as referred in Section 3.5, some changes to the government guidance underpinning the Natural Capital and BNG assessment methodologies were announced. The approaches used for the final WRMP24 options assessments were updated accordingly. The changes were as follows:
- Natural Capital – The approach for this assessment was informed by Defra's Enabling a Natural Capital Approach (ENCA)²⁷ guidance. In mid-2021 the valuations and calculation factors related to valuation of carbon in ENCA were updated.
 - BNG – In mid-2021 an updated version of Defra's BNG metric was issued, BNG 3.0.
- 4.4.3 Moreover, following an initial review of NCA and BNG assessments, it was decided that an additional minor change to the methodology should be incorporated. The mapping methodology for the NCA and BNG should be updated to account for the primary habitats that occur in the same location as, and are currently represented in the existing assessment by, active floodplain. More information on the NCA and BNG methodologies can be found in Appendix H.

²⁷ Department for Environment, Food & Rural Affairs (2020). Enabling a Natural Capital Approach (ENCA). Guidance for policy and decision makers to help them consider the value of a natural capital approach. Available at: Enabling a Natural Capital Approach (ENCA) - GOV.UK (www.gov.uk).

Habitat Regulations Assessment (HRA)

- 4.4.4 HRA is, on its own, a statutory requirement, but also feeds into the SEA biodiversity objective on designated sites (Objective 1, see Table 4-4 above). The stages of HRA include the Test of Likely Significance (ToLS), Appropriate Assessment (AA) (if required from the ToLS), and Consideration of Alternatives (should AA findings conclude effects on site integrity cannot be adequately mitigated). The ToLS and AA have both been based on concept designs at this stage and it is anticipated that project level AAs may be required as the individual options progress to detailed feasibility and design stages.
- 4.4.5 An initial HRA appraisal formed part of the high-level screening methodology (see Section 4.2.2 above) in January and February 2022. HRA results then fed iteratively into the option development process, eliminating those options for which AA could not rule out adverse impacts on the conservation objectives of Natura 2000 sites, or for which alternative design could not be considered. The HRA ensured that the options taken forwards would not affect the integrity of Natura 2000 sites, either alone or in-combination with other projects or plans. Possible mitigation measures to eliminate adverse effects of options were incorporated. Alongside the SEA cumulative effects assessment of the final WRMP24, an HRA in-combination effects of the whole WRE Regional Plan was undertaken.

Water Framework Directive (WFD) Assessment

- 4.4.6 The WFD assessment is a statutory requirement, but also feeds into the SEA objectives on biodiversity and water (Objectives 1.4 and 3.4, see Table 3.2). The WFD assessments were undertaken following the All Companies Working Group (ACWG) WFD Assessment Guidelines and using the ACWG Assessment Spreadsheet. The first stage of the process (Level 1 – Basic Screening) identifies any water bodies where the construction or operation of the option could lead to WFD impacts which needed to be ‘screened in’ and taken forward to the second stage of the process (Level 2 – Detailed Impact Screening). An initial WFD appraisal formed part of the high-level screening methodology (see Section 4.2.2 above) in February 2022. Mitigation and monitoring recommendations supported option development, and WFD results were used as part of the final assessment of the final WRMP24 and its cumulative effects.

Biodiversity Net Gain (BNG)

- 4.4.7 The results of the BNG fed into the SEA objective on protecting biodiversity, priority species, and habitats (Objective 2, see Table 3-2). BNG was considered at both the option and programme level. Each option looked to report the expected impacts on BNG and excluded any required biodiversity impact mitigation in order to achieve a 10% net gain. A biodiversity baseline was developed from spatial datasets of habitat inventories and assessed in line with the Defra BNG 3.0 metric, which assesses BNG based on land use change associated with each option. By quantifying the spatial extents of habitats and applying habitat-specific metrics, the approach aligned with the methodology of the WRPG Environmental and Society guidance. In this way, the approach also allowed consideration of biodiversity and habitat as an ecosystem service in the NCAs. Anticipated changes in land use due to option construction were used to assess change in the BNG scores. The BNG methodology was amended to incorporate active floodplain as a consideration. Active floodplain was considered as noted above in paragraph 4.4.8. The BNG assessments include the new stocks identified and therefore will equate to the total area of the option boundary. Note that the BNG tool does not include active floodplain as a habitat.

Natural Capital Assessment (NCA)

- 4.4.8 The results of the NCA provided a quantitative basis for qualitative professional judgements made throughout the SEAs, thereby feeding into several SEA objectives. The outputs of the NCA were also used to inform option selection and to further feed into decision-making as part

of the Best Value Planning process. Expected changes in natural capital stocks were assessed for each option, along with implications for five ecosystem services outlined in the WRPG Environmental and Society Supplementary Guidance – biodiversity and habitat, climate regulation, natural hazard regulation, water purification, and water regulation. Note that biodiversity and habitat services were assessed using the BNG methodology outlined in Appendix H. The NCA methodology was updated to incorporate active floodplain as a consideration. The areas for each option identified as Active Floodplain were run using the data sources used for the natural capital mapping. This identified that almost the entire area of active floodplain was made up of arable and pastoral land. Areas of active floodplain that did not overlap with the environmental datasets currently used within the WRE mapping methodology were supplemented using the 'Corine land cover map 2018', to identify habitats within the gaps and link them with the natural capital stocks named within the NCA assessments. NCA assessments now include both the area of natural capital stocks as well as the area of active floodplain that sits on top of these stocks. These options therefore show a larger area than the option boundary. However, double counting was avoided because active floodplain is not included within the Ecosystem Services Assessment (ESA) and works in synergy with the primary habitats it sits within. As such, a trade-off of stocks is not required.

INNS

- 4.4.9 The results of the INNS assessment fed into the SEA objectives on biodiversity and water (Objective 1.3 in Table 3-2). INNS information sheets were used to inform option development. The screening methodology used is based upon risk being the product of the severity and frequency of an impact caused by a final WRMP24 option, the impact being an action which could cause the spread of INNS. The severity of an impact is principally correlated with the extent with which final WRMP24 options increase connectivity between waterbodies (options are None, Very low, Low, Medium, High); whilst the frequency represents how often this would occur (options are None, Infrequent, Periodical, Regular). Thus, the methodology involves an assessor determining a Frequency of Impact rating and Severity of Impact rating which are combined to give an overall Magnitude of Risk (None, Very low, Low, Moderate, High).

Environmental Net Gain (ENG) and wider benefits

- 4.4.10 Environmental Net Gain (ENG) was also considered as part of the SEA, in line with WRPG expectations. The UK government is developing a tool ('Eco-metric') to assess quantifiable ENG benefits; however, this was not ready for use on the water resources plans at the time of their development. Therefore, the plan considered the wider SEA, NCA and BNG assessments to ensure the WRMP24 would leave the natural environment in a measurably better state than it is currently. Demonstrating achievement of BNG was a key requirement, and in addition the ENG approach included consideration of wider environmental gains such as improvements in air and water quality assessed in the NCA. This allowed the benefits of the plan to customers, society, and the environment to be measured, understood, and clearly explained as part of the WRMP24. This is reported in the SEA, NCA and BNG assessments.

4.5 Influencing the Development of the WRE Regional Plan

- 4.5.1 The options put forward as part of the final WRMP24 supported the development of the WRE Regional Plan (2023) by providing opportunities to address strategic water resource management issues.
- 4.5.2 As previously outlined in this section, the final WRMP24 environmental assessment methodology was underpinned by WRE's IEA approach, for consistency and efficiency in the assessment process.

- 4.5.3 The WRE Regional Plan (2023) is based on water service areas covered by four companies: Affinity Water (Brett resource zone), Anglian Water, Cambridge Water (part of South Staffordshire Water), and ESW (part of NW). Development and selection of options for inclusion in the WRE Regional Plan (2023) was informed by the WRMP24 environmental assessment process outlined previously in this Section.

5 Assessment of Final WRMP24

5.1 The BVP

5.1.1 The development of the BVP is discussed in final WRMP24 itself and within its Best Value Planning Summary Report technical supporting document. The BVP has been selected following portfolio based analysis of plan performance under various scenarios, adaptive programmes, and consideration of 25, 50 and 75 year plan durations.

5.1.2 The alternative plans produced in this process were compared on the basis of monetised and non-monetised BVP criteria that covered factors such as: cost, carbon, environmental performance, and customer preferences.

5.1.3 Following this assessment, the Central Plan was identified as performing best against these criteria and has been selected as the BVP which will achieve the delivery of the plan through:

- Environmental destination and ambition: Achieving BAU+ Environmental Destination starting in 2040 and profiled over time by prioritising the most sensitive areas in the Essex and Suffolk region, followed by a Second Phase of Environmental Destination in 2045. This approach enables the latter part of the BVP's delivery to be adaptable based on the outcome of the AMP8 WINEP investigations.
- 1 in 500-year drought resilience is achieved by 2036, choosing Lowestoft Water Re-use in 2032.
- Provide Biodiversity Net Gain and Natural Capital as part of the benefits within the assessment of the water supply options.

5.2 ESW's Final WRMP24 Option Types

5.2.1 The final WRMP24 includes both supply side and demand management options. These are introduced here and the assessment results for these options is summarised in Section 5.4. More detailed results of the assessments can be found in Appendix E.

Potential supply options

5.2.2 All the broad supply option types that were initially 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).
- **Borehole abstraction** – Usually a borehole which abstracts water from an aquifer which then goes to a treatment works.
- **Effluent re-use** – effluent is treated and discharged into rivers 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 banded reservoirs (i.e., not within a valley) with piped transfers in and out of supply.
- **Transfers** – transfers include asset transfers, and bulk transfers within/into region, either of raw or treated water.

Potential demand management options

5.2.3 The broad demand management option package types that were considered include:

- **Metering consumption reduction** – involves reducing water consumption by installing meters in currently unmeasured properties. It can include compulsory metering for household and non-household uses, smart metering, and other metering such as optant metering.
- **Other consumption reduction** – involves reducing household and non-household consumption in ways other than metering.
- **Tariffs/fees** – introduction of special fees, changes to existing measured tariffs, introduction of special tariffs for specific users.
- **Water recycling** – rainwater harvesting / grey water re-use for new or existing household and non-household.
- **Water efficiency measures** – water use audit and inspection, awareness campaigns, sponsoring water efficiency enabling activities by others, home visits to reduce plumbing losses, and the promotion of water saving devices.
- **Loss reduction** – involves reducing distribution system leakage, including service reservoir losses and trunk main leakage, as well as reducing customer supply pipe leakage. Leakage reduction options include capital investments to both the company-side and customer-side assets and operational improvements and policy changes. Examples include pressure management, mains renewal, increasing efficiency of active leakage control, etc. Customer supply pipe leakage reduction typically includes increased customer engagement/education or incentives to repair their supply pipes between the distribution main and the property.
- **Non-household water efficiency activity** – comprises 13 water efficiency options within six categories:
 - Information Provision – Customer side leakage education, customer specific alerts, and free water efficiency assessment.
 - Infrastructure and Leak Investigation – Leak Investigation, rain/greywater re-use, find & fix leaky facilities, toilet replacements, and landscaping redesign.
 - Water Efficiency Solutions for Domestic-Type Use – domestic use self-serve, and individual tailored audits.
 - Water Efficiency Solutions for Mixed-Type Use – Free water efficiency visit.
 - Water Efficiency Consultancy for Industry – This option will start with the highest water users and work downward in order to better understand water use in industry, identify areas where water is not being used efficiently, and provide suggestions and solutions to reduce water waste.
 - Golf Course Water Efficiency – Supporting golf courses to use water more efficiently through introducing rainwater harvesting and other smart irrigation solutions to reduce consumption of potable use, supplying courses with an irrigation audit where options are explored to reduce their consumption, and undertaking water saving visits for clubs and hospitality venues.
- **Smart enhancement for water efficiency** – comprises eight water efficiency options:
 - Flow restrictor install along with smart meter install – compulsory/opt out.
 - Education through engagement on door step at point of meter install.
 - Education through leave behind at point of install.
 - Leak repair (toilet) at point of install.
 - Leak repair (taps, boiler overflow) at point of install.
 - Leak check at point of install – no repair completed.

- Water saving product installation at point of install – tap inserts, shower timer etc.
- Water saving Visit at point of install for high water using properties.

Catchment management options

5.2.4 Catchment management options are also being considered. As catchment management is not solely considered as 'supply' or 'demand' option, but is more a combination of these, it is presented separately from the supply option types and demand management option package types above. Catchment management options include flow augmentation and licencing; integrated catchment management; knowledge exchange, education and agricultural activity; natural water retention measures (including natural flood management and wetland creation); nutrient and sediment reduction; pesticide reduction; river restoration; Sustainable Urban Drainage Systems (SuDS); and terrestrial habitat creation/management.

5.3 Option Descriptions

5.3.1 All supply and demand management options forming this final WRMP24 are included in Table 5-1. Catchment management options are being considered by WRE and therefore not included here. All options have been designed for the purposes of the final WRMP24 for Essex and Suffolk, apart from 03b0478B, which was initially designed as part of WRMP19 for WRE, therefore it has a different reference to the other options considered. ESW-NIT-001, design for the draft WRMP, was selected in the BVP, alternatives and adaptive programmes, however this option design did not include a necessary pipeline. ESW-NIT-004 option, designed for the revised draft WRMP24, contains the pipeline, whilst utilising a different nitrate treatment technology, therefore for the purposes of this assessment ESW-NIT-004 has been used to most accurately reflect the environmental impacts. Whilst not selected in the BVP, alternative or adaptive programmes being considered in this report, ESW-DES-004 has been selected as part of other Ofwat scenarios and therefore has been included in this report. As a result of it not being selected by the BVP or alternatives, no HRA AA has been undertaken for this option.

Table 5-1: Options Descriptions

Option ID	Option name	Description overview
ESW-ABS-003C	New Linford Water Treatment Works (WTW) (10MI/d)	Reinstatement of abandoned artesian well, and WTW capacity to 10MI/d. Requires drilling of up to two new boreholes, a raw water transfer to a new water treatment works, connection to network and wastewater discharge connection. For WRMP design and costing purposes, it has been assumed that no network upgrade should be required. The C in the option ID reflects the location of the treatment works of a possible four options; A, B, C or D. Location C reflects a “worst case scenario” for this option based on the size of the option footprint. All locations have been subject to high-level environmental screening and further information can be found in Appendix J.
ESW-DES-001	Canvey Island Terrestrial Desalination	Seawater Desalination Plant (190MI/d DO). Abstraction from the Thames Estuary with discharge to Hanningfield Service Reservoir. Service reservoir located off site. Transfer length between plant and reservoir approximately 20.7km. Tunnelling (micro-tunnelling/horizontal directional drilling) likely to be required as route passes under three railway lines, multiple major roads (A130, A13, A127, A129, A132), one minor road (B1464), eight river crossings (including the River Crouch) and five drainage channel crossings. First part of the route passes through Canvey Wick Nature Reserve however has been routed to avoid as much of this area as possible.
ESW-DES-004	California beach desalination	Seawater desalination plant. Service reservoir located off site. Two transfers required: Transfer 1 from beach infiltration galleries to desalination plant, length: 1.8km. Transfer 2 from desalination plant to Barsham WTW, length: approx. 37km. Tunnelling/trenchless techniques likely to be required.
ESW-DES-008	Corton beach well desalination	Seawater Desalination Plant. Service reservoir located off site. Two transfers required. Transfer 1: from beach infiltration galleries to desalination plant, length: 722m. Transfer 2: from desalination plant to Barsham WTW, length: approx. 24.7km. Tunnelling (micro/horizontal directional) likely to be required.
ESW-EFR-001	Southend-on-Sea Water Re-use	Effluent re-use plant. Intake from Southend-on-Sea WRC (Anglian Water owned asset), discharge to Hanningfield Service Reservoir. Two transfers required: Southend-on-Sea WRC to new effluent re-use plant (Transfer 1), new effluent re-use plant to Hanningfield reservoir (Transfer 2). Transfer 1: Transfer length approximately 991m. Route runs under an industrial estate road, no need for tunnelling. Pump station required at existing STW – located where the two existing outfalls meet. Transfer 2: Transfer length approximately 23.1km. Tunnelling (micro-tunnelling/horizontal directional drilling) required as route passes under one railway line, multiple major roads (A130, A132), two large river/estuary crossing (River Roach and River Crouch), three smaller river crossings, and one drainage channel crossing.
ESW-EFR-002A	Lowestoft Water Re-use to Ellingham Mill	Effluent re-use plant (15MI/d DO). Intake from Lowestoft/Corton WRC (Anglian Water owned asset), discharge to point near Ellingham Mill. Three transfers required: Lowestoft/Corton WRC to new effluent re-use plant (Transfer 1, length approximately 200m), new effluent re-use plant to Ellingham Mill on the River Waveney (Transfer 2, length approximately 26.3km), and a transfer of treated water from Barsham to Holton (Transfer 3, length approximately 12.5km).
03b0478B	Effluent Re-use at Caister and transfer to Ormesby	Water Re-use Treatment (16.4 MI/d max) within existing site footprint at Caister Effluent Re-use Plant (Anglian Water) and transfer from Caister to Ormesby Raw Water Tank (transfer length approx. 7.2 km).

Option ID	Option name	Description overview
ESW-NIT-004	Barsham Nitrate Removal + Pipeline	Electrodialysis Reversal (EDR) or Ion-Exchange (IEX) nitrate treatment at Barsham WTW so that final water meets nitrate PCV. Option contains a discharge stream transfer to Beccles STW (AWS). The pipeline is approx., 5.4km long with a Nominal Diameter of 150mm. The majority of the pipeline is to be laid in road, with approx., 1.1km laid in fields. Barsham River WTW source water has high nitrate concentrations at certain times of the year, particularly during the winter months, which can if too high stop water production. This option would allow the WTW to continue to operate throughout the year. This option will provide nitrate treatment via electrodialysis reversal (EDR) for a proportion of the 28 MI/d river works WTW capacity, when blended with borehole water.
ESW-NIT-005	Langford Nitrate Removal + Pipeline	Electrodialysis Reversal (EDR) or Ion-Exchange (IEX) nitrate treatment at Langford WTW so that final water meets nitrate PCV. Option contains a discharge stream transfer to Maldon STW (AWS). The pipeline is approx., 6.7km long with a Nominal Diameter of 200mm. The pipe is to be laid in road for the entirety of the route.
ESW-NIT-006	Langham Nitrate Removal + Pipeline	Electrodialysis Reversal (EDR) or Ion-Exchange (IEX) nitrate treatment at Langham WTW so that final water meets nitrate PCV. Option contains a discharge stream transfer to Colchester STW (AWS). The pipeline is approx., 14.523km long with a Nominal Diameter of 200mm and is laid in road for the entirety of the route.
ESW-PMP-001A	Langford WTW upgrade + Abberton RWPS Pump Replacement	Replacement, enhancement pumping capacity of two existing pumps, motors, and controls at Abberton Reservoir Raw Water Pumping Station. Upgrades to treatment infrastructure at Langford WTW to accommodate the introduction of source water for Abberton raw water reservoir.
ESW-RES-002C1	North Suffolk Winter Storage Reservoir + Barsham River Works Upgrade	New winter storage reservoir to be built. Intake comes from the River Waveney when there is no spare capacity at Barsham WTW. When supplies are short at Barsham WTW, water is taken from the reservoir and transferred to the WTW. Two transfer pipelines are required: River Waveney to reservoir (2.32km), reservoir to Barsham WTW (3.5km). There are three potential flow rates for both transfer pipelines: 16.2 MI/d, 18.5 MI/d, 19.9 MI/d. Option also includes additional treatment capacity provided by an 16MI/d extension at the existing Barsham WTW. The additional treatment capacity can easily be located within the existing site boundary. The client proposed that the additional treatment trains be accommodated and located next to, and as an extension of, to the existing processes. The C in the option ID reflects the largest size of the reservoir out of a possible three sizes.
ESW-TRA-001	Barsham WTW to Blyth Transfer	Transfer from Barsham WTW to Saxmundham Water Tower (8 MI/d). Transfer consists of multiple sections: A. Barsham WTW to Shadingfield Tower – construction of new pipeline next to an existing main, length approximately 5.6km Micro-tunnelling required for one railway crossing. B. Shadingfield Tower to Holton WTW - length approximately 7.4km. Tunnelling not required. C. Holton WTW to Saxmundham Tower - length approximately 19.2km. Tunnelling (micro-tunnelling/horizontal directional drilling) likely to be required as route passes under one railway, three major roads (A144, A1120, A12), three minor roads (B1124, B1123, B1119), two river crossings (River Blyth, River Yox), and two drainage channels. The route also runs along roads (B1119) for the last section to reach Saxmundham Tower. D. Connection to Walpole WTW, taken off Transfer C - approximate length of 1.4km. This transfer joins Transfer C not long after the railway crossing. No tunnelling required.

Option ID	Option name	Description overview
ESW-TRA-018	Transfer from Bungay Wells to Broome WTW	Transfer from Bungay Wells to Broome WTW. Transfer is approximately 3.6km long. Route follows roads.
ESW-TRA-019	Transfer from Holton WTW to Eye Airfield	Transfer from Holton WTW to Eye Airfield. Transfer approximately 30.6km long. Transfer mainly follows roads. Critical crossings include a railway crossing in Halesworth (route follows road bridge therefore trenchless techniques not possible), and the River Dove.
ESW-TRA-023	Broome to Barsham Transfer	New raw water main from Broome WTW to Barsham Bores Works connecting to a new service reservoir. The transfer pipeline is approximately 6.04km long and has an outside diameter of 225mm
ESW-UVC-001	Langford UV (Crypto)	Additional ultraviolet treatment contactors to treat for cryptosporidium for the full WTW flow capacity of 57Ml/d. These are to be located on the outlet from the Granular Activated Contactors, prior to the clean water storage tanks. The option assumes the need for inline pumping, on site power supply and transformer, additional standby power generation and fuel storage.
ESW-DMO-High	Demand Management Strategy High (Aspirational)	This option includes compulsory Metering by 2035 and 50% leakage reduction by 2050. It also includes a high impact water efficiency plan comprising 12 household water efficiency options within 5 categories (Water Use Audit and Inspection, Advice and Information on Leakage Detection and Fixing Techniques, Water Efficiency Enabling Activities, Promotion of Water Saving Devices, and Targeted Water Conservation Information (advice on appliance water usage).
ESW-DMO-Preferred	Demand Management Strategy Medium (Preferred)	This option includes compulsory Metering by 2035 and 40% leakage reduction by 2050. It also includes a Medium impact "enhanced" water efficiency plan comprising 12 household water efficiency options within 5 categories (Water Use Audit and Inspection, Advice and Information on Leakage Detection and Fixing Techniques, Water Efficiency Enabling Activities, Promotion of Water Saving Devices, and Targeted Water Conservation Information (advice on appliance water usage)
ESW-DMO-Low	Demand Management Strategy Low	This option includes low metering, AMI Smart metering (3 (Asset Management Plan) AMP - 15 year roll-out from 2025) and 30% leakage reduction by 2050. It also includes a Low impact water efficiency plan comprising 6 household water efficiency options within 3 categories (Water Use Audit and Inspection, Advice and Information on Leakage Detection and Fixing Techniques, and Targeted Water Conservation Information (advice on appliance water usage).

5.4 Options Assessment

5.4.1 The following environmental assessments were undertaken on each of the options developed for inclusion in the final WRMP24:

- SEA.
- HRA.
- WFD.
- BNG.
- NCA.
- INNS.

5.4.2 A summary of the results of each of these assessments can be found in Section 5.6 and 5.7. Further detail for each assessment is held in Appendix E, and in the corresponding appendices for each type of environmental assessment.

5.5 IEA Assessments Results

5.5.1 Table 5-2 outlines the colour coding used for the SEA, Table 5-3 and Table 5-4 summarise the overall assessment ratings of the SEA for both the construction phase and the operational phase for the options considered in the BVP, the reasonable alternatives and the adaptive programmes. These ratings were determined using the Assessment Stage Methods set out in Section 4.2 and other environmental assessments set out in Section 4.4 (HRA, WFD, BNG, NCA, INNS) alongside professional judgement.

5.5.2 The key that provides an explanation of the colour coding provides an indication of where likely significant effects are predicted to result from the supply and demand management option packages and is set out in Table 5-2 Note that **moderate** and **major** effects (be it positive or negative) are those considered significant. .

5.5.3 Four metrics derived from the SEA, generated by assigning a score of 1 (minor), 4 (moderate) and 8 (major) to the effects identified to each SEA objective from each option:

- Positive construction.
- Negative construction.
- Positive operation.
- Negative operation.

5.5.4 The metrics were based on the SEA's residual effects on the environment, assuming that recommended mitigation measures will be applied; this was considered to be appropriate as the costs of delivering standard good practice mitigation were included in the costs of constrained list of supply options the model selects from.

Table 5-2: Key to SEA Findings

Colour Code	Effect
+++	Major Positive (Significant)
++	Moderate Positive (Significant)
+	Minor Positive

0	Neutral
-	Minor Negative
--	Moderate Negative (Significant)
---	Major Negative (Significant)

The individual findings for each of the components of the final WRMP24 can be found in Appendix K (SEA Options Assessment). A summary of other Environmental Assessment results for these options is provided in Section 5.7 and Appendix E. More detailed information regarding the results of other discipline assessments can be found in their respective appendices.

Table 5-3: Supply and Demand Options Construction Effects

		Topic																				
		Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets	
Option ID		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2
New Linford Water Treatment Works (WTW) (10MI/d) (ESW-ABS-003C)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	-	-	0	0	-	-	0	-	-	0	-	-	0	-	-	-	0	-	-	-	-
Barsham WTW to Blyth Transfer (ESW-TRA-001)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	-	-	-	0	0	0	-	-	0	0	-	-	0	0	-	-	-
Transfer from Holton WTW to Eye Airfield (ESW-TRA-019)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	-	-	0	0	0	0	0	-	0	-	-	-	0	0	-	-	-
Langford Nitrate Removal + Pipeline (ESW-NIT-005)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	0	-	0	0	-	0	-	-	0	-	-	-	0	-	-	-	-
Langford UV Crypto (ESW-UVC-001)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	-	0	0	0	0	-	0	0	0	0	-	-	0	-	-	0	0	-	-	-	0
Langham Nitrate Removal + Pipeline (ESW-NIT-006)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	-	-	0	0	-	0	-	-	0	-	-	-	0	-	-	-	-
Barsham Nitrate Removal + Pipeline (ESW-NIT-004)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	-	-	0	0	-	0	-	-	0	-	-	-	0	-	-	-	-
Langford WTW upgrade + Abberton RWPS Pump Replacement (ESW-PMP-001A)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	-	-	0	0	0	0	0	0	-	0	0	-	0	-	0	-	0	-	-	-	-
Broome to Barsham Transfer (ESW-TRA-023)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	-	-	0	0	-	-	0	0	0	0	-	-	0	-	-	-	0	-	-	-	-
Transfer from Bungay Wells to Broome WTW (ESW-TRA-018)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	0	-	0	0	0	0	-	-	0	-	-	-	0	0	-	-	-

		Topic																				
		Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets	
Option ID		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2
Effluent Re-use at Caister and transfer to Ormesby (03b0478B)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	-	-	0	0	0	0	-	-	0	-	-	-	0	-	-	-	-
Lowestoft Water Re-use to Ellingham Mill (ESW-EFR-002A)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	--	--	0	0	-	-	0	0	0	0	-	-	0	-	-	-	0	-	-	-	-
North Suffolk Winter Storage Reservoir + Barsham River Works Upgrade (ESW-RES-002C1)	Positive	0	+++	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	---	-	--	0	-	-	-	-	-	0	-	-	0	-	-	-	0	-	-	-	-
Corton beach well desalination (ESW-DES-008)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	--	--	--	0	-	-	-	0	-	0	-	-	0	-	-	-	0	0	-	-	-
California beach desalination (ESW-DES-004)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	--	-	-	0	-	-	-	0	-	0	-	-	0	-	-	-	0	0	-	-	-
Canvey Island Terrestrial Desalination (ESW-DES-001)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	--	-	0	-	-	-	0	-	0	-	-	0	-	-	-	0	0	-	-	-
Southend-on-Sea desalination (ESW-EFR-001)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	--	--	0	0	--	-	0	0	-	0	-	-	0	-	-	-	0	-	-	-	-
Demand Management Strategy Medium (Preferred) (ESW-DMO-Preferred)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	-	0	0	-	-	0	-	-	0	0	-	-	0	-	-	-	0	0	0	-	-

Table 5-4: Supply and Demand Options Operational Effects

		Topic																					
		Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets		
Option ID		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2	
New Linford Water Treatment Works (WTW) (10MI/d) (ESW-ABS-003C)	Positive	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0	0
	Negative	--	0	0	0	0	0	0	0	--	0	0	-	0	0	0	0	0	0	0	0	0	-
Barsham WTW to Blyth Transfer (ESW-TRA-001)	Positive	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	-	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0
Transfer from Holton WTW to Eye Airfield (ESW-TRA-019)	Positive	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	0	0	0	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0
Langford Nitrate Removal + Pipeline (ESW-NIT-005)	Positive	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0	0
	Negative	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	-	0
Langford UV (Crypto) ESW-UVC-001	Positive	0	0	0	0	0	0	0	0	+	0	0	+	0	0	+	+	0	0	0	0	0	0
	Negative	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	-	0
Langham Nitrate Removal + Pipeline (ESW-NIT-006)	Positive	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0	0
	Negative	-	0	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	0	0	0	-	0
Barsham Nitrate Removal + Pipeline (ESW-NIT-004)	Positive	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0	0
	Negative	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	-	0
Langford WTW upgrade + Abberton RWPS Pump Replacement (ESW-PMP-001A)	Positive	0	+	0	0	0	+	0	0	++	0	0	+	0	0	0	+	0	0	0	0	0	0
	Negative	-	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	-	0
Broome to Barsham Transfer (ESW-TRA-023)	Positive	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	+	0	0	0	0	0	0
	Negative	0	0	0	0	0	0	0	0	-	0	-	0	0	0	0	0	0	0	0	0	0	0
Transfer from Bungay Wells to Broome WTW (ESW-TRA-018)	Positive	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	0	0
	Positive	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	+	0	0	0	0	0	0

		Topic																				
		Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets	
Option ID		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2
Effluent Re-use at Caister and transfer to Ormesby (03b0478B)	Negative	-	-	0	0	0	0	-	0	0	0	0	-	--	0	0	0	0	0	-	0	0
Lowestoft Water Re-use to Ellingham Mill (ESW-EFR-002A)	Positive	0	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	0	0
	Negative	-	-	0	0	0	0	-	0	0	0	0	-	--	0	0	0	0	0	0	0	0
North Suffolk Winter Storage Reservoir + Barsham River Works Upgrade (ESW-RES-002C1)	Positive	0	+	0	0	0	0	0	0	0	++	0	0	+	0	0	+	+	+	+	0	0
	Negative	-	0	-	0	-	0	-	0	---	-	0	-	0	0	0	0	0	0	0	-	0
Corton beach well desalination (ESW-DES-008)	Positive	0	0	0	0	0	0	0	0	0	++	0	0	+	0	0	+	0	0	0	0	0
	Negative	--	--	-	0	0	0	0	0	--	0	0	--	-	0	0	0	0	0	0	-	0
California beach desalination (ESW-DES-004)	Positive	0	0	0	0	0	0	0	0	0	++	0	0	+	0	0	+	0	0	0	0	0
	Negative	--	-	--	0	0	0	0	0	-	0	0	--	-	-	-	0	0	0	0	-	0
Canvey Island Terrestrial Desalination (ESW-DES-001)	Positive	0	0	0	0	0	0	0	0	0	++	0	0	+	0	0	+	0	0	0	0	0
	Negative	-	-	-	0	0	-	0	0	-	0	0	--	-	0	0	0	0	0	0	-	0
Southend-on-Sea Water Re-use (ESW-EFR-001)	Positive	0	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	0	0
	Negative	0	0	0	0	0	0	-	0	-	0	0	-	--	0	0	0	0	0	0	0	0
Demand Management Strategy Medium (Preferred) (ESW-DMO-Preferred)	Positive	+	+	0	+	0	0	+	+	+	+	0	+	++	+	0	+	++	++	0	0	0
	Negative	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

5.6 Summary of Supply and Demand Options SEA Results

5.6.1 The SEA's assessment of likely significant effects of final WRMP24 relates to the environmental consequences (positive or negative) in relation to each SEA Objective. Effects are separated between construction and operation phases, where construction is considered to relate to *short-* and medium-term effects whereas operation is considered *long term* effects. This Section presents a summary of the SEA's likely significant effects findings of each WRMP24 options, 17 supply options and one demand management scenario, against each of the SEA Objectives as part of the BVP. The methodology applied in undertaking the assessment is set out in Section 4: Environmental Assessment Methodology. All assessments have been undertaken on concept designs of options. The results of the assessments, including mitigation and monitoring currently proposed will be re-visited at a project level, as the projects progress through detailed design. Please see Appendix K: SEA Matrices, for the SEA Assessment sheets.

Construction

5.6.2 During the construction phase, significant residual negative effects are anticipated for SEA Objectives for 13 of the 18 options. None of the options have anticipated significant residual positive effects to SEA objectives.

Biodiversity

5.6.3 Nine options are anticipated to have significant residual negative effects to Biodiversity objectives during construction. These are options: ESW-ABS-003C; ESW-TRA-018; 03b0478B; ESW-EFR-002A; ESW-RES-002C1; ESW-DES-008; ESW-DES-001; ESW-DES-004, and ESW-EFR-001. A number of the options yield a high percentage loss of habitat, however the total amount of habitat units lost are relatively small and are considered to be straightforward to replace and therefore a minor negative impact has been recorded for these options; ESW-ABS-003C, ESW-TRA-001, ESW-TRA-019, ESW-NIT-005, ESW-NIT-006, ESW-NIT-004, ESW-PMP-001A, and ESW-TRA-023.

5.6.4 For the ESW-ABS-003C option, significant negative effects are anticipated for the objective, based on, to protect designated sites and their qualifying features. This is based on the outcomes of the ToLS assessments and therefore without considering mitigation. The HRA ToLS for this option identified likely significant effects (LSE) for two Natura 2000 sites that could be affected during construction due to non-physical disturbance and biological disturbance. AAs were undertaken which confirm the potential for impacts upon designated sites and mitigation required to avoid impacts.

5.6.5 ESW-TRA-018 is anticipated to have significant negative effects for the objective to deliver BNG, protect biodiversity, priority species and vulnerable habitats, in particular floodplain wetland mosaic, mixed deciduous woodland and broadleaved woodland which can be difficult to replace. This is as a result of a potential loss of habitat during the construction phase (-61.73% change).

5.6.6 03b0478B is anticipated to have significant negative effects for the objective to deliver BNG, protect biodiversity, priority species and vulnerable habitats. This is as a result of a potential loss of habitat during the construction phase (-33.95% change).

5.6.7 ESW-EFR-002A is anticipated to have significant negative effects to two biodiversity objectives. Firstly, significant negative effects are anticipated for the objective to protect designated sites and their qualifying features. This is based on the outcomes of the ToLS assessments and therefore without considering mitigation. The HRA ToLS for this option identified likely significant effects (LSE) for seven Natura 2000 sites that could be affected during construction due to non-physical disturbance and biological disturbance. Appropriate assessments were undertaken which confirm the potential for impacts to designated sites and mitigation which

would be required to avoid impacts. Secondly, significant negative effects are anticipated for the objective to deliver BNG, protect biodiversity, priority species and vulnerable habitats. This is as a result of a potential loss of habitat during the construction phase (-19.91% change).

- 5.6.8 ESW-RES-002C1 is anticipated to have significant negative effects to two biodiversity objectives. Firstly, significant negative effects are anticipated for the objective to protect designated sites and their qualifying features. This is based on the outcomes of the ToLS assessments and therefore without considering mitigation. The HRA ToLS for this option identified likely significant effects (LSE) for five Natura 2000 sites that could be affected during construction due to potential for non-physical disturbance, biological disturbance, toxic contamination, and non-toxic contamination. Appropriate assessments were undertaken which confirm the potential for impacts upon designated sites and mitigation required to avoid impacts. Secondly, significant negative effects are anticipated for the objective to avoid spreading and, where required, manage invasive and non-native species (INNS). This is as a result of the physical transfer of untreated water between two locations assumed currently unconnected, potentially resulting in the spread of INNS from the River Waveney to the reservoir along the two new pipeline routes.
- 5.6.9 ESW-DES-008 is anticipated to have significant negative effects to three biodiversity objectives. Firstly, significant negative effects are anticipated for the objective to protect designated sites and their qualifying features. This is based on the outcomes of the ToLS assessments and therefore without considering mitigation. The HRA ToLS for this option identified likely significant effects (LSE) for five Natura 2000 sites that could be affected during construction due to non-physical disturbance, toxic contamination, non-toxic contamination, biological disturbance, physical damage, and physical loss. Appropriate assessments were undertaken which confirm the potential for impacts upon designated sites and mitigation required to avoid impacts. Secondly, significant negative effects are anticipated for the objective to deliver BNG, protect biodiversity, priority species and vulnerable habitats. This is as a result of a potential loss of habitat during the construction phase (-40.20% change). Thirdly, significant negative effects are anticipated for the objective to avoid spreading and, where required, manage invasive and non-native species (INNS). This is as a result of potential for pipe bursts to cause untreated source water to be released to the environment during transfer to the desalination plant (creating pathway for the transfer of INNS).
- 5.6.10 ESW-DES-004 is anticipated to have significant effects for the objective to protect designated sites and their qualifying features. This is based on the outcomes of the ToLS assessments and therefore without considering mitigation. The HRA ToLS for this option identified likely significant effects for nine Natura 2000 sites due to construction effects from hydrological links. An Appropriate Assessment was not undertaken for this option as it is not considered part of the BVP, alternative plans or Adaptive Programmes.
- 5.6.11 ESW-DES-001 is anticipated to have significant negative effects for the objective to deliver BNG, protect biodiversity, priority species and vulnerable habitats. This is as a result of a potential loss of habitat during the construction phase (-53.47% change).
- 5.6.12 ESW-EFR-001 is anticipated to have significant negative effects to two biodiversity objectives. Firstly, significant negative effects are anticipated for the objective to protect designated sites and their qualifying features. This is based on the outcomes of the ToLS assessments and therefore without considering mitigation. The HRA ToLS for this option identified likely significant effects (LSE) for 10 Natura 2000 sites that could be affected during construction due to non-physical disturbance, biological disturbance, toxic contamination, non-toxic contamination, physical damage, and physical loss. Appropriate assessments were undertaken which confirm the potential for impacts upon designated sites and mitigation required to avoid impacts. Secondly, significant negative effects are anticipated for the objective to deliver BNG, protect

biodiversity, priority species and vulnerable habitats. This is as a result of a potential loss of habitat during the construction phase (-29.39% change).

- 5.6.13 Where HRA ToLS has identified LSE for Natura 2000 sites as a result of the construction of an option, HRA Appropriate Assessments (AA) were undertaken to further confirm anticipated effects, as well as to recommend appropriate mitigation and monitoring, detailed in Appendix F.

Soil

- 5.6.14 One option, ESW-EFR-001, is anticipated to have significant residual negative effects to Soil objectives during construction. For this option, significant negative effects are anticipated for the objective to protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.
- 5.6.15 ESW-EFR-001 proposes a new effluent re-use plant that will be located within Grade 1 agricultural land, and a new pumping station (the location of which is currently unknown). As these will be permanent structures, land will be permanently lost. During design development, it is anticipated that this Grade 1 agricultural land may be avoided. Additionally, transfer pipelines required for this option will cross Grade 1, 2, 3, and 4 agricultural land, with construction activities causing temporary disturbance to these soils. The option also crosses a historic landfill site and is within 500m of other historic landfill sites, thus there is potential to disturb contaminated soils during construction.

Landscape

One option, ESW-TRA-018, is anticipated to have significant residual negative effects to the Landscape objective during construction.

- 5.6.16 A majority of ESW-TRA-018 intersects The Broads National Park. As a result of required excavation for construction of the pipeline and permanent loss of woodland, landscape and visual effects during the construction phase are likely.

Climatic Factors and Material Assets

- 5.6.17 Three options are anticipated to have significant residual negative effects to Climatic Factors and Material Assets objectives during construction. These are options: ESW-NIT-004, ESW-NIT-005, and ESW-NIT-006.
- 5.6.18 For these options, significant negative effects are anticipated for both the Climatic Factors objective to minimise/reduce embodied and operational carbon emissions, and the Material Assets objective to minimise resource use and waste production. This is as a result of the embodied carbon emissions, resource use, and waste production that would be associated with these options. These options will require new infrastructure, such as pipelines and treatment facilities, to be built, thus construction is likely to require a significant quantity of materials and produce waste. Construction activities will also generate emissions through associated machinery movements for required earthworks, HGV movements for transporting materials, as well as emissions coming from other construction related activities.

Operation

- 5.6.19 During the operational phase, significant residual negative effects are anticipated to SEA objectives for eight of the 18 options. Significant residual positive effects are anticipated to SEA objectives for five of the options.

Biodiversity

- 5.6.20 Three options are anticipated to have significant residual negative effects to Biodiversity objectives during operation. These are options: ESW-ABS-003C; ESW-DES-004 and ESW-DES-008. This is based on the outcomes of the ToLS assessments and therefore without considering mitigation. Appropriate assessments were undertaken which confirm the potential for impacts upon designated sites and mitigation required to avoid impacts.
- 5.6.21 For the ESW-ABS-003C option, significant negative effects are anticipated for the objective to protect designated sites and their qualifying features. The HRA ToLS for this option identified likely significant effects (LSE) for two Natura 2000 sites that could be affected during operation due to physical damage, physical loss, toxic contamination, non-toxic contamination, and biological disturbance.
- 5.6.22 ESW-DES-008 is anticipated to have significant negative effects on two biodiversity objectives. Firstly, significant negative effects are anticipated for the objective to protect designated sites and their qualifying features. The HRA ToLS for this option identified likely significant effects (LSE) for one Natura 2000 site that could be affected during operation due to physical loss of intertidal habitat where wells/galleries and pipelines are installed. Secondly, significant negative effects are anticipated for the objective to deliver BNG, protect biodiversity, priority species and vulnerable habitats. This is also as a result of the HRA ToLS results for this option outlined above.
- 5.6.23 EWS-DES-004 is anticipated to have significant negative effects on the objective to protect designated sites and their qualifying features. The HRA ToLS for this option identified likely significant effects (LSE) for nine sites due to operational effects from hydrological links. Desalination options require discharge of saline solution and well abstraction works. This may lead to adverse effects to designated sites during operation. ESW-DES-004 is also anticipated to have significant negative effects on the objective to avoid spreading and, where required, manage invasive and non-native species (INNS). As source water is untreated, there is a moderate risk of INNS transfer from source and potential for pipe bursts to cause water to be released to the environment (creating pathway for the transfer of INNS). A level 2 INNS assessment may be required to confirm this impact, however at present it is not selected in the BVP, the alternative plans or the adaptive programmes which are considered in this report. If this option were to be selected for the plan at a later stage, a level 2 INNS assessment should be considered.
- 5.6.24 Where HRA ToLS has identified LSE for Natura 2000 sites as a result of the operation of an option, HRA Appropriate Assessments (AA) were undertaken to further confirm anticipated effects, as well as to recommend appropriate mitigation and monitoring.
- 5.6.25 One option, ESW-RES-002C1, is anticipated to have significant residual positive effects to Biodiversity objectives during operation. These objectives are to deliver BNG, and protect biodiversity, priority species and vulnerable habitats, with a gain in BNG units of +89.52%.

Water

- 5.6.26 Three options are anticipated to have significant residual negative effects to Water objectives during operation. These are options: ESW-ABS-003C, ESW-RES-002C1, and ESW-DES-008. This is based on the WFD screening exercise which does not consider mitigation. WFD Level 2 assessments were undertaken which confirm the potential for impacts to designated sites and mitigation which would be required to avoid impacts.
- 5.6.27 For the ESW-ABS-003C option, significant negative effects are anticipated for the objective to meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans. Out of the four waterbodies considered during WFD Level 1

assessment for this option, a high level of effect was determined for two waterbodies during operation as a result of new or increased groundwater abstraction, with low or new effects identified on all four watercourses during the operational phase.

- 5.6.28 ESW-RES-002C1 is anticipated to have significant negative effects for the objective to meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans. Out of the three waterbodies considered during WFD Level 1 assessment for this option, a high level of effect was determined for all three waterbodies due to the creation of a new winter storage reservoir. Whilst the primary extraction is to the River Hundred, there are potential high impacts anticipated specifically for Waveney (Ellingham Mill - Burgh St. Peter) due to increased surface water extraction during the winter when flows are available.
- 5.6.29 ESW-DES-008 is anticipated to have significant negative effects for the objective to meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans. Out of the four waterbodies considered during WFD Level 1 assessment for this option, a high level of effect was determined for two waterbodies. For Bure & Waveney & Yare & Lothing this was due to the new discharge of highly saline water, and for Waveney and East Suffolk Chalk & Crag (GW) this was due to construction of below ground shafts in the vicinity of the waterbody, new or increased surface water abstraction. Further details can be found in the WFD Report in Appendix G
- 5.6.30 Where WFD Level 1 assessment has identified a high level of effect to a waterbody as a result of the operation of an option, WFD Level 2 assessments were undertaken to further confirm these effects and recommend mitigation and monitoring.
- 5.6.31 Four options are anticipated to have significant positive residual effects to Water objectives during operation. These are options: ESW-PMP-001A; ESW-RES-002C1; ESW-DES-008; and ESW-DES-001.
- 5.6.32 For all four options, significant positive effects are anticipated for the objective to increase water efficiency and increase resilience of water supplies and natural systems to droughts. The Abberton RWPS elements of option ESW-PMP-001A involves the replacement of two existing pumps, as well as motors and controls, that will help to provide additional pumping capacity to transfer more water for treatment. The pumping station currently has a restricted capacity to 220 MI/d (at reservoir bottom water level). During a 1 in 500-year drought the current pumps would be insufficient to maximise abstraction from Abberton during a dry year. The additional pumping capacity is based upon 265-220 MI/d. The Langford WTW element involves upgrades to the site's treatment infrastructure, as well as the introduction of raw water from Abberton Reservoir, to allow the WTW to operate at its maximum output capacity, which at present can struggle to achieve its peak deployable output under certain conditions. As a result, both elements of this option will help to increase the resilience of water supplies and natural systems to droughts during operation.
- 5.6.33 ESW-RES-002C1 proposes the building of a new winter storage reservoir. This reservoir will store water from River Waveney, where the water will then be transferred to Barsham WTW when supplies are short. Two new transfer pipelines will be built with three potential flow rates, 16.2 MI/d, 18.5 MI/d, and 19.9 MI/d. The option also includes additional treatment capacity provided by a 16 MI/d extension at the existing Barsham WTW. During normal operation, this option could combat the effect of extreme temperatures and drought on water resilience by providing an additional reservoir to supply drinking water, where water has been taken from the River Waveney and stored prior to drought conditions.
- 5.6.34 Both ESW-DES-008 and ESW-DES-001 will have positive effects to water supply resilience as the proposed desalination plants will be able to provide water supply without having to rely on freshwater sources, thus enabling a base supply even during drought conditions.

Climatic Factors

- 5.6.35 Six options are anticipated to have significant residual negative effects to Climatic Factors objectives during operation. These are options: 03b0478B; ESW-EFR-002A; ESW-DES-008; ESW-DES-004, ESW-DES-001; and ESW-EFR-001.
- 5.6.36 Options 3b-0478B, ESW-EFR-002A, and ESW-EFR-001, significant negative effects are anticipated for the objective to introduce climate mitigation where required and improve the climate resilience of assets and natural systems. For all three of these options, this is due to potential effects to natural systems through possible changes in water levels as water is diverted from waterbodies for treatment.
- 5.6.37 Options ESW-DES-008, ESW-DES-004 and ESW-DES-001 have significant negative effects anticipated for the objective to minimise/reduced embodied and operational carbon emissions. This is due to the energy intensive desalination process that would be used during operation.
- 5.6.38 ESW-DMO-Preferred option is anticipated to result in a significant positive effect during the operation stage due to water efficiency improvements and leakage resolution leading to less water being extracted from the natural environmental and greater resilience to climate change impacts such as drought. No further options are anticipated to have significant residual positive effects to Climatic Factors objectives.

Population and Human Health

- 5.6.39 No options are anticipated to have significant residual negative effects to Population and Human Health objectives.
- 5.6.40 ESW-DMO-Preferred option is anticipated to result in a significant positive effect during the operation stage due to water efficiency improvements and leakage resolution leading to less water being extracted from the natural environmental and thus more secure water supplies for the community, and water efficiency advice and behavioural changes leading to greater awareness and education of the community on water supply issues.

5.7 Summary of other Environmental Assessments

- 5.7.1 In addition to the SEA, other assessments were undertaken for all supply options. Due to the lack of physical footprint and uncertainty around the exact timings and activities, the ESW-DMO-Preferred option has not been subjected to other environmental assessments. The results of these assessments are summarised here. For more detailed information, please see each assessments respective appendix.

HRA

- 5.7.2 The HRA ToLS results for all the options considered in the Basic Screening Assessment (Level 1), are detailed in Table 5-5. Results of the concept level HRA AA (Level 2) are detailed in Appendix F.

Table 5-5: HRA ToLS Results

Option ID	Option Name	Sites with Potential Likely Significant Effects (approx. distance) Pre-Mitigation
ESW-ABS-003C	New Linford WTW (10MI/d Option)	<ul style="list-style-type: none"> • Thames Estuary & Marshes SPA (UK9012021) (approx. 0km) • Thames Estuary & Marshes Ramsar (UK11069) (approx. 0km)
ESW-DES-001	Canvey Island Terrestrial Desalination (Maximum Capacity)	<ul style="list-style-type: none"> • Thames Estuary & Marshes SPA (UK9012021) (approx. 1.5km) • Thames Estuary and Marshes Ramsar (UK11069) (approx. 1.5km) • Outer Thames Estuary SPA (UK9020309) (approx. 7.5km)

Option ID	Option Name	Sites with Potential Likely Significant Effects (approx. distance) Pre-Mitigation
		<ul style="list-style-type: none"> • Benfleet and Southend Marshes Ramsar (UK11006) (approx. 0.5km) • Benfleet and Southend Marshes (SPA)(UK9009171) (approx. 0.5km) • Foulness (Mid-Essex Coast Phase 5) Ramsar (UK11026) (approx. 14km) • Foulness (Mid-Essex Coast Phase 5) SPA (UK9009246) (approx. 15km) • Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar (UK UK11058) (approx. 1.3km) • Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) SPA (UK9009244) (approx. 1.3km) • Essex Estuaries SAC (UK0013690) (approx. 1.3km) • Medway Estuary & Marshes Ramsar (UK11040) (approx. 8km) • Medway Estuary & Marshes SPA (UK9012031) (approx. 8km)
ESW-DES-004	California Caister beach desalination	<ul style="list-style-type: none"> • Broadland SPA (UK9009253) (approx. 0.05km) • Broadland Ramsar (UK11010) (approx. 0.05km) • The Broads SAC (UK0013577) (approx. 0.05km) • Southern North Sea SAC (UK0030395) (approx. 0.0km) • Greater Wash SPA (UK9020329) (approx. 0.0km) • Outer Thames Estuary SPA (UK9020309) (approx. 0.0km) • Breydon Water Ramsar (UK11008) (approx. 1.8km) • Breydon Water SPA (UK9009181) (approx. 1.8km) • Great Yarmouth North Denes SPA (UK9009271) (approx. 0km)
ESW-DES-008	Corton Beach Well Desalination	<ul style="list-style-type: none"> • Broadland SPA (UK9009253) (approx. 0.05km) • Broadland Ramsar (UK11010) (approx. 0.05km) • The Broads SAC (UK0013577) (approx. 0.05km) • Southern North Sea SAC (UK0030395) (approx. 0.0km) • Outer Thames Estuary SPA (UK9020309) (approx. 0.0km)
ESW-EFR-001	Southend-on-Sea Effluent Re-use (max capacity)	<ul style="list-style-type: none"> • Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar (UK UK11058) (approx. 0km) • Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) SPA (UK9009244) (approx. 0km) • Essex Estuaries SAC (UK0013690) (approx. 0km) • Foulness (Mid-Essex Coast Phase 5) Ramsar (UK11026) (approx. 7km) • Foulness (Mid-Essex Coast Phase 5) SPA (UK9009246) (approx. 7km) • Outer Thames Estuary SPA (UK9020309) (approx. 0km) • Benfleet and Southend Marshes Ramsar (UK11006) (approx. 3km) • Benfleet and Southend Marshes (SPA)(UK9009171) (approx. 3km)
ESW-EFR-002A	Lowestoft water re-use (transfer to River Waveney)	<ul style="list-style-type: none"> • Southern North Sea SAC (UK0030395) (approx. 0.55km) • Outer Thames Estuary SPA (UK9020309) (approx. 0.55km) • Breydon Water Ramsar (UK11008) (approx. 4.5km) • Breydon Water SPA (UK9009181) (approx. 4.5km) • The Broads SAC (UK0013577) (approx. 4.5km) • Broadland SPA (UK9009253) (approx. 6km) • Broadland Ramsar (UK11010) (approx. 6km)
03b0478B	Water Re-use Treatment at Caister EFR (AW) and	<ul style="list-style-type: none"> • The Broads SAC (UK0013577) (approx. 0.2km) • Broadland SPA (UK9009253) (approx. 0.6km)

Option ID	Option Name	Sites with Potential Likely Significant Effects (approx. distance) Pre-Mitigation
	transfer from Caister to Ormesby Raw Water Tank	<ul style="list-style-type: none"> Broadland Ramsar (UK11010) (approx. 0.8km)
ESW-NIT-004	Barsham EDR Nitrate Removal + Pipeline	<ul style="list-style-type: none"> Broadland SPA (UK9009253) (approx. 2km) Broadland Ramsar (UK110100) (approx. 2km) The Broads SAC (UK0013577) (approx. 2km)
ESW-NIT-005	Langford EDR Nitrate Removal + Pipeline	<ul style="list-style-type: none"> Blackwater Estuary Ramsar (UK11007) (approx. 0.08km) Essex Estuaries SAC (UK0013690) (approx. 0.08km) Blackwater Estuary SPA (UK9009245) (approx. 0.08km)
ESW-NIT-006	Langham EDR Nitrate Removal + Pipeline	<ul style="list-style-type: none"> Colne Estuary Ramsar (UK11015) (approx. 3.5km) Colne Estuary SPA (UK9009243) (approx. 3.5km) Essex Estuaries SAC (UK013690) (approx. 3.5km)
ESW-PMP-001A	Abberton RWPS	<ul style="list-style-type: none"> Abberton Reservoir SPA (UK9009141) (0km) Abberton Reservoir Ramsar (UK11001) (0km) Essex Estuaries SAC (UK0013690) (approx. 2.2km) Blackwater Estuary (Mid-Essex Coast Phase 4) SPA (UK9009245) (approx. 2.2km) Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar (UK11007) (approx. 2.2km) Colne Estuary (Mid-Essex Coast Phase 2) Ramsar (UK11015) (approx. 3km) Colne Estuary (Mid-Essex Coast Phase 2) SPA (UK9009243) (approx. 3km)
ESW-RES-002C1	North Suffolk Winter Storage Reservoir	<ul style="list-style-type: none"> Broadland SPA (UK9009253) (approx. 1.1km) Broadland Ramsar (UK11010) (approx. 1.1km) The Broads SAC (UK0013577) (approx. 1.1km) Breydon Water Ramsar (UK11008) (approx. 12.5km) Breydon Water SPA (UK9009181) (approx. 12.5km)
ESW-TRA-001	Barsham to Blyth Transfer Main	<ul style="list-style-type: none"> Dew's Ponds SAC (UK0030133) (approx. 0.49km) The Broads SAC (UK0013577) (approx. 2.1km) Broadland Ramsar (UK110100) (approx. 2.1km) Broadland SPA (UK9009243) (approx. 2.1km) Minsmere-Walberswick SPA (UK9009101) (approx. 3.5km) Minsmere to Walberswick Heaths & Marshes SAC (UK0012809) (approx. 3.5km) Minsmere to Walberswick Ramsar (UK11044) (approx. 4km) Alde-Ore & Butley Estuaries SAC (UK0030076) (approx. 5.5km) Alde-Ore Estuary Ramsar (UK11002) (approx. 5.5km) Alde-Ore SPA (UK9009112) (approx. 5.5km) Outer Thames Estuary SPA (UK9020309) (approx. 8km) Southern North Sea SAC (UK0030395) (approx. 8km)
ESW-TRA-018	Bungay Wells to Broome WTW Transfer	<ul style="list-style-type: none"> Broadland SPA (UK9009253) (approx. 3.7km) Broadland Ramsar (UK11010) (approx. 3.7km) The Broads SAC (UK0013577) (approx. 3.7km)
ESW-TRA-019	Transfer from Holton WTW to Eye Airfield	<ul style="list-style-type: none"> Minsmere-Walberswick SPA (UK9009101) (approx. 5km) Minsmere to Walberswick Ramsar (UK11044) (approx. 5km) Outer Thames Estuary SPA (UK9020309) (approx. 9.9km) Southern North Sea SAC (UK0030395) (approx. 9.9km)

Option ID	Option Name	Sites with Potential Likely Significant Effects (approx. distance) Pre-Mitigation
ESW-TRA-023	Broome to Barsham Transfer	<ul style="list-style-type: none"> Broadland SPA (UK9009253) (approx. 1.5km) Broadland Ramsar (UK110100) (approx. 1.5km) The Broads SAC (UK0013577) (approx. 1.5km)
ESW-UVC-001	Langford UV (Crypto)	<ul style="list-style-type: none"> Essex Estuaries SAC (UK0013690) (approx. 2.5km) Blackwater Estuary Ramsar (UK11007) (approx. 2.5km) Blackwater Estuary SPA (UK9009245) (approx. 2.5km)

5.7.3 HRA Appropriate Assessments for the above-mentioned sites identified as having potential for LSE have been undertaken to determine whether the construction and/or operation of the options will result in adverse effects to their site integrity. Following Stage 2 Appropriate Assessment, it is concluded that assuming all proposed monitoring and mitigation measures are implemented, there will not be a significant change to the extent and distribution of qualifying species, to the structure and function of habitats and qualifying species, and to the supporting processes on which habitats of qualifying species rely; avoiding and/or mitigating any potential effect.

5.7.4 All assessments have been undertaken on concept designs of options. The results of the assessments, including mitigation and monitoring currently proposed will be re-visited at a project level, as the projects progress through detailed design. Based on the current level of detail available for the final WRMP24, a number of established mitigation and monitoring measures are given which can be assumed for all options, this is detailed within Appendix F – *Habitats Regulations Assessment*. These measures are defined as industry-wide best practice measures to address common risks in the construction and development sectors and thus are proven to reduce the risk of the identified effects as far as is reasonably possible. Option specific mitigation and monitoring measures are also outlined. In-combination these measures will be applied to the construction of the final option and constitute mitigation to avoid or reduce adverse effects on Habitats Site integrity and therefore are only mentioned at the AA stage and are outlined within Appendix F – *Habitats Regulations Assessment*.

WFD

5.7.5 For the final WRMP24, all the supply options have been subject to a WFD assessment. The Level 1 WFD assessments, Basic Screenings, indicated eight options are anticipated to have very low risks of being non-compliant with WFD objectives, and do not require further assessment.

5.7.6 Level 2 WFD assessments, Detailed Impact Screenings, are required for eight of the options. These assessments are more detailed and will determine whether there are any residual significant impacts once mitigation has been considered.

Table 5-6: WFD Level 1 Results

Option ID	Option Name	Number of waterbodies requiring further WFD assessment
ESW-ABS-003C	New Linford WTW (10Ml/d Option)	2
ESW-DES-001	Canvey Island Terrestrial Desalination (Maximum Capacity)	2
ESW-DES-004	California Beach Desalination	3
ESW-DES-008	Corton Beach Well Desalination	2

ESW-EFR-001	Southend-on-Sea Effluent Re-use (max capacity)	3
ESW-EFR-002A	Lowestoft water re-use (transfer to River Waveney)	0
03b0478B	Water Re-use Treatment at Caister EFR (AW) and transfer from Caister to Ormesby Raw Water Tank	1
ESW-NIT-004	Barsham EDR Nitrate Removal + Pipeline	0
ESW-NIT-005	Langford EDR Nitrate Removal + Pipeline	2
ESW-NIT-006	Langham EDR Nitrate Removal + Pipeline	0
ESW-PMP-001A	Abberton RWPS	0
ESW-RES-002C1	North Suffolk Winter Storage Reservoir	2
ESW-TRA-001	Barsham to Blyth Transfer Main	0
ESW-TRA-018	Bungay Wells to Broome WTW Transfer	2
ESW-TRA-019	Transfer from Holton WTW to Eye Airfield	0
ESW-TRA-023	Broome to Barsham Transfer	0
ESW-UVC-001	Langford UV (Crypto)	0

5.7.7 The above options with at least one waterbody requiring further WFD assessment have been subject to a WFD Level 2 assessment.

5.7.8 The majority of the options assessed as part of the three plans have only been subject to high level design and if they are taken forward would require additional design and assessment as they progress to next stage of optioneering. Due to this, the confidence in the option design has been rated as low throughout all of the Level 2 assessments undertaken.

5.7.9 The findings indicate that there are precautionary WFD compliance risks associated primarily with the operation of additional/new abstractions and new or ceased discharges (see summaries provided in Section 3 of Appendix G). The potential hydrological effects of these activities, among several other varying impacts, could conflict with achieving WFD status objectives. This is particularly the case where hydrology/river flow is an existing limiting factor, recorded in WFD baseline data as a 'reason for not achieving good'. The potential biological effects, particularly on fish, and physio-chemical changes (for example, reduced dilution as a result of a new or increased abstraction) would require further assessment to improve certainty of the scale of effects.

5.7.10 For groundwater bodies, deterioration risks were primarily associated with changes to quantitative surface water dependent status elements or water balance, as a result of new or increased groundwater abstractions, or construction of below ground works, particularly within close proximity of a Groundwater Dependent Terrestrial Ecosystem (GWDTE).

5.7.11 For new or modified intakes, it is recognised that appropriate fish and eel screening would be required to prevent entrainment. At this stage, this has been considered as likely mitigation, but moderate/amber risks have been maintained until option designs and assessments are further progressed. The same approach has been taken with other likely mitigation such as using trenchless methods to cross larger watercourses where feasible or discharging construction dewatering into a watercourse to maintain flow.

Further investigations and assessments

5.7.12 Subject to their progression through the approvals process, of the supply options which have been assessed at Level 2, it was determined that further WFD mitigation and assessment would be required for two options: ESW-RES-002C1, and ESW-DES-001. Level 2 assessments have assessed a potential risk of deterioration to some water bodies due to these options. As a result, it was determined that further investigations and information would be required to improve the certainty of WFD risk, and these are set out in Section 3 of Appendix G. Following such further investigations, design and mitigation development, it is anticipated that the WFD non-

compliance risk can be reduced to minor localised (impact score 1) for these waterbodies, and therefore the option would be considered to be WFD compliant.

BNG

5.7.13 The results of the BNG Assessment for all the options considered are detailed in Table 5-7.

Table 5-7: BNG Results

Option ID	Option Name	BNG Score	BNG Units
ESW-ABS-003C	New Linford WTW (10MI/d Option)	-10.92%	-5.26
ESW-DES-001	Canvey Island Terrestrial Desalination (Maximum Capacity)	-52.56%	-113.97
ESW-DES-004	California beach desalination	-28.99%	-90.80
ESW-DES-008	Corton Beach Well Desalination	-25.40%	-58.51
ESW-EFR-001	Southend-on-Sea Effluent Re-use (max capacity)	-29.39%	-48.75
ESW-EFR-002A	Lowestoft water re-use (transfer to River Waveney)	-33.95%	-15.97
03b0478B	Water Re-use Treatment at Caister EFR (AW) and transfer from Caister to Ormesby Raw Water Tank	-19.96%	-5.92
ESW-NIT-004	Barsham EDR Nitrate Removal + Pipeline	-51.57%	-9.17
ESW-NIT-005	Langford EDR Nitrate Removal + Pipeline	-49.21%	-4.58
ESW-NIT-006	Langham EDR Nitrate Removal + Pipeline	-18.32%	-6.36
ESW-PMP-001A	Abberton RWPS	-26.44%	-0.64
ESW-RES-002C1	North Suffolk Winter Storage Reservoir	89.52%	205.89
ESW-TRA-001	Barsham to Blyth Transfer Main	-14.17%	-23.52
ESW-TRA-018	Bungay Wells to Broome WTW Transfer	-61.73%	-22.39
ESW-TRA-019	Transfer from Holton WTW to Eye Airfield	-10.42%	-14.91
ESW-TRA-023	Broome to Barsham Transfer	-42.41%	-23.03
ESW-UVC-001	Langford UV (Crypto)	-100%	-0.10

NCA

5.7.14 The results of the NCA Assessment for all the options considered are detailed in Table 5-8. The costs quoted below are subject to an uplift in price reporting year for the ecosystem services in-line with the Enabling a Natural Capital Approach (ENCA) guidance. More accurate costs are provided in the final NCA Appendix of this report. This uplift is not likely to account for a significant increase.

Table 5-8: NCA Results

Option ID	Option Name	Natural Capital	Ecosystem Services
ESW-ABS-003C	New Linford WTW (10MI/d Option)	-£384.49	The option is likely to generate the temporary and permanent loss of natural capital stocks during construction. However, habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services. Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO ₂ due to habitat clearance, loss of natural hazard management, loss of food production, loss of air pollutant removal and a

Option ID	Option Name	Natural Capital	Ecosystem Services
			reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated. There is no change anticipated to water flow regulation.
ESW-DES-001	Canvey Island Terrestrial Desalination (Maximum Capacity)	-£42,652.13	<p>The option is likely to generate the loss of natural capital stocks during construction. However, habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services.</p> <p>Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO₂ due to habitat clearance, loss of natural hazard management, a reduction in food production services, a reduction in recreational and amenity services, and a reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated. There is some change anticipated in water flow regulation.</p>
ESW-DES-004	California Caister beach desalination	-£2,541.09	<p>The option is likely to generate the temporary and permanent loss of natural capital stocks during construction. However, most habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services.</p> <p>Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO₂ due to habitat clearance, loss of natural hazard management and a reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated. There is no change anticipated to water flow regulation. Permanent loss of arable and pastoral stocks will likely affect agricultural ecosystem services.</p>
ESW-DES-008	Corton Beach Well Desalination	-£2,367.11	<p>The option is likely to generate the temporary and permanent loss of natural capital stocks during construction. However, most habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services.</p> <p>Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO₂ due to habitat clearance, loss of natural hazard management and a reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated. There is no change anticipated to water flow regulation. Permanent loss of arable and pastoral stocks will likely impact agricultural ecosystem services e.g., food production.</p>
ESW-EFR-001	Southend-on-Sea Effluent Re-use (max capacity)	-£11,271.62	<p>The option is likely to generate the loss of natural capital stocks during construction. However, habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services.</p> <p>Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO₂ due to habitat clearance, loss of natural hazard management and a reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated.</p>

Option ID	Option Name	Natural Capital	Ecosystem Services
			There is no change anticipated to water flow regulation. Permanent loss of arable stocks due to option construction hence loss of associated ecosystem services expected.
ESW-EFR-002A	Lowestoft water re-use (transfer to River Waveney)	-£3,016.16	The option is likely to generate the temporary loss of most natural capital stocks and permanent loss of arable and ancient woodland stocks during construction. However, most habitat that is expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services. Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO ₂ due to habitat clearance, loss of natural hazard management and a reduction in water purification. The permanent loss of arable stocks will lead to loss of food production services. Permanent loss of ancient woodland stock will result in the reduction in water purification, loss of carbon sequestration and loss of natural hazard management services. There is no change anticipated to water flow regulation however any potential impacts will be covered in the WFD.
03b0478B	Water Re-use Treatment at Caister EFR (AW) and transfer from Caister to Ormesby Raw Water Tank	-£739.02	The option is likely to generate the loss of natural capital stocks during construction. Permanent loss is expected within flood plain and as such the provision of natural hazard management. Broadleaved, mixed and yew woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted through offsetting. Habitat is expected to be reinstated/compensated to pre-construction conditions following best practice techniques where possible, and as such will likely have no permanent impact to the provision of ecosystem services. Major construction impacts include the loss of water purification, loss of natural hazard regulation and release of CO ₂ due to habitat clearance. The option is anticipated to retain the provision of water regulation during construction.
ESW-NIT-004	Barsham EDR Nitrate Removal + Pipeline	-£588.84	The option is likely to generate the loss of natural capital stocks during construction. However, habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services. Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO ₂ due to habitat clearance, loss of air pollutant removal, loss of natural hazard management and a reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated. There is no change anticipated to water flow regulation.
ESW-NIT-005	Langford EDR Nitrate Removal + Pipeline	-£737.96	The option is likely to generate the temporary and permanent loss of natural capital stocks during construction. However, habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services. Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO ₂ due to habitat clearance, loss of natural hazard management, reduction in air quality, and a reduction in water purification.

Option ID	Option Name	Natural Capital	Ecosystem Services
			However, it is not expected to affect the future value as stocks are expected to be reinstated. There is no change anticipated to water flow regulation.
ESW-NIT-006	Langham EDR Nitrate Removal + Pipeline	-£950.89	The option is likely to generate the temporary and permanent loss of natural capital stocks during construction. However, habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services. Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO ₂ due to habitat clearance, loss of food production, loss of air pollutant removal, loss of natural hazard management and a reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated. There is no change anticipated to water flow regulation.
ESW-PMP-001A	Abberton RWPS	-£457.30	The option is likely to generate the temporary and permanent loss of natural capital stocks during construction. However, habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services. Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO ₂ due to habitat clearance, loss of natural hazard management, loss of food production, loss of air pollutant removal and a reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated. There is no change anticipated to water flow regulation.
ESW-RES-002C1	North Suffolk Winter Storage Reservoir	-£55,665.83	The option is likely to generate the temporary and permanent loss of natural capital stocks during construction. However, habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services. Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO ₂ due to habitat clearance, loss of natural hazard management, loss of food production and a reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated. There is a positive change anticipated to water flow regulation due to the addition of the reservoir.
ESW-TRA-001	Barsham to Blyth Transfer Main	-£758.01	The option is likely to generate the temporary and permanent loss of natural capital stocks during construction. However, habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services. Broadleaved/mixed/yew/priority woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the permanent loss of stocks which will result in the permanent release of CO ₂ due to habitat clearance, permanent loss of natural hazard management, and a permanent reduction in water purification services. There is no change anticipated to water flow regulation.

Option ID	Option Name	Natural Capital	Ecosystem Services
ESW-TRA-018	Bungay Wells to Broome WTW Transfer	-£118.17	The option is likely to generate the temporary loss of natural capital stocks during construction. However, all habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services. Broadleaved/mixed/yew/priority woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO ₂ due to habitat clearance, loss of natural hazard management and a reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated. There is no change anticipated to water flow regulation.
ESW-TRA-019	Transfer from Holton WTW to Eye Airfield	-£360.92	The option is likely to generate the temporary loss of natural capital stocks during construction. However, habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services. Broadleaved/mixed/yew/priority woodland has a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO ₂ due to habitat clearance, loss of natural hazard management and a reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated. There is no change anticipated to water flow regulation.
ESW-TRA-023	Broome to Barsham Transfer	-£517.41	The option is likely to generate the loss of natural capital stocks during construction. However, habitat expected to be reinstated/compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services. Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted. Construction impacts include the release of CO ₂ due to habitat clearance, loss of natural hazard management, loss of air quality, loss of food production and a reduction in water purification. However, it is not expected to affect the future value as stocks are expected to be reinstated. There is no change anticipated to water flow regulation.
ESW-UVC-001	Langford UV (Crypto)	-£334.73	The option is likely to generate the permanent loss of natural capital stocks during construction. Permanent impacts include the loss of food production, carbon storage and air pollutant removal.

INNS

5.7.15

The results of the Level 1 INNS Assessment for all the options considered are summarised in Table 5-9. Four options scored as 'Low', 'Moderate' or 'High'. Three of these, ESW-TRA-023, ESW-DES-001, ESW. DES-008, and ESW-DES-002C1 have been subject to Level 2 assessment. ESW-DES-004 has not been progressed to a Level 2 assessment as it is not selected by the BVP, the alternative plans or the adaptive programmes.

Table 5-9: Level 1 INNS Assessment Results

Risk Score	Options
0 = None	ESW-NIT-005, ESW-UVC-001, ESW-NIT-006, ESW-NIT-004, ESW-PMP-001A
1 = Very Low	ESW-ABS-003C, ESW-TRA-001, ESW-TRA-019, ESW-TRA-018, 03b0478B, ESW-EFR-002A, ESW-EFR-001
3 = Low	ESW-TRA-023, ESW-DES-001
4 = Moderate	ESW-DES-008, ESW-DES-004
6 = High	ESW-RES-002C1

6 Assessment of Alternative Plans and Adaptive Programmes and WRMP24 Decision-making

6.1 Assessment of Reasonable Alternatives Programmes

- 6.1.1 The SEA Directive states in Article 5 that *“an environmental report shall be prepared in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme, are identified, described and evaluated”*.
- 6.1.2 Whilst the final WRMP24 has a number of objectives, it is clear that meeting the water supply needs of customers over the next 25 years is at the heart of the plan. It is the key issue to be addressed and taken to be the primary objective of the plan. This is reflected in the EAs WRPG (2018), which states in Section 3 that, *“if there is a deficit you must identify options to increase supply or reduce demand so that you achieve a secure supply of water”*.
- 6.1.3 The methodology used for the identification, development and screening of water supply options has been developed to align with process set out in the WRPG. The WRPG requires water companies to review all possible options that could contribute to deficit reduction and include all that are likely to be technically feasible within an unconstrained list. Once the options with unalterable constraints that make them unsuitable for promotion have been removed through screening, options on the resulting feasible list are further assessed to feed into programme appraisal and optimisation of a BVP.
- 6.1.4 Best Value Planning aims to determine whether the inclusion of further monetised and non-monetised criteria would identify a plan that delivers the best value, defined by the WRPG as *‘one that considers factors alongside economic cost and seeks to achieve an outcome that increases the overall benefits to customers, the wider environment and overall society’*.
- 6.1.5 The options and costs identified within the detailed feasibility studies were developed for inclusion within Economics of Balancing Supply and Demand (EBSD) modelling and further decision-making as part of the Best Value Planning process. The EBSD framework is used by UK Water Companies to identify which demand-side and supply side options are needed to maintain levels of service over a 25-year planning period. The framework applies optimisation techniques to ensure that the group of options selected is the least-cost plan available that can meet forecast future deficits. The EBSD model considers the supply-demand balance for each WRZ at annual timesteps and selects options to address deficits based on a cost per Ml/d and the earliest available date of supply for relevant options. The EBSD tool does not consider other monetised criteria such as carbon or other societal and environmental impacts and benefits. As such the model results represent a least-cost plan with no further optimisation. Best Value Planning, as described above, aims to determine whether the inclusion of further monetised and non-monetised criteria would identify a plan that deliver the best value as defined by WRPG. Further information on the methodology used, and the processes followed, during Best Value Planning can be found in Section 2.
- 6.1.6 Following EBSD modelling and Best Value Planning assessment, ESW’s Least Cost Plan and Best Value (Preferred) Plan have been found to comprise the same options. Results support the selection of the BVP from a best value and a monetised (Totex and AIC) perspective. Comparison, both at a plan and option level, has not identified any alternative plans or options

that significantly outperform the Least Cost Plan on a Best Value perspective. A summary of key findings is provided below.

- 6.1.7 All available AMP8 options are selected under all scenarios and time frames. In order to address immediate planning deficits, the model is limited to a small portfolio of options for inclusion based upon earliest start date. New water resources are generated by the selection of Linford groundwater abstraction. The model also selects three transfers to utilise surplus at the start of the planning period.
- 6.1.8 In AMP9, the North Suffolk Winter Storage Reservoir represents the best value option available within this timeframe that can provide new WAFU to alleviate growth constraints and emerging deficits. The Least Cost Plan selects Lowestoft Re-use before the North Suffolk Reservoir, and this is primarily driven by the deficits in the plan and that Lowestoft can be made available before the reservoir.
- 6.1.9 Under the North Suffolk Reservoir adaptive programme, the EBSD model is forced to select the North Suffolk Winter Storage Reservoir in 2034. Two size variants of the reservoir were explored :3.5Mm³ and 7.5Mm³. In both these EBSD model runs plans were developed that resulted in a cheaper Totex than the Central Plan. However, in the final WRMP24 assessment, to achieve SDB in the North Suffolk Reservoir Adaptive Programme scenario the moratorium on new non-domestic supplies in Hartismere WRZ must be extended for one year (compared to the Central Plan) to and including 2032/33. The North Suffolk Reservoir Adaptive Programme is a feasible plan, but it is acknowledged that this is dependent on the outcomes of the detailed engineering design stage of both the ESW-RES-002C1 and ESW-EFR-002A and whether the ESW-RES-002C1 can be delivered as quickly as ESW-EFR-002A.
- 6.1.10 Further detailed design work should be undertaken to confirm the earliest delivery date for the reservoir, scheme costs, and deployable output benefits.
- 6.1.11 Table 6-1 lays out which options are considered in each alternative plan and Adaptive Programme. Table 6-2 and Table 6-3 show the results of the options selected in the Best Value Plan. Table 6-4 to Table 6-7 show the results of the SEA for the options considered in the Ofwat Core and Best Environment & Society Plans. The Least Cost Plan has the same options as the BVP, as such no SEA summary tables are provided for the Least Cost Plan to avoid repetition.

Table 6-1: Alternative Plans and Adaptive Programmes

Option ID	Option name	Best Value Plan	Ofwat Core Plan	Best Environment & Society Plan	Adaptive Programmes
ESW-ABS-003C	New Linford Water Treatment Works (WTW) (10Ml/d)	✓	✓	✓	All
ESW-DES-001	Canvey Island Terrestrial Desalination			✓	High ED
ESW-DES-008	Corton beach well desalination			✓	High ED, High PCC
ESW-EFR-001	Southend-on-Sea Water Re-use			✓	High ED, smaller variant in High PCC
ESW-EFR-002A	Lowestoft Water Re-use to Ellingham Mill	✓	✓	✓	High ED, High PCC, HRSR
03b0478B	Effluent Re-use at Caister and transfer to Ormesby			✓	All

Option ID	Option name	Best Value Plan	Ofwat Core Plan	Best Environment & Society Plan	Adaptive Programmes
ESW-NIT-004	Barsham Nitrate Removal + Pipeline	✓	✓	✓	All
ESW-NIT-005	Langford Nitrate Removal + Pipeline	✓	✓		All
ESW-NIT-006	Langham Nitrate Removal + Pipeline	✓	✓		All
ESW-PMP-001A	Langford WTW upgrade + Abberton RWPS Pump Replacement	✓	✓	✓	All
ESW-RES-002B	North Suffolk Winter Storage Reservoir + Barsham River Works Upgrade	✓			Medium variant in HRSR programme
ESW-RES-002C1	North Suffolk Winter Storage Reservoir + Barsham River Works Upgrade	✓			Smaller variant in NSR programme
ESW-TRA-001	Barsham WTW to Blyth Transfer	✓	✓	✓	All
ESW-TRA-018	Transfer from Bungay Wells to Broome WTW	✓	✓	✓	All
ESW-TRA-019	Transfer from Holton WTW to Eye Airfield	✓	✓	✓	All. 9.13 Ml/d capacity variant in HRSR programme
ESW-TRA-023	Broome to Barsham Transfer	✓	✓	✓	All
ESW-UVC-001	Langford UV (Crypto)	✓	✓		All
ESW-DMO-Preferred	Demand Management Strategy Medium (Preferred)	✓	✓	✓	NSR, High ED & HRSR. Lower water efficiency variant in High PCC programme.

Best Value Plan

Table 6-2: Best Value Plan Construction Effects

		Topic																				
		Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets	
Option ID		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2
New Linford Water Treatment Works (WTW) (ESW-ABS-003C)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	-	-	0	0	-	-	0	-	-	0	-	-	0	-	-	-	0	-	-	-	-
Barsham WTW to Blyth Transfer (ESW-TRA-001)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	-	-	-	0	0	0	-	-	0	0	-	-	0	0	-	-	-
Transfer from Holton WTW to Eye Airfield (ESW-TRA-019)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	-	-	0	0	0	0	0	-	0	-	-	-	0	0	-	-	-
Langford Nitrate Removal + Pipeline (ESW-NIT-005)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	0	-	0	0	-	0	-	-	0	-	-	-	0	-	-	-	-
Langford UV (Crypto) (ESW-UVC-001)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	-	0	0	0	0	-	0	0	0	0	-	-	0	-	-	0	0	-	-	-	0
Langham Nitrate Removal + Pipeline (ESW-NIT-006)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	-	-	0	0	-	0	-	-	0	-	-	-	0	-	-	-	-
Barsham Nitrate Removal + Pipeline (ESW-NIT-004)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	-	0	0	-	-	0	0	-	0	-	-	0	-	-	-	0	-	-	-	-
Langford WTW upgrade + Abberton RWPS Pump Replacement (ESW-PMP-001A)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	-	-	0	0	0	0	0	0	-	0	0	-	0	-	0	-	0	-	-	-	-
	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Topic																				
		Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets	
Option ID		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2
Broome to Barsham Transfer (ESW-TRA-023)	Negative	-	-	0	0	-	-	0	0	0	0	-	-	0	-	-	-	0	-	-	-	-
Transfer from Bungay Wells to Broome WTW (ESW-TRA-018)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	-	--	0	0	0	-	0	0	0	0	-	-	0	-	-	-	0	0	-	-	-
Lowestoft Water Re-use to Ellingham Mill (ESW-EFR-002A)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	--	--	0	0	-	-	0	0	0	0	-	-	0	-	--	-	0	-	-	-	-
North Suffolk Winter Storage Reservoir + Barsham River Works Upgrade (ESW-RES-002C1)	Positive	0	+++	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	---	-	--	0	-	-	-	-	-	0	-	-	0	-	-	-	0	-	-	-	-
Demand Management Strategy Medium (Preferred) (ESW-DMO-Preferred)	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	-	0	0	-	-	0	-	-	0	0	-	-	0	-	-	-	0	0	0	-	-

Table 6-3: Best Value Plan Operational Effects

Option ID		Topic																					
		Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets		
		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2	
New Linford Water Treatment Works (WTW) (10MI/d) ESW-ABS-003C	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0
	Negative	--	0	0	0	0	0	0	0	--	0	0	-	0	0	0	0	0	0	0	0	-	0
Barsham WTW to Blyth Transfer (ESW-TRA-001)	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	-	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0
Transfer from Holton WTW to Eye Airfield (ESW-TRA-019)	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0
	Negative	0	0	0	0	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0
Langford Nitrate Removal + Pipeline (ESW-NIT-005)	Positive	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0	0
	Negative	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	-	0
Langford UV (Crypto) (ESW-UVC-001)	Positive	0	0	0	0	0	0	0	0	+	0	0	+	0	0	+	+	0	0	0	0	0	0
	Negative	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	-	0	-	0	-	0
Langham Nitrate Removal + Pipeline (ESW-NIT-006)	Positive	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0	0
	Negative	-	0	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	0	0	0	-	0
Barsham Nitrate Removal + Pipeline (ESW-NIT-004)	Positive	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0	0
	Negative	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	-	0
Langford WTW upgrade + Abberton RWPS Pump Replacement (ESW-PMP-001A)	Positive	0	+	0	0	0	+	0	0	++	0	0	+	0	0	0	+	0	0	0	0	0	0
	Negative	-	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	-	0
Broome to Barsham Transfer (ESW-TRA-023)	Positive	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	+	0	0	0	0	0	0
	Negative	0	0	0	0	0	0	0	0	-	0	-	0	0	0	0	0	0	0	0	0	0	0

		Topic																					
		Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets		
Option ID		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2	
Transfer from Bungay Wells to Broome WTW (ESW-TRA-018)	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	+	0	0	0
	Negative	0	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	0
Lowestoft Water Re-use to Ellingham Mill (ESW-EFR-002A)	Positive	0	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	0	0	0
	Negative	-	-	0	0	0	0	-	0	0	0	0	-	--	0	0	0	0	0	0	0	0	0
North Suffolk Winter Storage Reservoir + Barsham River Works Upgrade (ESW-RES-002C1)	Positive	0	+	0	0	0	0	0	0	0	++	0	0	+	0	0	+	+	+	+	+	0	0
	Negative	-	0	-	0	-	0	-	0	---	-	0	-	0	0	0	0	0	0	0	0	-	0
Demand Management Strategy Medium (Preferred) (ESW-DMO-Preferred)	Positive	+	+	0	+	0	0	+	+	+	+	0	+	++	+	0	+	++	++	0	0	0	0
	Negative	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ofwat Core Plan

Table 6-4: Ofwat Core Plan Construction Effects

				Topic																					
				Biodiversity				Soil	Water					Air	Climatic Factors			Landscape	Historic Environment	Population and Human Health				Material Assets	
Option ID	Timescales	WRZ		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2	
Linford water treatment works (ESW-ABS-003C)	2027-2028	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Negative	--	-	0	0	-	-	0	-	-	0	-	-	0	-	-	-	-	0	-	-	-	-
Lowestoft Re-use (ESW-EFR-002A)	2030-2031	Northern Central	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	--	--	0	0	-	-	0	0	0	0	0	-	-	0	-	-	-	-	0	-	-	-
Barsham Nitrate Reduction Scheme (ESW-NIT-004)	2029-2030	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	-	0	0	-	-	0	0	-	0	-	-	0	-	-	-	-	-	0	-	-	--
Langford Nitrate Removal + Pipeline (ESW-NIT-005)	2029-2030	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	-	0	0	0	-	0	0	-	0	-	-	0	-	-	-	-	-	0	-	-	--
Langham Nitrate Removal + Pipeline (ESW-NIT-006)	2029-2030	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	-	0	0	-	-	0	0	-	0	-	-	0	-	-	-	-	-	0	-	-	--
Langford WTW Upgrade + Abberton RWPS Pump Replacement (ESW-PMP001A)	2030-2031	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Negative	-	-	0	0	0	0	0	0	-	0	0	-	0	-	0	-	0	-	0	-	-	-
Barsham WTW to Blyth Transfer (ESW-TRA-001)	2028-2029	Hartismere	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	-	0	0	-	-	-	0	0	0	-	-	0	0	-	-	-	-	0	0	-	-
Transfer from Bungay Wells to Broome WTW (ESW-TRA-018)	2030-2031	Northern Central	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	--	0	0	0	-	0	0	0	0	-	-	0	-	-	-	-	-	0	0	-	-

				Topic																					
				Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets		
Option ID	Timescales	WRZ		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2	
Transfer from Holton WTW to Eye Airfield (ESW-TRA-019)	2030-2031	Blyth	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	-	0	0	-	-	0	0	0	0	0	0	-	0	-	-	-	-	0	0	-	-
Broome to Barsham Transfer (ESW-TRA-023)	2030-2031	Northern Central	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Negative	-	-	0	0	-	-	0	0	0	0	-	-	0	-	-	-	-	0	-	-	-	-
Langford UV (Crypto) ESW-UVC-001	2029-2030	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Negative	-	0	0	0	0	-	0	0	0	0	-	-	0	-	-	0	0	0	-	-	-	-
Demand Management Strategy Medium (Preferred) ESW-DMO-Preferred	2024-2100	Region Wide	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Negative	-	0	0	-	-	0	-	-	0	0	-	-	0	-	-	-	-	0	0	0	-	-

Table 6-5: Ofwat Core Operational Effects

				Topic																						
				Biodiversity				Soil	Water					Air	Climatic Factors			Landscape	Historic Environment	Population and Human Health				Material Assets		
Option ID	Timescales	WRZ		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2		
New Linford Water Treatment Works (WTW) (10 Ml/d) ESW-ABS-003C	2027-2028	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0	0
			Negative	-	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	-	0
Lowestoft Water Re-use to Ellingham Mill (ESW-EFR-002A)	2030-2031	Northern Central	Positive	0	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	0	0	0	0
			Negative	-	-	0	0	0	0	-	0	0	0	0	0	-	-	0	0	0	0	0	0	0	0	0
Barsham Nitrate Removal + Pipeline (ESW-NIT-004)	2029-2030	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0	0
			Negative	0	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	-	0
Langford Nitrate Removal + Pipeline (ESW-NIT-005)	2029-2030	ESWEssex	Positive	0	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0	0
			Negative	0	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	-	0
Langham Nitrate Removal + Pipeline (ESW-NIT-006)	2029-2030	ESWEssex	Positive	0	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0	0
			Negative	-	0	0	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	0	0	0	-	0
Langford WTW Upgrade + Abberton RWPS Pump Replacement (ESW-PMP001A)	2030-2031	ESWEssex	Positive	0	+	0	0	0	+	0	0	0	++	0	0	+	0	0	0	+	0	0	0	0	0	0
			Negative	-	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	-	0
Barsham WTW to Blyth Transfer (ESW-TRA-001)	2028-2029	Hartismere	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0
			Negative	-	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0
Transfer from Bungay Wells to Broome WTW (ESW-TRA-018)	2030-2031	Northern Central	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	0	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	0	0
	2030-2031	Blyth	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0

			Topic																					
			Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets		
Option ID	Timescales	WRZ	1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2	
Transfer from Holton WTW to Eye Airfield (ESW-TRA-019)			Negative	0	0	0	0	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0
Broome to Barsham Transfer (ESW-TRA-023)	2030-2031	Northern Central	Positive	0	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	+	0	0	0	0
			Negative	0	0	0	0	0	0	0	0	0	-	0	-	0	0	0	0	0	0	0	0	0
Langford UV Crypto (ESW-UVC-001)	2029-2030	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	+	0	0	+	0	0	+	+	0	0	0	0
			Negative	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	-	0	-	0
Demand Management Strategy Medium (Preferred) ESW-DMO-Preferred	2024-2100	Region Wide	Positive	+	+	0	+	0	0	+	+	+	+	0	+	++	+	0	+	++	++	0	0	0
			Negative	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Best Environment & Society Plan

Table 6-6: Best Environment & Society Plan Construction Effects

				Topic																					
				Biodiversity				Soil	Water					Air	Climatic Factors			Landscape	Historic Environment	Population and Human Health				Material Assets	
Option ID	Timescales	WRZ		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2	
New Linford Water Treatment Works (WTW) (10MI/d) ESW-ABS-003C	2027-2028	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Negative	--	-	0	0	-	-	0	-	-	0	-	-	0	-	-	0	-	0	-	-	-	-
Canvey Island Terrestrial Desalination (ESW-DES-001)	2040-2041	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	--	-	0	-	-	-	0	-	0	-	-	0	-	-	0	-	0	0	-	-	-
Corton beach well desalination (ESW-DES-008)	2045-2046	Northern Central	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	--	--	--	0	-	-	-	0	-	0	-	-	0	-	-	0	-	0	0	-	-	-
Southend-on-Sea Water Re-use (ESW-EFR-001)	2045-2046	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	--	--	0	0	--	-	0	0	-	0	-	-	0	-	-	0	-	0	-	-	-	-
Lowestoft Water Re-use to Ellingham Mill (ESW-EFR-002A)	2030-2031	Northern Central	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	--	--	0	0	-	-	0	0	0	0	0	0	-	-	0	-	--	-	0	-	-	-
Effluent Re-use at Caister and transfer to Ormesby (03b0478B)	2040-2041	Northern Central	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	--	0	0	-	-	0	0	0	0	0	0	-	-	0	-	-	-	0	-	-	-
Barsham Nitrate Removal + Pipeline (ESW-NIT-004)	2029-2030	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	-	0	0	-	-	0	0	-	0	-	--	0	-	-	-	-	-	0	-	-	--
Langford WTW upgrade + Abberton RWPS Pump Replacement (ESW-PMP-001A)	2030-2031	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Negative	-	-	0	0	0	0	0	0	-	0	0	-	0	-	0	-	0	-	0	-	-	-
	2028-2029	Hartismere	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0

			Topic																					
			Biodiversity				Soil	Water					Air	Climatic Factors			Landscape	Historic Environment	Population and Human Health				Material Assets	
Option ID	Timescales	WRZ	1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2	
Barsham WTW to Blyth Transfer (ESW-TRA-001)			Negative	-	-	0	0	-	-	-	0	0	0	-	-	0	0	-	-	0	0	-	-	
Transfer from Bungay Wells to Broome WTW (ESW-TRA-018)	2030-2031	Northern Central	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	-	0	0	0	-	0	0	0	0	-	-	0	-	-	-	-	0	0	-	-
Transfer from Holton WTW to Eye Airfield (ESW-TRA-019)	2030-2031	Blyth	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	-	0	0	-	-	0	0	0	0	0	-	0	-	-	-	-	0	0	-	-
Broome to Barsham Transfer (ESW-TRA-023)	2030-2031	Northern Central	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Negative	-	-	0	0	-	-	0	0	0	0	-	-	0	-	-	-	-	0	-	-	-
Demand Management Strategy Medium (Preferred) (ESW-DMO-Preferred)	2024-2100	Region Wide	Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Negative	-	0	0	-	-	0	-	-	0	0	-	-	0	-	-	-	-	0	0	0	-

Table 6-7: Best Environment & Society Plan Operational Effects

				Topic																					
				Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets		
Option ID	Timescales	WRZ		1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2	
New Linford Water Treatment Works (WTW) (10MI/d) (ESW-ABS-003C)	2027-2028	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	-	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	-
Canvey Island Terrestrial Desalination (ESW-DES-001)	2040-2041	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	++	0	0	+	0	0	+	0	0	0	0	0	0
			Negative	-	-	-	0	0	-	0	0	-	0	0	0	0	-	-	0	0	0	0	0	0	-
Corton beach desalination (ESW-DES-008)	2045-2046	Northern Central	Positive	0	0	0	0	0	0	0	0	0	++	0	0	+	0	0	+	0	0	0	0	0	0
			Negative	-	-	-	0	0	0	0	0	-	0	0	0	0	-	-	0	0	0	0	0	0	-
Southend-on-Sea Water Re-use (ESW-EFR-001)	2045-2046	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	0	0	0
			Negative	0	0	0	0	0	0	-	0	-	0	0	0	0	-	-	0	0	0	0	0	0	0
Lowestoft Water Re-use to Ellingham Mill (ESW-EFR-002A)	2030-2031	Northern Central	Positive	0	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	0	0	0	0	0	0
			Negative	-	-	0	0	0	0	-	0	0	0	0	0	0	-	-	0	0	0	0	0	0	0
Effluent Re-use at Caister and transfer to Ormesby (03b0478B)	2040-2041	Northern Central	Positive	0	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	+	0	0	0	0	0
			Negative	-	-	0	0	0	0	-	0	0	0	0	0	0	-	-	0	0	0	0	0	-	0
Barsham Nitrate Removal + Pipeline (ESW-NIT-004)	2029-2030	ESWEssex	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	+	0	0	0	0	0
			Negative	0	0	0	0	0	0	0	0	0	-	0	0	0	-	0	0	0	0	0	0	0	-
Langford WTW upgrade + Abberton RWPS Pump Replacement (ESW-PMP-001A)	2030-2031	ESWEssex	Positive	0	+	0	0	0	+	0	0	0	++	0	0	+	0	0	0	+	0	0	0	0	0
			Negative	-	0	0	0	0	0	0	0	0	-	0	0	0	-	0	0	0	0	0	0	0	-
Barsham WTW to Blyth Transfer (ESW-TRA-001)	2028-2029	Hartismere	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0
			Negative	-	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0
	2030-2031	Northern Central	Positive	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	+	0	0	0	0

			Topic																					
			Biodiversity				Soil	Water					Air	Climatic Factors		Landscape	Historic Environment	Population and Human Health				Material Assets		
Option ID	Timescales	WRZ	1.1	1.2	1.3	1.4	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2	
Transfer from Bungay Wells to Broome WTW (ESW-TRA-018)			Negative	0	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0
			Positive	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0
Transfer from Holton WTW to Eye Airfield (ESW-TRA-019)	2030-2031	Blyth	Negative	0	0	0	0	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0
			Positive	0	0	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	+	0	0	0
Broome to Barsham Transfer (ESW-TRA-023)	2030-2031	Northern Central	Negative	0	0	0	0	0	0	0	0	0	-	0	-	0	0	0	0	0	0	0	0	0
			Positive	0	0	0	0	0	0	0	0	0	0	+	0	0	+	0	0	0	+	0	0	0
Demand Management Strategy Medium (Preferred) (ESW-DMO-Preferred)	2024-2100	Region Wide	Negative	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Positive	+	+	0	+	0	0	+	+	+	+	0	+	++	+	0	+	++	++	0	0	0

6.2 Adaptive Programmes

6.2.1 This section presents the Adaptive Programme scenarios, including a description of the scenario and comparison with the BVP SEA results.

6.2.2 Further detail on the option selection process for the Adaptive Programmes can be found in Section 6 of the BVP Technical Report (Mott MacDonald, 2023).

High Environmental Destination

6.2.3 The High Environmental Destination Adaptive Programme uses the Enhanced Environmental Destination Scenario, whereas the BVP uses the BAU+ scenario. The options selected are as per the BVP in AMP8 and AMP9. Beyond 2040 the greater deficit drives additional re-use and desal selection including the large Canvey Island Desalination and Southend Re-use options for Essex and the Corton Desalination and Caister Re-use options in Suffolk. However, lead times are sufficient for option selection to be refined at later plans based upon additional information on required abstraction reductions.

6.2.4 The difference between the High Environmental Destination Adaptive Programme and the BVP is the addition of options ESW-DES-001, 03b0478B, ESW-EFR-001 and ESW-DES-008, and the omission of option ESW-RES-002C1 (the North Suffolk Reservoir). The demand management package (ESW-DMO-Preferred) remains the same as for the BVP.

6.2.5 In terms of the SEA scores, the High Environmental Destination Adaptive Programme does not score any major negative or major positive construction or operational effects, relating to biodiversity. The removal of ESW-RES-002C1 may result in the potential for a decrease in negative cumulative effects for biodiversity objective 1.1 during construction and water objective 3.4 during operation. The High Environmental Destination Adaptive Programme includes Options ESW-DES-001, 03b0478B, ESW-EFR-001 and ESW-DES-008. This means there is potential for increased negative effects on biodiversity objective 1.2 in WRZ NorthernCentral during construction and increased negative effects on climatic factors objective 5.2 during operation.

High PCC

6.2.6 The High PCC Adaptive Programme is based on the scenario that PCC does not reduce as far or as quickly as forecast in the BVP. The options selected are as per the BVP in AMP8, but in AMP9 ESW-EFR-001 is required in addition to Lowestoft Re-use (which is in the BVP). The variant ESW-EFR-001 which has been selected is a smaller variant to that assessed here. As mentioned previously, the largest variant of each option is assessed to present a “worst case scenario”. Beyond 2040 the greater deficit drives the selection of the Corton Desalination option and Caister Re-use option in preference to the North Suffolk Reservoir, but lead times are sufficient for option selection to be refined at later plans based upon additional information on climate change impacts.

6.2.7 The difference between the High PCC Adaptive Programme and the BVP is the addition of options ESW-EFR-001, 03b0478B and ESW-DES-008, and the omission of option ESW-RES-002C1. The demand management package also assumes lower household and non-household water efficiency activity than the ESW-DMO-Preferred package used for the BVP.

6.2.8 In terms of the SEA scores, the High PCC Adaptive Programme scores do not contain any major negative or major positive construction or operational effects, relating to biodiversity. The removal of ESW-RES-002C1 may result in the potential for a decrease in negative cumulative effects for biodiversity objective 1.1 during construction and water objective 3.4 during operation. The High PCC Programme includes Options 03b0478B, ESW-DES-008 and ESW-DMO-Low. This means there is potential for increased negative effects on biodiversity objective

1.2 in WRZ NorthernCentral. The SEA scores for Options 03b0478B and ESW-DES-008 are broadly similar to those within the BVP and are likely to yield similar minor positive operational effects related to water efficiency, climate resilience and resilient water supplies.

North Suffolk Reservoir

- 6.2.9 The North Suffolk Reservoir Adaptive Programme is the same as the BVP in AMP8, but in AMP9 Lowestoft Re-use is replaced with a smaller variant of the option ESW-RES-002C1. The 3.5Mm³ reservoir size is selected in AMP9 then Caister re-use is required from 2045. If the reservoir size is fixed at 7.5Mm³ (the option used in the BVP) then once it is selected in AMP9, Lowestoft Re-use is selected in 2045.
- 6.2.10 The difference between the North Suffolk Reservoir Adaptive Programme and the BVP is the addition of Option 03b0478B and the omission of Option ESW-EFR-002A. The demand management package (ESW-DMO-Preferred) remains the same as for the BVP.
- 6.2.11 The North Suffolk Reservoir Adaptive Pathway includes 03b0478B. This option scores similarly to option ESW-EFR-002A which is removed. Therefore, there are unlikely to be any changes in cumulative effects during construction and operation, compared to the BVP cumulative effects assessment results. The North Suffolk Reservoir Adaptive Programme selects a smaller variant of this option, the effects may be lessened. Should this programme be selected in the future it is recommended that a more detailed assessment is undertaken on the selected variant.

Habitats Regulations Sustainability Reductions

- 6.2.12 The Habitats Regulations Sustainability Reductions Adaptive Programme has been included to address the uncertainty around the scale of abstraction licence reductions required to meet the requirements of the Habitats Regulations in the Broads area. The options selected are the same as the BVP in AMP8, but in AMP9 Lowestoft Re-use is required earlier in the AMP and Caister Re-use is also required.
- 6.2.13 The difference between the Habitats Regulations Sustainability Reductions Adaptive Programme and the BVP is the addition of Option 03b0478B and the selection of the medium variant of the option ESW-RES-002C1, option ESW-RES-002B. The demand management package (ESW-DMO-Preferred) remains the same as for the BVP.
- 6.2.14 There are potential additional localised effects as a result of an additional 03b0478B option to the Habitats Regulations Sustainability Reductions Adaptive Programme, however there are unlikely to be any changes in cumulative effects during construction and operation, compared to the BVP cumulative effects assessment results. In terms of the SEA scores, the Habitats Regulations Sustainability Reductions Adaptive Programme selects a medium variant of ESW-RES-002C1 option, option ESW-RES-002B, and ESW-TRA-019 variant with 9.13 MI/d capacity. Where smaller variants of options are selected by plans, this assessment has utilised a consistent assessment of the largest size to present a “worst case scenario”. Should this programme be selected in the future it is recommended that a more detailed assessment is undertaken on the selected variant.

6.3 Conclusions

- 6.3.1 The SEA results of the four adaptive programmes are broadly comparable as a result of them being made up of similar groups of options. The following nine options; ESW-UVC-001, ESW-NIT-006, ESW-NIT-005, ESW-ABS-003C, ESW-NIT-004, ESW-PMP-001A, ESW-TRA-001, ESW-TRA-018 and ESW-TRA-023 are consistent across all four adaptive programmes and are in the BVP. All the adaptive programmes contain Caister Re-use (03b0478B), whereas the Best Value and Least Cost Plans contain the larger variant of the North Suffolk Reservoir (ESW-RES-002C1), which is not selected in any of the Adaptive Programmes (although the smaller

3500 MI variant is selected in the North Suffolk Reservoir Programme and the medium 5000 MI variant is selected in Habitats Regulations Sustainability Reductions Programme). The Habitats Regulations Sustainability Reductions Programme also considers a variant of ESW-TRA-019 with 9.13 MI/d capacity.

- 6.3.2 The Best Environment & Society Plan contains four options (03b0478B, ESW-DES-001, ESW-DES-008, and ESW-EFR-001) that are not included in the BVP, Least Cost Plan or Ofwat Core Plan. The inclusion of these options, plus the omission of the North Suffolk Reservoir from the Best Environment & Society Plan, would therefore be expected to give the greatest difference in SEA outcomes compared to the BVP.

Construction

- 6.3.3 During the construction phase, each of the plans are likely to have effects across a broad range of the SEA topics assessed. These effects are predominantly negative. The Ofwat Core Plan is considered to perform slightly better than the Best Environment & Society Plan when considering biodiversity objectives, and the Best Environment & Society Plan is considered to perform slightly better than the Ofwat Core when considering water objectives. Performance between the two plans is considered similar when other SEA objectives are considered. Additionally, performance between the Least Cost Plan and the Ofwat Core Plan is considered to be very similar, however the Ofwat Core Plan does not include the ESW-RES-002C1 option, and as such this plan performs slightly better when considering biodiversity objectives.

Operation

- 6.3.4 During the operational phase, each of the plans are likely to have both positive and negative effects across many of the SEA topics assessed. The Ofwat Core Plan is considered to perform slightly better than the Best Environment & Society Plan when considering biodiversity objectives, and the Best Environment & Society Plan is considered to perform slightly better than the Ofwat Core Plan when considering water objectives. The Best Environment & Society Plan is considered to perform similarly to the Ofwat Core Plan when other SEA objectives are considered. Performance between the two plans is considered similar when other SEA objectives are considered. Additionally, performance between the Least Cost Plan and the Ofwat Core Plan is considered to be very similar, however the Ofwat Core Plan does not include the ESW-RES-002C1 option, and as such this plan performs slightly better when considering water objectives.

7 Cumulative Effects

7.1 Cumulative Effects Assessment (Intra-Plan Effects)

Introduction

7.1.1 The results of the assessments for the individual options, including those within the BVP, are presented in Section 5.4. A summary table showing the SEA outcomes for the plan options can be found in Section 6.1. In order to appropriately consider the effects of the final WRMP24, it is important to not only consider the options in isolation, but also consider how the options might interact and combine to yield positive or negative effects on the SEA objectives. The methodology for approaching a cumulative assessment for the proposed BVP and alternative plans is presented in this section alongside the results of the assessment. The effects of the BVP and alternative plans have also been considered in combination with other projects, plans and programmes in the Essex and Suffolk Region. The methodology for this assessment along with the results can be found in Section 7.2.

Methodology

7.1.2 The options which make up the BVP and the alternative plans were reviewed against the SEA objectives. This approach is considered to be an efficient and proportionate approach to the cumulative effects assessment, which is cognisant of the work being undertaken for the Regional Plan and other WRMPs. There is no standard approach to the assessment of interrelationships between effects. Effects are very rarely additive, but rather a collection of impacts on a receptor that need to be drawn together. Consideration also needs to be given to the potential for 'synergistic' effects whereby different types of impact affecting a receptor may interact together and increase their effect.

7.1.3 A receptor-based approach to the assessment of interrelationships between effects is set out below:

- Step 1: Identify receptor types (e.g., community, ecological habitat or species, a heritage asset, landscape or natural feature, waterbody or watercourse) and geographical locations.
- Step 2: Identify receptors and their geographical location.
- Step 3: Screen out receptors where there is no potential for interrelationships between effects or temporal overlap of impacts, or where impacts are anticipated to be negligible.
- Step 4: Assess interrelationships between effects at remaining receptors and report on a receptor basis (within geographical areas) appropriate to the effects identified.

7.1.4 Where more than one option is considered to have a residual (post-mitigation) effect on an SEA objective (positive or negative), these options are assessed against the criteria to determine whether they would result in more significant effects. Temporal and spatial dimensions of the proposed options are considered and where options are located in close proximity to one another or are to be delivered with overlapping timescales, they are considered to have potential cumulative effects. For certain SEA objectives, environmental receptors, which are used to indicate an effect on a particular objective (for example designated sites for Biodiversity objectives), are then considered to determine whether more than one option would have an effect on a receptor. Professional judgement, following the SEA framework, is used to determine the significance of the effects identified; neutral, minor, moderate or major positive or negative. A narrative explaining the selection will accompany the score.

Assessment Results

7.1.5 This section presents the results of the intra-plan cumulative effects assessment for construction and operational phases, with a concluding statement per SEA topic on the anticipated residual cumulative effects. The intra-plan cumulative effects assessment results for the BVP are presented in Table 7-1, the Ofwat Core Plan in Table 7-2 and the Best Environment and Society in Table 7-3. The Least Cost Plan comprises the same options as the BVP and therefore the results are identical. As such, the Least Cost Plan is not discussed in this Section.

BVP

Table 7-1: BVP Cumulative Effects

	Construction Phase Effects	Operational Phase Effects
Biodiversity	<p>A number of the proposed options having potential effects on designated biodiversity sites and their qualifying features. In particular, options ESW-TRA-001 and ESW-EFR-002A which both potentially impact Tital Wood Ancient Woodland. These options are due to be delivered in 2028/2029 and 2030/2031 respectively. Therefore, there is potential for cumulative construction effects. In-combination effects on Natura 2000 sites are considered in the HRA AA Appendix F. The sites with potential adverse effects are; The Broads SAC, Broadlands SPA and Broadland Ramsar. There is potential for cumulative permanent construction phase effects to the aforementioned sensitives sites. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.</p>	<p>A number of options have potential effects on designated biodiversity sites and their qualifying features. Whilst ESW-TRA-001 and ESW-EFR-002A both potentially impact Tital Wood Ancient Woodland, it is anticipated that the impacts arising as a result of ESW-TRA-001 are temporary in nature. Therefore, there are not anticipated to be in-combination effects on this receptor during the operational phase. In-combination effects on Natura 2000 sites are considered in the HRA AA Appendix F. The sites with potential adverse effects are; The Broads SAC, Broadlands SPA and Broadland Ramsar. The HRA AA considers many of these effects to be reduced by applying best practice mitigation however there may still be residual operational phase effects. It is anticipated that there would be a minor negative cumulative effect on this SEA objective.</p>
	<p>To protect designated sites and their qualifying features.</p>	
	<p>To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.</p>	<p>During the operational phase, options ESW-PMP-001A, ESW-RES-002C1 and ESW-DMO-Preferred are considered to have potential minor positive operational effects, on the ability to deliver BNG and long term habitat enhancement. Although these options are located within different WRZs, they will all be operational eventually. Therefore, it is anticipated that would be a minor positive cumulative effect on this SEA objective during the operational phase.</p>

		Construction Phase Effects	Operational Phase Effects
		2041, which reduces the potential for in-combination effects. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.	
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	No construction phase cumulative effects are anticipated for this SEA objective.	No operational phase cumulative effects are anticipated for this SEA objective.
	To meet WFD objectives relating to biodiversity.	No construction phase cumulative effects are anticipated for this SEA objective.	No operational phase cumulative effects are anticipated for this SEA objective.
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	<p>There are several instances of where two or more options pass through the same area of Provisional Grade 2 agricultural land. ESW-ABS-003C and ESW-NIT-006 are located in the ESW Essex WRZ, and ESW-RES-002C1, ESW-TRA-023 and ESW-TRA-018 are located in the Northern Central WRZ. Despite being delivered under different timescales, there is potential for permanent construction effects due to loss of good quality agricultural land.</p> <p>ESW-EFR-002A, ESW-TRA-001 and ESW-TRA-019 all interact with Holton Pit Historic Landfill Site. ESW-TRA-001 and ESW-TRA-019 are both to be delivered in 2028-2029, therefore there will be potential for cumulative effects on this historic landfill site. Similarly, ESW-EFR-002A, ESW-RES-002C1 and ESW-TRA-001 all interact with Site at Ringsfield Historic Landfill Site. Despite being delivered under different timescales, there is potential for permanent construction effects on soil quality and contamination.</p> <p>It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.</p>	No operational phase cumulative effects are anticipated for this SEA objective.
Water	To reduce or manage flood risk, taking climate change into account.	Options included in this plan are mostly located in Flood Zone 1, however options also pass through Flood Zones 2 and 3. However, due to the spatial and temporal diversity between the options and considering flood risk mitigation and management applied during the construction phase, these effects can be lessened. It is anticipated that there would be a minor negative cumulative effect on this SEA objective.	No operational phase cumulative effects are anticipated for this SEA objective.
	To enhance or maintain surface	Minor negative effects were identified for ESW-TRA-001, ESW-RES-002C1 and ESW-DMO-Preferred, due to be delivered during 2028-	ESW-NIT-005 and ESW-NIT-006 are considered to have potential minor positive effects due to water quality improvements due to the

	Construction Phase Effects	Operational Phase Effects
	water quality, flows and quantity.	2029, 2032-2033 and ongoing respectively. Therefore, no construction phase cumulative effects are anticipated for this SEA objective.
	To enhance or maintain groundwater quality and resources.	Minor negative effects were identified for ESW-ABS-003C, ESW-RES-002C1 and ESW-DMO-Preferred, due to be delivered during 2027-2028, 2032-2033 and ongoing respectively. Therefore, no construction phase cumulative effects are anticipated for this SEA objective.
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	Many of the proposed options interact with waterbodies. The WFD Assessment Appendix G identified 10 waterbodies which are impacted by more than one BVP option. Of these water bodies, one, GB105034045903: Waveney (Ellingham Mill - Burgh St. Peter), was assessed to have potential to increase risk of WFD deterioration due to cumulation of multiple options, which are ESW-RES-002C1, ESW-TRA-023, ESW-TRA-001, ESW-NIT-004, ESW-EFR-002A. Further assessment, specifically for option ESW-RES-002C1, is required to confirm these impacts. Therefore, it is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	No construction phase cumulative effects are anticipated for this SEA objective.
		The WFD Assessment Appendix G identified 10 waterbodies which are impact by more than one BVP option. Of these water bodies, one, GB105034045903: Waveney (Ellingham Mill - Burgh St. Peter), was assessed to have potential to increase risk of WFD deterioration due interaction with multiple options, which are: ESW-RES-002C1, ESW-TRA-023, ESW-TRA-001, ESW-NIT-004, ESW-EFR-002A. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the operational phase.
		ESW-NIT-005 and ESW-NIT-006 are considered to have potential minor positive effects due to the anticipated level of increase in water supplies. These options will be operation during the same timescale, and they are located within the same ESW-Essex WRZ. All other options, including the DMO-Preferred scenario, are expected to have minor positive effects due to the anticipated increase in water supplies. The plan as a whole is aimed at ensuring the resilience of the water supplies for the next 100 years and thus it is anticipated that there would be a moderate positive cumulative effect on this SEA objective during the operation phase.
Air	To reduce and minimise air emissions during construction and operation.	Each option is predicted to result in minor effects to local air quality resulting from construction activity. ESW-NIT-005, ESW-UVC-001 and ESW-NIT-006 are all located within ESW Essex and due to be delivered during 2029-2030. However, effects are anticipated to be local and short term in nature and provided mitigation as recommended is put in place, it is anticipated that there would be no cumulative effects on this SEA objective during the construction phase.
		No operational phase cumulative effects are anticipated for this SEA objective.

		Construction Phase Effects	Operational Phase Effects
Climatic Factors	To minimise/reduce embodied and operational carbon emissions.	Each option requires built infrastructure to varying degrees. Emissions related to construction activities are local and short term and are not anticipated to result in cumulative effects on this SEA objective. However, whilst the options are spatially and temporally diverse, nine out of the eleven options are due to be delivered in the UK's Fifth Carbon Budget and a further one will be delivered in the UK's Sixth Carbon Budget, and a final option beyond this. Embodied emissions associated with the construction of these options may lead to cumulative effects. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.	A number of the options will require energy-intensive processes during the operational phase. Carbon emissions associated with the operation of the proposed options, specifically those with operational energy requirements such as effluent re-use and abstraction processes, are likely to contribute to the UK's Fifth Carbon Budget and beyond and emissions targets are likely to become more stringent over the long term. At present, there are no confirmed opportunities to supply the options with renewable energy during the operational phase however, these should be investigated as part of further design development. As the energy grid is decarbonised, greener energy will be available. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the operation phase.
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	No construction phase cumulative effects are anticipated for this SEA objective.	ESW-TRA-023, ESW-TRA-019, ESW-RES-002C1, ESW-PMP-001A, ESW-UVC-001 and ESW-EFR-002A will transfer water from an area of surplus to an area of deficit, thus improving the resilience of local water supplies during potential future drought scenarios. This could, however, have a detrimental effect to the resilience of natural systems during operation if drought conditions coincide with consistently high rates of transfer. It is anticipated that there would be a minor positive cumulative effect on this SEA objective during the operational phase.
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	Each option will have a local and temporary effect on landscape and visual amenity through construction activities and traffic. Best practice mitigation measures can be applied to reduce this impact. Whilst the options are spatially and temporally diverse, ESW-EFR-002A, ESW-RES-002C1, ESW-TRA-023 and ESW-TRA-018 all have the potential to affect The Broads National Park, while ESW-NIT-004 and ESW-TRA-001 lie within 500m. Although these options are all to be delivered under different timescales, there is still potential for cumulative construction effects. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.	No operational phase cumulative effects are anticipated for this SEA objective.
Historic Environment	To conserve/Protect and enhance the historic environment including the	Each option has the potential to affect the historic environment as a result of construction activities. However, in most cases, the options are spatially and temporally diverse. Three of the five options proposed in ESW Essex WRZ are to be delivered over 2029-2030, therefore there is potential for cumulative construction effects.	No operational phase cumulative effects are anticipated for this SEA objective.

	Construction Phase Effects	Operational Phase Effects
significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	<p>ESW-EFR-002A and ESW-TRA-001 are both within 500m of two Scheduled Monuments, 'Moated site and associated earthworks at Westend Farms', and 'Moated site at Moat Farm'. Similarly, ESW-NIT-005, ESW-UVC-001 and ESW-PMP-001A are all within 500m of a Scheduled Monument, 'Pumping station'. For the latter, these will be delivered under overlapping timescales, with potential for cumulative construction effects.</p> <p>There is also potential for unknown buried archaeology, however further study is likely required to confirm the potential risk. Best practice mitigation measures can be implemented during construction. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.</p>	
To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	Options proposed as part of this plan have the potential to affect health and wellbeing of local communities. Many of the options pose a potential risk to community facilities such as golf courses, religious grounds, playing fields etc. Best practice construction measures can also be implemented to reduce local effects to the health and wellbeing of the local community. Furthermore, many of the options result in minor positive effects resulting from potential contributions to the local economy during the construction phase. It is anticipated that there would be both minor negative and minor positive cumulative effects on this SEA objective during the construction phase.	Minor positive effects were identified for ESW-UVC-001, ESW-RES-002C1 and ESW-DMO-Preferred, due to be delivered during 2029-2030, 2040-2041 and ongoing respectively. Although these options will eventually be operational at the same time, they are located within different WRZs. Therefore, no operational cumulative effects are anticipated for this SEA objective.
Population and Human Health		
To secure resilient water supplies for the health and wellbeing of customers.	No construction phase cumulative effects are anticipated for this SEA objective.	All options are aimed at providing resilient water supplies to customers across the region. A majority of the options predicted to have a minor positive effect are due to be operational during similar timescales. It is anticipated that there would be a moderate positive cumulative effect on this SEA objective during the operational phase.
To increase access and connect customers to the natural environment, provide education or information	Each of these options have the potential to cause temporary disruption to walking and cycling routes and public rights of way. None of the options propose opportunities associated with environmental or recreational benefits for local communities during the construction phase. ESW-NIT-005, ESW-NIT-006 and ESW-PMP-001A are all located within ESW Essex WRZ and have overlapping delivery timescales and therefore have the potential to cause cumulative effects through disruption to the same communities.	Minor positive effects were identified for ESW-NIT-004 and ESW-RES-002C1, and moderate positive effects were identified for ESW-DMO-Preferred, due to be delivered in 2029-2030, 2040-2041 and ongoing respectively. Although these options will eventually be operational at the same time, they are located within different WRZs. Therefore, no operational cumulative effects are anticipated for this SEA objective.

	Construction Phase Effects	Operational Phase Effects
resources for the public.	Best practice measures can be implemented to reduce construction phase disruption. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.	
Maintain and enhance tourism and recreation.	Each of these options have the potential to cause temporary disruption to tourism and recreation opportunities for local communities. None of the options propose opportunities associated with environmental or recreational benefits for local communities during construction. A number of options are located within ESW Essex WRZ and Northern Central WRZ and have overlapping timescales for delivery. Therefore, have the potential to causes cumulative effects through disruption to the same communities. Best practice measures can be implemented to reduce construction phase disruption. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.	No operational phase cumulative effects are anticipated for this SEA objective.
Material Assets	<p>Minimise resource use and waste production.</p> <p>New infrastructure will be required for all options. ESW-ABS-003C, ESW-NIT-005, ESW-UVC-001, ESW-NIT-006 and ESW-PMP-001A are all located within the ESW Essex WRZ and ESW-NIT-004, ESW-TRA-023, ESW-TRA-018, ESW-EFR-002A and ESW-RES-002C1 are all located within the Northern Central WRZ. ESW-NIT-005 and ESW-NIT-006 are both anticipated to require a significant amount of material during construction and are both located within ESW Essex WRZ and due to be delivered during 2029-2030.</p> <p>There is potential for material resource use required for construction of the options and limited opportunities for re-use or recycling of waste materials have been identified currently, however this could be investigated further during later design stages. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.</p>	Energy consumption will be required for a number of the options, for activities including operating WTWs, pumping and treating water and for periodic maintenance works. ESW-NIT-005, ESW-UVC-001, ESW-NIT-006 and ESW-PMP-001A are all located within ESW Essex WRZ with the same, or overlapping, timescales for delivery. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the operational phase.
Avoid negative effects on built assets and infrastructure.	<p>Many of the options cross railway lines, major roads and the National Cycle Network, therefore there is likely to be disruption to built assets and infrastructure during the construction phase.</p> <p>ESW-TRA-001, ESW-EFR-002A and ESW-RES-002C1 all cross National Cycle Network No.1, however, are due to be delivering under different timescales. Similarly, ESW-TRA-001 and ESW-EFR-002A intersect the same area of railway tracks, however, are due to be delivered under different timescales.</p>	No operational phase cumulative effects are anticipated for this SEA objective.

	Construction Phase Effects	Operational Phase Effects
	<p>Best practice measures included a plan wide Traffic Management Plan could be implemented to minimise disruption and whilst the options are temporally diverse, this could lead to extended disruption over a long period of time. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.</p>	

Ofwat Core

Table 7-2: Ofwat Core Cumulative Effects

		Construction Phase Effects	Operational Phase Effects
Biodiversity	To protect designated sites and their qualifying features.	A number of the proposed options having potential effects on designated biodiversity sites and their qualifying features. In particular, options ESW-TRA-001 and ESW-EFR-002A which both potentially impact Tital Wood Ancient Woodland. These options are due to be delivered in 2028/2029 and 2030/2031 respectively. Therefore, there is potential for cumulative construction effects. In-combination effects on Natura 2000 sites are considered in the HRA AA Appendix F. The sites with potential adverse effects are; The Broads SAC, Broadlands SPA and Broadland Ramsar. There is potential for cumulative permanent construction phase effects to the aforementioned sensitive sites. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.	A number of options have potential effects on designated biodiversity sites and their qualifying features. Whilst ESW-TRA-001 and ESW-EFR-002A both potentially impact Tital Wood Ancient Woodland, it is anticipated that the impacts arising as a result of ESW-TRA-001 are temporary in nature. Therefore, there are not anticipated to be in-combination effects on this receptor during the operational phase. In-combination effects on Natura 2000 sites are considered in the HRA AA Appendix F. The sites with potential adverse effects are; The Broads SAC, Broadlands SPA and Broadland Ramsar. The HRA AA considers many of these effects to be reduced by applying best practice mitigation however there may still be residual operational phase effects. It is anticipated that there would be a minor negative cumulative effect on this SEA objective.
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	A number of the options considered as part of this plan are considered to have moderate negative effects during the construction phase on the ability of the plan to deliver BNG, protect biodiversity, priority species and vulnerable habitats. This is as a result of negative BNG scores for the options included in the plan resulting from construction of the options however this score does not take into consideration opportunities for BNG enhancement. As 10% BNG will be mandatory for each option which requires planning permission taken forward, this is a measure of the difficulty of achieving 10%. The proposed options are also all either spatially or temporally diverse. Options with moderate negative effects include; ESW-TRA-018 and ESW-EFR-002A. These options are to be constructed in the same WRZ, Northern Central, and they are both due to be delivered between 2028 and 2033, which reduces the potential for in-combination effects. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.	During the operational phase, option ESW-PMP-001A is considered to have potential minor positive operational effects on the ability to deliver BNG and long term habitat enhancement, whilst ESW-EFR-002A will result in minor negative operational effects. Although these options will be operational at the same time eventually, they are located within different WRZs. Therefore, no operational phase cumulative effects are anticipated for this SEA objective.
	To avoid spreading and, where required, manage invasive	No construction phase cumulative effects are anticipated for this SEA objective.	No operational phase cumulative effects are anticipated for this SEA objective.

		Construction Phase Effects	Operational Phase Effects
	and non-native species (INNS).		
	To meet WFD objectives relating to biodiversity.	No construction phase cumulative effects are anticipated for this SEA objective.	No operational phase cumulative effects are anticipated for this SEA objective.
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	<p>There are several instances of where two or more options pass through the same area of Provisional Grade 2 agricultural land. ESW-ABS-003C and ESW-NIT-006 are located in the ESW Essex WRZ, and ESW-NIT-004, ESW-TRA-023 and ESW-TRA-018 are located in the Northern Central WRZ. Despite being delivered under different timescales, there is potential for permanent construction effects due to loss of good quality agricultural land.</p> <p>ESW-EFR-002A, ESW-TRA-001 and ESW-TRA-019 all interact with Holton Pit Historic Landfill Site. ESW-TRA-001 and ESW-TRA-019 are both to be delivered in 2028-2029, therefore there will be potential for cumulative effects on this historic landfill site. Similarly, ESW-EFR-002A, and ESW-TRA-001 both interact with Site at Ringsfield Historic Landfill Site. Despite being delivered under different timescales, there is potential for permanent construction effects on soil quality and contamination.</p> <p>It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.</p>	No operational phase cumulative effects are anticipated for this SEA objective.
Water	To reduce or manage flood risk, taking climate change into account.	Options included in this plan are mostly located in Flood Zone 1, however options also pass through Flood Zones 2 and 3. However, due to the spatial and temporal diversity between the options and considering flood risk mitigation and management applied during the construction phase, these effects can be minimised. It is anticipated that there would be a minor negative cumulative effect on this SEA objective.	No operational phase cumulative effects are anticipated for this SEA objective.
	To enhance or maintain surface water quality, flows and quantity.	No construction phase cumulative effects are anticipated for this SEA objective.	ESW-NIT-005, ESW-NIT-006 and the DMO-Preferred scenario are considered to have potential minor positive effects due to water quality improvements due to the nature of options proposed. These options both fall within Essex WRZ and will be operational during the same time period. It is anticipated that there would be a minor positive cumulative effect on this SEA objective during the operation phase.

	Construction Phase Effects	Operational Phase Effects
	To enhance or maintain groundwater quality and resources.	No construction phase cumulative effects are anticipated for this SEA objective.
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	<p>No operational phase cumulative effects are anticipated for this SEA objective.</p> <p>The WFD Assessment Appendix G identified six waterbodies which are impacted by more than one Ofwat Core option. Of these water bodies, one, GB530603911401: Thames Lower, was assessed to have potential to increase risk of WFD deterioration due interaction with multiple options, which are: ESW-DES-001 and ESW-EFR-001. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the operational phase.</p>
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	<p>No construction phase cumulative effects are anticipated for this SEA objective.</p> <p>ESW-NIT-005 and ESW-NIT-006 are considered to have potential minor positive effects due to the anticipated level of increase in water supplies. However, these options are located within different WRZs and will be operational during different timescales. All other options are expected to have minor positive effects, so for same reason. The plan as a whole is aimed at ensuring the resilience of the water supplies for the next 100 years and thus it is anticipated that there would be a moderate positive cumulative effect on this SEA objective during the operation phase.</p>
Air	To reduce and minimise air emissions during construction and operation.	<p>Each option is predicted to result in minor effects to local air quality resulting from construction activity. ESW-NIT-005, ESW-UVC-001 and ESW-NIT-006 are all located within ESW Essex and due to be delivered during 2029-2030. However, effects are anticipated to be local and short term in nature and the options proposed as spatially and temporally diverse. It is anticipated that there would be no cumulative effects on this SEA objective during the construction phase.</p> <p>No operational phase cumulative effects are anticipated for this SEA objective.</p>
Climatic Factors	To minimise/reduce embodied and operational carbon emissions.	<p>Each option requires built infrastructure to varying degrees. Emissions related to construction activities are local and short term and are not anticipated to result in cumulative effects on this SEA objective. However, whilst the options are spatially and temporally diverse, seven out of the eleven options are due to be delivered in the UK's Fifth Carbon Budget and a further one will be delivered in the UK's Sixth Carbon Budget. Embodied emissions associated with the construction of these options may lead to cumulative effects. It is</p> <p>A number of the options will require energy-intensive processes during the operational phase. Carbon emissions associated with the operation of the proposed options, specifically those with operational energy requirements such as effluent re-use and abstraction processes, are likely to contribute to the UK's Fifth Carbon Budget and beyond and emissions targets are likely to become more stringent over the long term. At present, there are no confirmed opportunities to supply the options with renewable energy during the</p>

		Construction Phase Effects	Operational Phase Effects
		anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.	operational phase however, these could be investigated as part of further design development. As the energy grid is decarbonised, greener energy will be available. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the operation phase.
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	No construction phase cumulative effects are anticipated for this SEA objective.	ESW-TRA-023, ESW-TRA-019, ESW-PMP-001A, ESW-UVC-001 and ESW-EFR-002A will transfer water from an area of surplus to an area of deficit, thus improving the resilience of local water supplies during potential future drought scenarios. This could, however, have a detrimental effect to the resilience of natural systems during operation if drought conditions coincide with consistently high rates of transfer. It is anticipated that there would be a minor positive cumulative effect on this SEA objective during the operational phase.
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	Each option will have a local and temporary effect on landscape and visual amenity through construction activities and traffic. Best practice mitigation measures can be applied to reduce this impact. Whilst the options are spatially and temporally diverse, ESW-EFR-002A, ESW-TRA-023 and ESW-TRA-018 have the potential to affect The Broads National Park, while ESW-NIT-004 and ESW-TRA-001 lie within 500m. Although these options are all to be delivered under different timescales, there is still potential for cumulative construction effects. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.	No operational phase cumulative effects are anticipated for this SEA objective.
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that	Each option has the potential to affect the historic environment as a result of construction activities. However, in most cases, the options are spatially and temporally diverse. Three of the five options proposed in ESW Essex WRZ are to be delivered over 2029-2030, therefore there is potential for cumulative construction effects. ESW-NIT-005, ESW-UVC-001 and ESW-PMP-001A are all within 500m of a Scheduled Monument, 'Pumping station' and will be delivered under overlapping timescales, with potential for cumulative construction effects. There is also potential for unknown buried archaeology, however further study is likely required to confirm the potential risk. Best practice mitigation measures can be implemented during construction. It is anticipated that there would be a moderate	No operational phase cumulative effects are anticipated for this SEA objective.

	Construction Phase Effects	Operational Phase Effects
	significance by setting.	negative cumulative effect on this SEA objective during the construction phase.
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	Options proposed as part of this plan have the potential to affect health and wellbeing of local communities. Many of the options pose a potential risk to community facilities such as golf courses, religious grounds, playing fields etc. Best practice construction measures can also be implemented to reduce local effects to the health and wellbeing of the local community. Furthermore, many of the options result in minor positive effects resulting from potential contributions to the local economy during the construction phase. It is anticipated that there would be both minor negative and minor positive cumulative effects on this SEA objective during the construction phase.
	To secure resilient water supplies for the health and wellbeing of customers.	No construction phase cumulative effects are anticipated for this SEA objective.
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	Each of these options have the potential to cause temporary disruption to walking and cycling routes and public rights of way. None of the options propose opportunities associated with environmental or recreational benefits for local communities during the construction phase. ESW-NIT-005, ESW-NIT-006 and ESW-PMP-001A are all located within ESW Essex WRZ and have overlapping delivery timescales and therefore have the potential to cause cumulative effects through disruption to the same communities. Best practice measures can be implemented to reduce construction phase disruption. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.
	Maintain and enhance tourism and recreation.	Each of these options have the potential to cause temporary disruption to tourism and recreation opportunities for local communities. None of the options propose opportunities associated with environmental or recreational benefits for local communities during construction. A number of options are located within ESW Essex WRZ and Northern Central WRZ and have overlapping timescales for delivery. Therefore, there is the potential for
		No operational phase cumulative effects are anticipated for this SEA objective.
		All options are aimed at providing resilient water supplies to customers across the region. A majority of the options predicted to have a minor positive effect are due to be operational during similar timescales. It is anticipated that there would be a moderate positive cumulative effect on this SEA objective during the operational phase.
		Option ESW-UVC-001 identified a minor negative effect and option ESW-NIT-004 identified a minor positive effect. Although these options are both due to be delivered during 2029-2030, they are located within different WRZs. Therefore, no operational phase cumulative effects are anticipated for this SEA objective.
		No operational phase cumulative effects are anticipated for this SEA objective.

	Construction Phase Effects	Operational Phase Effects
	<p>cumulative effects through disruption to the same communities. Best practice measures can be implemented to reduce construction phase disruption. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.</p>	
Material Assets	<p>Minimise resource use and waste production.</p> <p>New infrastructure will be required for all options. ESW-ABS-003C, ESW-NIT-005, ESW-UVC-001, ESW-NIT-006 and ESW-PMP-001A are all located within the ESW Essex WRZ and ESW-NIT-004, ESW-EFR-002A, ESW-TRA-023 and ESW-TRA-018 are all located within the Northern Central WRZ. ESW-NIT-005 and ESW-NIT-006 are both anticipated to require a significant amount of material during construction, both located within ESW Essex WRZ and due to be delivered during 2029-2030.</p> <p>There is potential for material resource use required for construction of the options and limited opportunities for re-use or recycling of waste materials have been identified currently, however this could be investigated further during later design stages. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.</p>	<p>Energy consumption will be required for a number of the options, for activities including operating WTWs, pumping and treating water and for periodic maintenance works. ESW-NIT-005, ESW-UVC-001, ESW-NIT-006 and ESW-PMP-001A are all located within ESW Essex WRZ with the same, or overlapping, timescales for delivery. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the operational phase.</p>
	<p>Avoid negative effects on built assets and infrastructure.</p> <p>Many of the options cross railway lines, major roads and the National Cycle Network, therefore there is likely to be disruption to built assets and infrastructure during the construction phase. ESW-TRA-001 and ESW-EFR-002A both cross National Cycle Network No.1 and the same area of railway tracks, however these options are due to be delivered under different timescales.</p> <p>Best practice measures included a plan wide Traffic Management Plan could be implemented to minimise disruption and whilst the options are temporally diverse, this could lead to extended disruption over a long period of time. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.</p>	<p>No operational phase cumulative effects are anticipated for this SEA objective.</p>

Best Environment and Society

Table 7-3: Best Environment and Society Cumulative Effects

	Construction Phase Effects	Operational Phase Effects
Biodiversity	<p>To protect designated sites and their qualifying features.</p> <p>A number of the proposed options having potential effects on designated biodiversity sites and their qualifying features. In particular, options ESW-TRA-001 and ESW-EFR-002A which both potentially impact Tital Wood Ancient Woodland. These options are due to be delivered in 2028/2029 and 2030/2031 respectively. Therefore, there is potential for cumulative construction effects. In-combination effects on Natura 2000 sites are considered in the HRA AA Appendix F. The sites with potential adverse effects are; The Broads SAC, Broadlands SPA and Broadland Ramsar. There is potential for cumulative permanent construction phase effects to the aforementioned sensitive sites. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.</p>	<p>A number of options have potential effects on designated biodiversity sites and their qualifying features. Whilst ESW-TRA-001 and ESW-EFR-002A both potentially impact Tital Wood Ancient Woodland, it is anticipated that the impacts arising as a result of ESW-TRA-001 are temporary in nature. Therefore, there are not anticipated to be in-combination effects on this receptor during the operational phase. In-combination effects on Natura 2000 sites are considered in the HRA AA Appendix F. The sites with potential adverse effects are; The Broads SAC, Broadlands SPA and Broadland Ramsar. The HRA AA considers many of these effects to be reduced by applying best practice mitigation however there may still be residual operational phase effects. It is anticipated that there would be a minor negative cumulative effect on this SEA objective.</p>
	<p>To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.</p> <p>A number of the options considered as part of this plan are considered to have moderate negative effects during the construction phase on the ability of the plan to deliver BNG, protect biodiversity, priority species and vulnerable habitats. This is as a result of negative BNG scores for the options included in the plan resulting from construction of the options however this score does not take into consideration opportunities for BNG enhancement. As 10% BNG will be mandatory for each option requiring planning permission taken forward, this is a measure of the difficulty of achieving 10%. The proposed options are also all either spatially or temporally diverse. Options with moderate negative effects include; ESW-TRA-018, ESW-EFR-002A, ESW-DES-001, 03b0478, ESW-EFR-001 and ESW-DES-008. These options are located within the same WRZs (ESW-DES-001 and ESW-EFR-002A in Essex, and 03b0478, ESW-EFR-001 and ESW-DES-008 in Suffolk Northern central) and have overlapping dates for delivery. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.</p>	<p>During the operational phase, options ESW-PMP-001A and ESW-DMO-Preferred are considered to have potential minor positive operational effects on the ability to delivery BNG and long term habitat enhancement, whilst option ESW-DES-008 identified moderate negative operational effects and ESW-EFR-002A, ESW-DES-001 and 03b0478B identified minor negative operational effects. Although these options are located across different WRZs, they will all be operational eventually. Therefore, it is anticipated that would be a minor positive cumulative effect on this SEA objective during the operational phase.</p>
	<p>To avoid spreading and, where required, manage invasive</p> <p>No construction phase cumulative effects are anticipated for this SEA objective.</p>	<p>No operational phase cumulative effects are anticipated for this SEA objective.</p>

	Construction Phase Effects	Operational Phase Effects
	and non-native species (INNS).	
	To meet WFD objectives relating to biodiversity.	No construction phase cumulative effects are anticipated for this SEA objective.
		No operational phase cumulative effects are anticipated for this SEA objective.
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	<p>There are several instances of where two or more options pass through the same area of Provisional Grade 2 agricultural land. ESW-ABS-003C and ESW-NIT-006 are located in the ESW Essex WRZ, and ESW-NIT-004, ESW-TRA-023 and ESW-TRA-018 are located in the Northern Central WRZ. Despite being delivered under different timescales, there is potential for permanent construction effects due to loss of good quality agricultural land.</p> <p>ESW-TRA-001, ESW-TRA-019 and ESW-EFR-002A all interact with Holton Pit Historic Landfill Site. ESW-TRA-001 and ESW-TRA-019 are both to be delivered in 2028-2029, therefore will be potential for cumulative effects on this historic landfill site.</p> <p>It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.</p>
	To reduce or manage flood risk, taking climate change into account.	Options included in this plan are mostly located in Flood Zone 1, however options also pass through Flood Zones 2 and 3. However, due to the spatial and temporal diversity between the options and considering flood risk mitigation and management applied during the construction phase, these effects can be lessened. It is anticipated that there would be a minor negative cumulative effect on this SEA objective.
Water	To enhance or maintain surface water quality, flows and quantity.	Minor negative effects were identified for ESW-TRA-001, ESW-DES-001, ESW-DES-008 and DMO_PREFERRED scenario. These options are located within different WRZs and due to be delivered during different timescales. Therefore, no construction phase cumulative effects are anticipated for this SEA objective.
	To enhance or maintain groundwater quality and resources.	Minor negative effects were identified for options ESW-EFR-002A, 03b0478B and ESW-EFR-001. These options are located within different WRZs. Therefore, no operational phase cumulative effects are anticipated for this SEA objective.
		No operational phase cumulative effects are anticipated for this SEA objective.

	Construction Phase Effects	Operational Phase Effects
	<p>To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.</p> <p>Many of the proposed options interact with waterbodies. The WFD Assessment Appendix G identified six waterbodies which are impacted by more than one BES option. Of these water bodies, one, GB530603911401: Thames Lower, was assessed to have potential to increase risk of WFD deterioration due interaction with multiple options, which are: ESW-DES-001 and ESW-EFR-001. Further assessment is required to confirm these impacts. Therefore, it is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.</p>	<p>The WFD Assessment Appendix G identified six waterbodies which are impacted by more than one BES option. Of these water bodies, one, of these water bodies, one, GB530603911401: Thames Lower, was assessed to have potential to increase risk of WFD deterioration due interaction with multiple options, which are: ESW-DES-001 and ESW-EFR-001. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the operational phase.</p>
	<p>To increase water efficiency and increase resilience of water supplies and natural systems to droughts.</p> <p>No construction phase cumulative effects are anticipated for this SEA objective.</p>	<p>ESW-DES-001, ESW-PMP-001A and ESW-DES-008 are all considered to have potential minor positive effects due to the anticipated level of increase in water supplies. However, these options are either located within different WRZs or will be operational during different timescales. All other options, including the DMO-Preferred scenario, are expected to have minor positive effects due to the anticipated increase in water supplies. The plan as a whole is aimed at ensuring the resilience of the water supplies for the next 100 years and thus it is anticipated that there would be a moderate positive cumulative effect on this SEA objective during the operation phase.</p>
Air	<p>To reduce and minimise air emissions during construction and operation.</p> <p>Each option is predicted to result in minor effects to local air quality resulting from construction activity. ESW-PMP-001A and ESW-EFR-001 are both located within ESW-Essex WRZ and due to be delivered during 2045-2046. However, effects are anticipated to be local and short term in nature and the options proposed as spatially and temporally diverse. It is anticipated that there would be no cumulative effects on this SEA objective during the construction phase.</p>	<p>No operational phase cumulative effects are anticipated for this SEA objective.</p>
Climatic Factors	<p>To minimise/reduce embodied and operational carbon emissions.</p> <p>Each option requires built infrastructure to varying degrees. Emissions related to construction activities are local and short term and are not anticipated to result in cumulative effects on this SEA objective. However, whilst the options are spatially and temporally diverse, five out of the eleven options are due to be delivered in the UK's Fifth Carbon Budget and a further one will be delivered in the UK's Sixth Carbon Budget. Embodied emissions associated with the construction of these options may lead to cumulative effects. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.</p>	<p>A number of the options will require energy-intensive processes during the operational phase. Carbon emissions associated with the operation of the proposed options, specifically those with operational energy requirements such as effluent re-use and abstraction processes, are likely to contribute to the UK's Fifth Carbon Budget and beyond and emissions targets are likely to become more stringent over the long term. At present, there are no confirmed opportunities to supply the options with renewable energy during the operational phase however, these could be investigated as part of further design development. As the energy grid is decarbonised, greener energy will be available. It is anticipated that there would be</p>

		Construction Phase Effects	Operational Phase Effects
			a moderate negative cumulative effect on this SEA objective during the operation phase.
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	No construction phase cumulative effects are anticipated for this SEA objective.	Many of the options will transfer water from an area of surplus to an area of deficit, thus improving the resilience of local water supplies during potential future drought scenarios. This could, however, have a detrimental effect to the resilience of natural systems during operation if drought conditions coincide with consistently high rates of transfer. It is anticipated that there would be a minor positive cumulative effect on this SEA objective during the operational phase.
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	Each option will have a local and temporary effect on landscape and visual amenity through construction activities and traffic. Best practice mitigation measures can be applied to reduce this impact. Whilst the options are spatially and temporally diverse, ESW-EFR-002A, ESW-TRA-023, ESW-TRA-018, ESW-DES-008 and 03b04788 all have the potential to affect The Broads National Park, while ESW-NIT-004 and ESW-TRA-001 lie within 500m. Although these options are all to be delivered under different timescales, there is still potential for cumulative construction effects. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.	No operational phase cumulative effects are anticipated for this SEA objective.
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that	Each option has the potential to affect the historic environment as a result of construction activities. However, in most cases, the options are spatially and temporally diverse. Two of the four options proposed in ESW Essex WRZ are to be delivered over 2045-2046, therefore there is potential for cumulative construction effects. A number of options are within 500m of the same various Scheduled Monuments, for example both ESW-DES-008 AND ESW-EFR-002A are within 500m of 'St Olave's Priory'. Similarly, options are within 500m of the same listed buildings. There is also potential for unknown buried archaeology, however further study is likely required to confirm the potential risk. Best practice mitigation measures can be implemented during construction. It is anticipated that there would be a moderate negative cumulative effect on this SEA objective during the construction phase.	No operational phase cumulative effects are anticipated for this SEA objective.

	Construction Phase Effects	Operational Phase Effects	
	significance by setting.		
	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	Options proposed as part of this plan have the potential to affect health and wellbeing of local communities. Many of the options pose a potential risk to community facilities such as golf courses, religious grounds, playing fields etc. Best practice construction measures can also be implemented to reduce local effects to the health and wellbeing of the local community. Furthermore, many of the options result in minor positive effects resulting from potential contributions to the local economy during the construction phase. It is anticipated that there would be both minor negative and minor positive cumulative effects on this SEA objective during the construction phase.	Minor positive effects were identified for ESW-DES-001 and ESW-EFR-001. Although these options are located within the same WRZ and will eventually be operational at the same time, no operational phase cumulative effects are anticipated for this SEA objective.
	To secure resilient water supplies for the health and wellbeing of customers.	No construction phase cumulative effects are anticipated for this SEA objective.	All options are aimed at providing resilient water supplies to customers across the region. A majority of the options predicted to have a minor positive effect are due to be operational during similar timescales. It is anticipated that there would be a minor positive cumulative effect on this SEA objective during the operational phase.
Population and Human Health	To increase access and connect customers to the natural environment, provide education or information resources for the public.	Each of these options have the potential to cause temporary disruption to walking and cycling routes and public rights of way. None of the options propose opportunities associated with environmental or recreational benefits for local communities during the construction phase. ESW-NIT-004 and ESW-TRA-023 are both located within Northern Central WRZ and have overlapping delivery timescales. Similarly, ESW-PMP-001A and ESW-DES-008 are both located within ESW Essex WRZ and have the same delivery timescales and therefore have the potential to cause cumulative effects through disruption to the same communities. Best practice measures can be implemented to reduce construction phase disruption. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.	No operational phase cumulative effects are anticipated for this SEA objective.
	Maintain and enhance tourism and recreation.	Each of these options have the potential to cause temporary disruption to tourism and recreation opportunities for local communities. None of the options propose opportunities associated with environmental or recreational benefits for local communities	No operational phase cumulative effects are anticipated for this SEA objective.

	Construction Phase Effects	Operational Phase Effects
	<p>during construction. A number of options are located within ESW Essex WRZ and Northern Central WRZ and have overlapping timescales for delivery. Therefore, have the potential to causes cumulative effects through disruption to the same communities. Best practice measures can be implemented to reduce construction phase disruption. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.</p>	
Minimise resource use and waste production.	<p>New infrastructure will be required for all options. ESW-ABS-003C, ESW-PMP-001A, ESW-DES-001 and ESW-EFR-001 are all located within the ESW Essex WRZ and ESW-NIT-004, ESW-TRA-023, ESW-TRA-018, ESW-EFR-002A, 03b0478B and ESW-DES-008 are all located within the Northern Central WRZ.</p> <p>There is potential for material resource use required for construction of the options and limited opportunities for re-use or recycling of waste materials have been identified currently, however this could be investigated further during later design stages. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.</p>	<p>Energy consumption will be required for a number of the options, for activities including operating WTWs, pumping and treating water and for periodic maintenance works. ESW-PMP-001A and ESW-EFR-001 are both located within ESW Essex WRZ with the same timescales for delivery. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the operational phase.</p>
Material Assets Avoid negative effects on built assets and infrastructure.	<p>Many of the options cross railway lines, major roads and the National Cycle Network, therefore there is likely to be disruption to built assets and infrastructure during the construction phase. ESW-DES-008 AND ESW-EFR-002A both cross the A143 in multiple locations and are location within the same WRZ, with differing timescales. Similarly, ESW-TRA-001 and ESW-EFR-002A both cross National Cycle Network No.1 and the same area of railway tracks, however these options are due to be delivered under different timescales.</p> <p>Best practice measures included a plan wide Traffic Management Plan could be implemented to minimise disruption and whilst the options are temporally diverse, this could lead to extended disruption over a long period of time. It is anticipated that there would be a minor negative cumulative effect on this SEA objective during the construction phase.</p>	<p>No operational phase cumulative effects are anticipated for this SEA objective.</p>

7.2 Cumulative Effects Assessment with other Plans, Programmes and Projects (Inter-Plan Effects)

Introduction

7.2.1 Whilst there is no standard approach to the assessment of cumulative effects in conjunction with other plans programmes and projects, the Planning Inspectorate has issued Advice Note Seventeen, which provides useful guidance. This guidance has been considered in developing a proportionate approach to assessing cumulative effects for this Environmental Report.

7.2.2 A two-stage approach was taken to determine the Inter-Plan Effects:

7.2.3 **Step 1** – A strategic cumulative assessment of the interactions with other policies, plans and programmes which is applicable across the final WRMP24.

7.2.4 **Step 2** – A plan based cumulative effects assessment. The plans, programmes and strategic projects considered in this review were:

- Large existing and emerging Local Plan allocations.
- NSIPs listed on the Planning Inspectorate's Website.
- Hybrid Bills.
- Transport and Works Act Orders for large-scale transport infrastructure.
- Minerals and waste applications, including for landfill and energy from waste projects.

Step 1 Methodology

7.2.5 Step 1 comprised a strategic review across other water company draft WRMP24s, Regional Water Resource Plans and it also included a review of other companies Drought Plans (where applicable) to identify the potential cumulative effects. The RBMPs were also reviewed to identify the potential for any cumulative effects.

Step 2 Methodology

7.2.6 The final WRMP24 developed an approach, based on the steps set out below, which is appropriate for the maturity of the scheme and scale of development, and provides justification for the approach taken. The first step was to identify the other plans and developments that will be considered by establishing a reasonable buffer (2km) around each proposed option as part of each plan being considered. Given the nature and scale of the BVP for the final WRMP24, an inter-plan cumulative effects assessment was undertaken. The list of developments and plans is proportionate to the level of detailed engineering information known at the time, and includes:

- Large existing and emerging Local Plan allocations e.g., 500 or more dwellings.
- Projects on the Planning Inspectorate's Programme of Projects.
- Hybrid Bills e.g., High Speed 2 (HS2) Phase One.
- Transport and Works Act Orders for large-scale transport infrastructure.
- Minerals and waste applications, including for landfill and energy from waste.
- Major planning applications made under the Town and Country Planning Act (1990).

7.2.7 Once the list of other plans and developments was identified, a schedule was developed providing information for each development including location information, planning status, and programme for construction/operation, if known, to determine if there is an overlap in temporal scope. This schedule was mapped against the proposed options within the three plans being considered to determine where there is potential for in-combination effects between the proposed plans and other plans, projects and programmes listed above. This allowed the

potential for cumulative effects of two or more developments by virtue of overlaps in temporal or geographical scope or due to the scale and nature of the 'other development'/receiving environment, and whether these could require additional mitigation. This also identified interactions of construction and/or operational effects between developments. This information is not being collected to inform route and/or site selection decisions. The results have been split into potential general SEA inter-project effects, WFD inter-project effects, and HRA inter-project effects. This is because for most SEA topics, for the purposes of this Environmental Report, 2km is an indicator of where there is potential for effects, however for WFD and HRA, the potential effects of a project can more wide-ranging. Specific methodologies for WFD and HRA inter-project cumulative effects can be found in their respective appendices. The schedule of other plans and developments can be made available on request.

Results

Step 1: Regional Plans, Other WRMPs, Drought Plans, Drainage Plans and RBMPs

7.2.8 The final WRMP24 supports several local, regional, and national plans and projects. It will have a direct link to water resources and water supply plans and policies, for example in Local Plans. The development of the final WRMP24 has taken future population growth into account and as such will support Local Plan policies on growth, housing and development. It will also have additional direct links to plans that relate to health and well-being, housing, and the environment.

7.2.9 The WRE Regional Plan has undertaken a cumulative effects assessment, specifically covering its own intra-plan cumulative effects between the Regional Plan schemes and inter-plan cumulative effects with other Regional Plans and projects; this is considered to be in line with WRPG expectations to seek to manage interactions between WRMP and Regional body plan making activities.

Drought Plans

7.2.10 Water company drought plans sets out the range of demand management and supply augmentation measures that the company may need to implement during drought conditions to maintain essential water supplies to its customers. The measures include water use restrictions (Temporary Use Bans and Drought Orders to further restrict non-essential water use) as well as Drought Permit or Drought Order options to temporarily authorise amendments to abstraction licence conditions to enable more water to be abstracted during drought from water sources.

7.2.11 The final WRMP24 options proposed are linked to both Essex and Suffolk Water Drought Plan(s), as well as those of neighbouring water companies as the measures contained in each plan act in-combination to provide a resilient water supply to customers in the region and safeguard the provision of essential water supplies in drought conditions.

7.2.12 The final WRMP24 includes schemes to provide greater resilience to severe drought conditions by ensuring that, despite significant growth in demand for water, there is sufficient reliable water provision available to sustain essential water supplies during a severe drought that may only occur on average once in every 500 years. The supply schemes are complemented by a very substantial programme of demand management measures designed to reduce the scale of future growth in demand.

7.2.13 A cumulative beneficial effect is identified as the demand management measures in water company Drought Plans will have beneficial effects on the water environment in-combination with the extensive demand management programmes included in the final WRMP24. This is achieved by reducing the pressure on water resources in periods of prolonged dry weather when river flows, and groundwater levels are below normal. This would further enhance the positive effects identified for the water, biodiversity, population and human health SEA

objectives, and also highlights the importance of the timing of drought resilience. Cumulative negative effects are also identified during the implementation of the drought management measures, particularly related to aspects such as hosepipe bans and availability of water for recreation.

- 7.2.14 In terms of geographic location, both the positive and negative cumulative effects may occur in catchments where the drought plans are put in place, particularly if this occurs at a time before adequate supply side options have been introduced. Drought Plans are required to be updated every five years by water companies.

Neighbouring Water Companies WRMP24s and Drought Plans

- 7.2.15 A review of other water company draft WRMP24s was undertaken to identify potential interactions with the ESW final WRMP24. In addition, the WRE Regional Plan (December 2023) concluded that the cumulative effects of options within the region are less likely to be of an immediate proximity in nature, but instead relate to inter-relationships along a river, within a groundwater body, or in an estuarine / marine environment. The effects are more likely to emerge from the combined operation of options, as abstractions and discharges from proposed new supply options between one, or more, plans.
- 7.2.16 A cumulative neutral effect is identified for the wider array of SEA objectives aside from biodiversity and water, due to the greater distance that will exist between new supply options contained in other Regional Plans and those set out in the WRE Regional Plan.
- 7.2.17 Further, to the above, the SEA conducted for the WRE Regional Plan published in December 2023 undertook a cumulative effects assessment, this specifically covered the intra-plan cumulative effects between the Regional Plans' schemes and inter-plan cumulative effects with other Regional Plans and projects. The results of the regional cumulative effects assessment, including effects specific to the Essex and Suffolk Water rdWRMP24 are available in the regional planning report.

River Basin Management Plans

- 7.2.18 The majority of the Essex and Suffolk Water region is within the Anglian River Basin. The latest RBMPs were adopted at the end of 2022 and one of the key themes noted as being important during the consultation period was 'changes to planning and regulation across government, and adequate funding to deal with the impact of activity in urban areas, housing, water supply and rural areas', which is also a consideration for the final WRMP24.
- 7.2.19 In accordance with the RBMPs, the final WRMP24 includes measures to maintain a supply-demand balance while addressing the need to deliver sustainable abstraction from water bodies and measures to maximise the use of existing water resources in a sustainable manner.
- 7.2.20 The final WRMP24 includes a very substantial programme of demand management activities that have been assessed in the SEA as having cumulative beneficial effects, with the Anglian RBMP measures targeted at implementing and encouraging water efficiency measures. Therefore, a cumulative beneficial effect is identified for the water, biodiversity, population and human health SEA objectives.
- 7.2.21 Additionally, the final WRMP24 includes commitments by Essex and Suffolk Water to carry out further investigations in consultation with the Environment Agency of some existing water sources to assess whether abstraction licence conditions should be modified to ensure a long term sustainable water environment as part of its wider WINEP investigations programme.

Step 2: Cumulative Effects Associated with Programmes and Strategic Projects

- 7.2.22 The Cumulative Effects Associated with Programmes and Strategic Projects are outlined in Table 7-4.

Table 7-4: Potential Inter-Plan BVP Cumulative Effects against SEA Objectives

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
Topic 1: Biodiversity, flora and fauna	Objective 1.1: To protect designated sites and their qualifying features.	<p><u>Special Protection Areas and Special Areas of Conservation</u></p> <p>The HRA (Appendix F) examined the potential construction and operation effects in light of the individual Habitats Site's conservation objectives. At this stage, (the plan making stage), the HRA assessment concluded that, with applied mitigation, would not give rise to adverse effects on the integrity of individual habitat sites, as assessed against the conservation objectives.</p> <p>Neutral cumulative effects have been identified on HRA Habitats Sites with other developments.</p> <p><u>Other designated sites</u></p> <p>Multiple BVP options have potential to impact a number of SSSIs and Ramsar sites. However, no developments, plans or projects are anticipated to impact these SSSIs and Ramsar sites.</p> <p>There is the potential for the BVP (ESW-NIT-005 and ESW-NIT-006) and EC2: East Colchester / Hythe Special Policy Area to have cumulative on Blackwater, Crouch, Roach and Colne Estuaries MCZ.</p> <p>ESW-NIT-005 and ESW-NIT-006 were both identified to have minor adverse effects on this objective during construction.</p>	<p>Potential for significant cumulative effects should only exist if the construction phase of ESW-NIT-005 and ESW-NIT-006 over-lap with development of EC2: East Colchester / Hythe Special Policy Area. No cumulative effects are anticipated during the operation phase.</p> <p>With applied mitigation, no significant cumulative effects have been identified for this SEA objective, subject to i) the implementation of construction best practice mitigation for the BVP Options, ii) assuming that the LPAs have, or will, go through an appropriate level of environmental assessment (e.g., Environmental Impact Assessment) and iii) Construction programmes do not coincide.</p>	<p>Best practice methods to be implemented to minimise disturbance effects and habitat loss. Where required directional drilling or option re-alignment may be required as the option design progresses.</p> <p>Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat.</p> <p>Ecology surveys will be required at future design stages to further refine identified effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects will be further reduced. Implementation of mitigation measures set out in HRA Stage 2 Appropriate Assessments where these have been undertaken for both ESW and other water companies.</p> <p>EC2: East Colchester / Hythe Special Policy Area mitigation: The Local Planning Authority will only grant planning consent where it can be ascertained that the proposal will not adversely affect the integrity of a habitats site, unless the exceptional requirements of Regulations 62 and 66 of the Habitats Regulations relating to the absence of alternative solutions, imperative reasons of overriding public interest and provision of compensation have been met. In addition, Colchester Borough Council has signed up to and is a key partner in the Essex Coast RAMS/ Bird Aware Essex Coast recreational mitigation strategy, this mechanism is supported by Natural England as ensuring that AEoI to European Sites will be avoided through the Local Plan.</p>

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
	Objective 1.2: To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	<p>BVP options ESW-EFR-002A, ESW-NIT-006, ESW-TRA-001 and ESW-TRA-019 have potential to affect a number of areas of Ancient Woodland. However, no developments, plans or projects are anticipated to impact these areas of Ancient Woodland.</p> <p>As these are indirect impacts during construction it is expected that construction best practice mitigation would manage disturbance to a level where there is no combined effect.</p> <p>All options which require planning permission will be required to demonstrate a least 10% BNG. By identifying developments and projects that have the potential to have a cumulative effect with the BVP, opportunities to work with developers can be identified at an early stage. Working with developers to design and implement a BNG strategy would have the potential for beneficial cumulative effects as it will allow an integrated approach which considers nature recovery networks and habitat connectivity.</p> <p>Assuming the BNG requirements at the time of construction are met, neutral cumulative effects are identified for this SEA Objective.</p>	<p>With applied mitigation, no significant adverse effects have been identified subject to i) the implementation of construction best practice mitigation for the BVP Options, ii) assuming that the BNG requirements at the time of construction are met by the developments listed.</p> <p>There is potential for minor positive cumulative effects on the wider environment in the long-term from achieving a 10% BNG and habitat reinforcement.</p>	<p>By identifying developments and projects that have the potential to have a cumulative effect with the BVP, opportunities to work with developers can be identified at an early stage. Working with developers to design and implement a BNG strategy would have the potential for beneficial cumulative effects as it will allow an integrated approach which considers nature recovery networks and habitat connectivity.</p>
	Objective 1.3: To avoid spreading and, where required, manage invasive and non-native species (INNS).	<p>Each project is required to ensure that they do not spread INNS. Therefore, although there are multiple developments within the project area, neutral cumulative effects are anticipated for this SEA Objective, as a result of the findings of the INNS risk assessment in Appendix I.</p>	<p>With applied mitigation, no significant effects have been identified during construction and operation..</p> <p>INNS risk assessment (Appendix I) recommend that the assessment is reviewed and updated using the SAI-RAT for options which are taken forward as more information becomes available. Given the current uncertainty surrounding the final option design, several inputs into the tool are 'Unknown' and therefore an average score</p>	<p>Best practice construction techniques to be implemented.</p> <p>Adjust timing of construction works as required so construction activities are not coinciding with other developments.</p> <p>Abstraction from rivers will be taken at appropriate times to mitigate against effects on water-dependent designated sites.</p>

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
			has been generated to mitigate for the uncertainty surrounding these values.	
	Objective 1.4: To meet WFD objectives relating to biodiversity.	<p>A full assessment of cumulative inter-plan effects for the BVP and WFD objectives relating to biodiversity is provided in the WFD Assessment (Appendix G).</p> <p>The cumulative effects assessment for the BVP has identified 10 water bodies which are impacted by more than one BVP option. Of these water bodies, none were assessed to have potential to increase risk of WFD deterioration due to multiple options.</p> <p>In addition to the BVP options, other developments, plans or projects could lead to potential for impacts upon some water bodies. The inter-plan effects assessment identified 12 water bodies where multiple options and other plans occur. The inter-plan cumulative effects assessment identified one water body (GB105035046270: Minsmere Old River) is at potential risk of further WFD deterioration due to the combination of options and developments. Further information on the developments, plans or projects, delivery dates and any overlap between options in this water body would be required to quantify the in-combination effects.</p> <p>As a result of the above, cumulative adverse effects has been identified for this Objective, related to the potential for cumulative effects (related to biodiversity) on WFD water bodies.</p>	<p>With applied mitigation, no significant effects have been identified for the construction phase, It is assumed by managing the timing of construction activities to reduce/remove overlap of construction activities of other developments, cumulative adverse effects can be mitigated.</p> <p>Further information on the planning projects, delivery dates and any overlap between options would be required to quantify the in-combination effects during the operation phase.</p>	<p>Best practice construction techniques to be implemented.</p> <p>Adjust timing of construction works as required so construction activities are not coinciding with other developments.</p> <p>Abstraction from rivers will be taken at appropriate times to mitigate against effects on water-dependent designated sites. For mitigation measures for supply side options that underwent WFD Level 2 assessment refer to Appendix G.</p> <p>The monitoring and / or modelling of river flows is required to determine when surface water can be abstracted. Groundwater levels will also be monitored and / or modelled to minimise the effect on them. Specific mitigation measures will be identified through monitoring.</p>
Topic 2: Soil	Objective 2.1: To protect and enhance the functionality and quality of soils, including the protection of high-grade	<p>Landfill</p> <p>There is potential for 8 direct cumulative effects on historical landfill sites from the BVP and other developments, plans or projects.</p>	<p>With applied mitigation, no significant cumulative effects have been identified for this SEA objective during construction and operation, subject to i) the implementation of construction best practice mitigation for the</p>	<p>Best practice construction techniques. For instance, permanent loss should be on non-best and most versatile (BMV) land where possible, and only on BMV land where there are no other alternatives. The reinstatement or</p>

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
	agricultural land, and geodiversity.	<p>While it is recommended to consider realignment of the options or trenchless construction techniques to avoid or reduce potential direct cumulative effects, at present there is potential for adverse cumulative effects on the identified historical landfill sites. Best practice techniques are required to prevent disturbance of contaminated material during construction.</p> <p>Agriculture</p> <p>A number of BVP options and other developments, plans and projects are located within areas of the best and most versatile (BMV) agricultural land (Grade 1, 2 and Grade 3a). BVP options involving permanent below ground infrastructure, such as transfers, will look to reinstate soils and return land to agriculture on construction completion. BVP options involving permanent above ground infrastructure may require permanent land take of BMV agricultural land. Whilst there is potential for this to be mitigated through design (i.e., by locating above ground infrastructure outside of BMV agricultural areas), a precautionary assessment of an adverse cumulative effect on BMV agricultural land has been concluded.</p> <p>Following the above assessment, adverse cumulative effects are identified for this SEA Objective.</p>	BVP Options, ii) assuming that the LPAs have, reprovision of land will be required post- or will, go through an appropriate level of environmental assessment (e.g., Environmental Impact Assessment).	reprovision of land will be required post-construction.
Topic 3: Water	Objective 3.1: To reduce or manage flood risk, taking climate change into account.	<p>11 of the 13 BVP options are located within either Flood Zone 2 or Flood Zone 3, with 10 being located in both flood zones.</p> <p>Areas around Colchester and Lowestoft are likely to be particularly susceptible to cumulative effects from ESW-EFR-002A and ESW-NIT-006 options, and multiple LPAs; Housing Development North of Lowestoft Garden Village, Cross Boundary</p>	<p>With applied mitigation no significant effects have been identified during construction and operation.</p> <p>Best practice measures will be implemented to reduce the impact on flooding during the construction phase, however the risk still remains during construction, meaning short term flood risk effects may remain.</p>	<p>Best practice measures to be implemented as described in Table 8-1.</p> <p>A Flood Risk Assessment (FRA) is to be undertaken during detailed design and above-ground infrastructure will be designed to be flood resilient. Floodplain compensation may be required.</p>

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
		<p>Garden Community and Housing Development at Land at Middlewick Ranges SC2.</p> <p>There is the potential for cumulative effects from the loss of active floodplain, due to the implementation of the BVP alongside other developments, plans and projects. However, there is a national planning requirement for schemes to demonstrate no net loss of floodplain storage and no obstruction to flood flows. Therefore, subject to this requirement being enforced, and no net loss of floodplain achieved (e.g., through compensation), neutral cumulative effects are identified for this SEA Objective.</p>		<p>In addition, the Housing Development North of Lowestoft Garden Village Masterplan includes plans to address site levels to provide a suitable surface water management and utilising the existing ditch around parts of the site that conveys water.²⁸</p>
	<p>Objective 3.2: To enhance or maintain surface water quality, flows and quantity.</p>	<p>A full assessment of cumulative inter-plan effects for the BVP and WFD objectives relating to biodiversity is provided in the WFD Assessment (Appendix G).</p> <p>The cumulative effects assessment for the BVP has identified 10 water bodies which are impacted by more than one BVP option. Of these water bodies, none were assessed to have potential to increase risk of WFD deterioration due to multiple options.</p> <p>In addition to the BVP options, other developments, plans or projects could lead to potential for impacts upon some water bodies. The inter-plan effects assessment identified 12 water bodies where multiple options and other plans occur. The inter-plan cumulative effects assessment identified one water body (GB105035046270: Minsmere Old River) is at potential risk of further WFD deterioration due to the combination of options and developments. Further</p>	<p>With applied mitigation, no significant effects have been identified during construction and operation.</p> <p>Further information on the planning projects, delivery dates and any overlap between options would be required to quantify the in-combination effects. It is assumed by managing the timing of construction activities to reduce/remove overlap of construction activities of other developments, cumulative adverse effects can be mitigated.</p>	<p>Best practice construction to be implemented as described in Table 8-1.</p> <p>The monitoring and / or modelling of river flows is required to determine when surface water can be abstracted. Groundwater levels will also be monitored and / or modelled to minimise the effect on them. Specific mitigation measures will be identified through monitoring.</p>

²⁸ North of Lowestoft Garden Village Masterplan, [Accessed 28.08.2024], Available at [Lowestoft-Masterplan-20.04.22.pdf \(northoflowestoft.co.uk\)](#)

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
		<p>information on the developments, plans or projects, delivery dates and any overlap between options in this water body would be required to quantify the in-combination effects.</p> <p>Consequently, cumulative adverse effects have been identified for this Objective, related to the potential for cumulative effects (related to surface water) on WFD water bodies.</p>		
	<p>Objective 3.3: To enhance or maintain groundwater quality and resources.</p>	<p>A number of the BVP options and other developments, plans and projects are located within Source Protection Zone 2 or Source Protection Zone 3. For example, 9 of the BVP options and LPAs; Urban Extension Land East of Great Notley (within Black Notley Parish) LPP17 BLAN114 and solar PV installation at Sunica East are located within the same area of Source Protection Zone 3 and have potential for cumulative effects.</p> <p>In light of the above, adverse cumulative effects are anticipated for this SEA Objective.</p> <p>The BVP does not include any new abstractions within the SPZs and any new development will be required to prevent pollution to groundwater sources, therefore mitigation to reduce risk of pollution will likely be sufficient to remove significant cumulative adverse effects.</p>	<p>With applied mitigation, no significant effects have been identified during construction and operation.</p> <p>It is assumed by managing the timing of construction activities to reduce/remove overlap of construction activities of other developments, cumulative adverse effects can be mitigated.</p> <p>Further information on the planning projects, delivery dates and any overlap between options would be required to quantify the in-combination effects.</p>	<p>Best practice construction techniques to be implemented as outlined in Table 8-1.</p> <p>Best practice methods during construction to reduce contamination of surface waters and groundwater. Pollution prevention measures are to be implemented, including the use of directional drilling or other trenchless techniques where pipelines are to cross watercourses.</p> <p>Groundwater levels will be monitored and / or modelled to minimise the effect on them. Specific mitigation measures will be identified through monitoring.</p>
	<p>Objective 3.4: To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.</p>	<p>A full assessment of cumulative inter-plan effects for the BVP and WFD objectives relating to biodiversity is provided in the WFD Assessment (Appendix G).</p> <p>The cumulative effects assessment for the BVP has identified 10 water bodies which are impacted by more than one BVP option. Of these water bodies, none were</p>	<p>With applied mitigation, no significant effects have been identified during construction and operation.</p> <p>Further information on the planning projects, delivery dates and any overlap between options would be required to quantify the in-combination effects. It is assumed by</p>	<p>The monitoring and / or modelling of river flows is required to determine when surface water can be abstracted. Groundwater levels will also be monitored and / or modelled to minimise the effect on them. Specific</p>

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
		<p>assessed to have potential to increase risk of WFD deterioration due to multiple options.</p> <p>In addition to the BVP options, other developments, plans or projects could lead to potential for impacts upon some water bodies. The inter-plan effects assessment identified 12 water bodies where multiple options and other plans occur. The inter-plan cumulative effects assessment identified one water body (GB105035046270: Minsmere Old River) is at potential risk of further WFD deterioration due to the combination of options and developments. Further information on the developments, plans or projects, delivery dates and any overlap between options in this water body would be required to quantify the in-combination effects.</p> <p>As a result, adverse cumulative effects have been identified for this Objective, related to the potential for cumulative effects (related to WFD objectives) on WFD water bodies.</p>	<p>managing the timing of construction activities to reduce/remove overlap of construction activities of other developments, cumulative adverse effects can be mitigated.</p>	<p>mitigation measures will be identified through monitoring.</p> <p>For mitigation measures for supply side options that underwent WFD Level 2 assessment refer to Appendix G. Further assessment of the effects under the WFD would be required for those waterbodies detrimentally affected. If there is a likelihood of deterioration to, or prevention of future improvement to the ecological status of the waterbodies, evidence would be required to demonstrate that there are no reasonable alternative options that would avoid these effects. If no alternative options are available, consideration would need to be given to the presence of reasons of overriding public interest, mitigation and compensation measures would need to be secured.</p>
	<p>Objective 3.5: To increase water efficiency and increase resilience of water supplies and natural systems to droughts.</p>	<p>The anticipated shift in behaviour, along with efficiency savings, will result in the BVP increasing the volume of reliable water resource available. This has the potential for cumulative effects with other developments, plans and projects taking place within the Essex and Suffolk area, by increasing resilience to water supplies, particularly areas such as Braintree, Colchester and Maldon, which have local plan housing allocations for over 1000 dwellings.</p> <p>Therefore, cumulative beneficial effects are identified for this SEA Objective.</p>	<p>Moderate significant positive effects have been identified during operation.</p> <p>With applied mitigation no significant adverse effects have been identified during construction or operation.</p>	<p>The monitoring and / or modelling of river flows is required to determine when surface water can be abstracted. Groundwater levels will also be monitored and / or modelled to minimise the effect on them. Specific mitigation measures will be identified through monitoring.</p>
Topic 4: Air	Objective: To reduce and minimise air emissions	The BVP has the potential to impact the following Air Quality Management Areas (AQMAs); Area 1 - Central Corridors (ESW-	No significant effects have been identified during construction and operation.	Undertake further assessment of environmental effects through the design development and consenting process, which

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
	during construction and operation.	NIT-006) and Area 2 - East Street and the adjoining lower end of Ipswich Road (ESW-NIT-006). However, there are currently no developments, plans or projects anticipated to impact any AQMAs. Following the above, neutral cumulative effects are therefore identified for this SEA Objective.		may include Environmental Impact Assessment. Best practice mitigation measures are to be implemented during construction to minimise air pollution. Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is reasonably possible. Ensure all vehicles switch off engines when stationary – no idling vehicles. Ensure water suppression is used during demolition, excavation and other earth-moving operations. Any demolitions or concrete breakout to be undertaken in suitable weather conditions i.e., avoiding windy conditions. For demand management, consider shift of employee fleet to electric vehicles to lessen impact from maintenance, audit, and installation visits. however, short term air quality effects may remain.
Topic 5: Climatic Factors	Objective 5.1: To minimise/reduce embodied and operational carbon emissions.	There are multiple developments planned within WRZs ESW Essex and Northern Central, the same areas as a majority of the BVP options. This could have the potential to have a cumulative effect on carbon emissions within the Essex & Suffolk region. The opportunity to use renewables during construction and operation for energy supply and use of materials with lower embodied carbon will be investigated for the BVP. A carbon footprint study could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in short and medium-term will likely remain from individual options, consequently resulting in potential	Significant adverse cumulative effects have been identified during the construction phase. With applied mitigation no significant effects have been identified during the operation phase.	Undertake further assessment of environmental impacts through the design development and consenting process, which may include Environmental Impact Assessment. The use of renewables for the energy supply during construction and operation will be investigated, as well as the use of materials with lower embodied carbon. A carbon footprint study could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will become available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain. Seek alternatives to energy intensive activities, such as pumping, where practicable alternatives could be used. The sustainable use of water should be ensured to reduce the vulnerability of the local environment.

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
		<p>cumulative effects with the BVP and other developments.</p> <p>In light of this assessment, adverse cumulative effects are identified for this SEA Objective.</p>		
	<p>Objective 5.2: To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.</p>	<p>Water levels are not predicted to be significantly affected by the construction of any of the options forming part of the BVP and are therefore unlikely to have cumulative effects with other developments to the resilience of the local environment to climate change. However, there may be short term effects due to flood risk during the construction phase for the options and other developments. It is anticipated that those effects can be mitigated resulting in no residual effects on the climate resilience of any of the options' assets. As such, there are no likely cumulative effects on the ability of the BVP and other developments to reduce vulnerability to climate change risks and hazards during construction.</p> <p>During operation, many of the options will increase the surface area of hardstanding in the region, which has the potential to increase surface flood risk and therefore increase vulnerability to climate change risks and hazards. Options are also proposed in coastal regions which could be prone to flooding risk with potential future sea level rise. For those options operating in proximity to another development, there is likely to be an indirect cumulative effect, dependent upon the location of permanent above ground assets.</p> <p>Consequently, no cumulative effects are identified for this SEA objective.</p>	<p>No significant effects have been identified.</p>	<p>None required.</p>
<p>Topic 6: Landscape</p>	<p>Objective 6.1: To conserve, protect and enhance landscape and townscape character and visual amenity.</p>	<p>The Broads National Park has the potential to be affected by the BVP and other developments, plans and projects.</p> <p>The Broads National Park will be directly affected by the BVP (ESW-EFR-002A,</p>	<p>With applied mitigation, no significant effects have been identified during construction and operation.</p>	<p>Best practice measures are to be implemented to minimise effects during construction, although temporary effects during construction may remain. Measures will be incorporated to reduce landscape and visual impact of</p>

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
		<p>ESW-RES-002C1, ESW-TRA-018 and ESW-TRA-023) and indirectly affected by Kirkley Waterfront and Sustainable Urban Neighbourhood. Impacts are anticipated during both construction and operation, due to the nature of the BVP options and other developments plans and projects.</p> <p>At planning stage, it is likely the impacts on The Broads National Park will be mitigated, through landscape and visual impact assessment, for example.</p> <p>As a result, adverse cumulative effects are identified for this SEA Objective.</p>		<p>construction, such as through avoiding unnecessary tree and vegetation removal.</p> <p>Undertake further assessment of environmental impacts through the design development and consenting process, which may include Environmental Impact Assessment and visual impact assessment.</p> <p>Measures will be incorporated to reduce landscape and visual impact of substantive above ground infrastructure, such as the new reservoir and embankment, for example the planting of trees to screen and reduce the height of any embankment. However, although design features will likely improve the aesthetics, the landscape will remain changed.</p>
Topic 7: Historic Environment	Objective 7.1: To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	<p>The following historic assets have potential for indirect cumulative effects from the BVP options and external plans and/or projects:</p> <ul style="list-style-type: none"> • 'Group of barrows at Annan Road' Scheduled Monument has the potential to be indirectly affected by the BVP (ESW-NIT-006) and EC2: East Colchester / Hythe Special Policy Area. • Chelmer and Blackwater Navigation Conservation Area has the potential to be directly affected by the BVP (ESW-UVC-001, ESW-NIT-005 and ESW-PMP-001A) and Housing Development North Heybridge Garden Suburb. • Langford Conservation Area has the potential to be directly affected by the BVP (ESW-UVC-001, ESW-NIT-005 and ESW-PMP-001A) and Housing Development North Heybridge Garden Suburb. <p>There is potential for adverse cumulative effects on the presence and/or setting of</p>	With applied mitigation, no significant effects have been identified during construction and operation.	<p>Undertake further assessment of environmental effects through the design development and consenting process, which may include Environmental Impact Assessment.</p> <p>Best practice measures are to be implemented to protect designated and non-designated heritage assets and to minimise effects on their setting during construction. Temporary works to be situated away from listed buildings and scheduled monuments where appropriate.</p> <p>Further studies will be undertaken as option design progresses, including consultation with LPA advisor and a review of the Historic Environment Record.</p> <p>Early engagement with regional Historic England office, particularly in locations where there is potential for nationally significant remains.</p>

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
		<p>historic assets (for example, Scheduled Monuments, Conservation Areas) where options are located within or adjacent to the designation. For example, Lower Thames Crossing DCO and Option ESW b20154-ABS-003 have potential for adverse cumulative effects on <i>Crop mark complex</i>, <i>Orsett</i> Scheduled Monument.</p> <p>In light of the above assessment, adverse cumulative effects are identified for this SEA Objective.</p>		
<p>Topic 8: Population and Health</p>	<p>Objective 8.1: To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.</p>	<p>The following BVP options have the potential to impact the Noise Action Planning Important Areas; ESW-EFR-002A and ESW-NIT-006. However, there are currently no developments, plans or projects anticipated to impact any Noise Action Planning Important Areas.</p> <p>A number of community features have the potential to be impacted by the BVP and other developments, plans or projects. These include:</p> <ul style="list-style-type: none"> • Saxmundham War Memorial Playing Field will be affected by BVP option ESW-TRA-001 and The Sizewell C Project. • St Bartholomew's Church will be affected by BVP options ESW-RES-002C1 and ESW-TRA-023 and North of Lowestoft Garden Village development. • King George's Playing Fields and Elms Farm Park will be affected by BVP option ESW-NIT-005 and North Heybridge Garden Suburb development. <p>Construction related effects which could impact the health and wellbeing of the local community include pollution events (air or</p>	<p>Significant positive cumulative effects have been identified during operation.</p> <p>With applied mitigation no significant adverse effects have been identified during construction and operation.</p>	<p>Best practice construction techniques to be implemented as described in Table 8-1.</p> <p>Effects can be mitigated by managing construction timings to minimize risk of noise disturbance from overlapping construction activities.</p>

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
		<p>water), noise and disturbance. It is expected that construction best practice would mitigate such risk.</p> <p>The East of England is one of the direst regions in the UK. The BVP is expected to provide sufficient water to accommodate this growth, which is anticipated to be a positive cumulative effect.</p> <p>Therefore, cumulative beneficial effects have been identified for this SEA Objective, related to the increased resilience of water supply, to accommodate future growth.</p>		
	<p>Objective 8.2: To secure resilient water supplies for the health and wellbeing of customers.</p>	<p>The BVP options will have the potential for cumulative beneficial effects, by providing a resilient water supply to customers in the Essex and Suffolk region and safeguarding the provision of essential water supplies in drought conditions, such as to those areas outlined above.</p> <p>The above assessment concludes cumulative beneficial effects have been identified for this SEA Objective.</p>	<p>Positive cumulative effects identified during operation.</p> <p>No significant adverse effects have been identified during construction and operation.</p>	<p>None Required</p>
	<p>Objective 8.3: To increase access and connect customers to the natural environment, provide education or information resources for the public.</p>	<p>There are direct overlaps with multiple BVP options and proposed developments, plans or projects including the North Heybridge Garden Suburb in Maldon. Depending on construction timescales, there is the potential for cumulative effects during construction. Multiple instances of construction disturbance could reduce access to the environment during construction. However, appropriate traffic management and construction best practice is likely to reduce this.</p> <p>Following the assessment above, neutral cumulative effects are identified for this SEA Objective.</p>	<p>No significant effects have been identified.</p>	<p>None Required</p>

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
	Objective 8.4: Maintain and enhance tourism and recreation.	There are direct overlaps with multiple BVP options and other developments, plans or projects. In the operational phase, there are potentially positive cumulative effects, due to the reservoir (ESW-RES-002C1) providing recreational benefits alongside new developments, plans or projects within the area. Therefore, cumulative beneficial effects have been identified for this SEA Objective.	No significant effects have been identified.	None Required
Con/OperationTopic 9: Material Assets	Objective 9.1: Minimise resource use and waste production	Within the Essex and Suffolk region, there are multiple developments planned within the same areas as the BVP options. Although timescales for the planned developments are not yet known, there is the potential for cumulative effects on resource use and waste production, as the need for construction material are increased substantially. In light of this, adverse cumulative effects are identified for this SEA Objective.	Significant (moderate) cumulative adverse effects identified during the construction phase. With applied mitigation no significant cumulative effects have been identified during the operation phase.	Undertake further assessment of environmental effects through the design development and consenting process, which may include Environmental Impact Assessment. Opportunities will be sought after to implement sustainable design measures (design to reduce footprint, selection of materials) and re-use excavated material to reduce the impact. However, it is likely that minor (non-significant) negative effects will remain. Ensure best practice methods to reduce waste through accurate planning. Production of a waste management plan which details what waste will be generated during construction, as well as to highlight opportunities for re-use or recycling of materials. Minimise waste generation and adopt the waste hierarchy process. Integrated planning of infrastructure can contribute to decreased resource use by limiting the amount of new infrastructure that is required in order to meet user needs.
	Objective 9.2: Avoid negative effects on built assets and infrastructure.	<u>Roads:</u> There is potential for cumulative effects from the BVP and other developments, plans and projects, for example between	With applied mitigation, no significant effects have been identified during construction and operation.	Implementation of a CEMP Best practice construction techniques to be implemented as described in Table 8-1.

SEA Topic	SEA Objective	Potential for Cumulative Effects	Significant effects	Potential Mitigation measures
		<p>BVP option ESW-TRA-001 and the A12 and Option ESW-ABS-003, the Lower Thames Crossing DCO and A13.</p> <p><u>Railway:</u> BVP option ESW-NIT-006 and EC2: East Colchester / Hythe Special Policy Area will both direct affect areas of the railway running to the east of Colchester.</p> <p><u>National Cycle Routes:</u> There is potential for cumulative effects from the BVP (ESW-TRA-001) and other developments, plans and projects (Preferred Option SSP23 Carlton Park, Main Road, Kelsale cum Carlton) on National Cycle Route 14.</p> <p>Adverse cumulative effects are identified for this SEA Objective, as a result of the above assessment.</p>		

7.3 Final Plan Justification

- 7.3.1 ESW have developed an efficient BVP using a best practice decision-making process involving EBSD cost modelling and multi-criteria assessment. The investment that Ofwat allows for these plans will help to continue to provide essential services long into the future. ESW recognise that there is a lot more that water companies will be required to do in the future than has been delivered in the past, meaning that much larger investments are required across all areas of their business. As a result, they have developed these plans with their customers in mind to manage the impact on customer bills while making sure there will be enough water in the region in the future.
- 7.3.2 ESW believe that this BVP delivers its objectives and meets government expectations as set out in Section 2.2 of this report. For further information on ESW's justification for this plan, see the ESW WRMP Main Report.

8 Mitigation Measures and Enhancement Opportunities

8.1 Mitigation and Enhancement Measures

- 8.1.1 Mitigation and enhancement measures were identified as part of the SEA options assessment process. These measures have been recorded and collated into a register (see Table 8-1). The outcome of the assessments (reported in Sections 5, 6, and 7) are the residual effects, which means that it is assumed that the identified mitigation has been applied (to the option) and the reported effects are those that remain. It is noted that the HRA Appropriate Assessment – within Appendix F – *Habitats Regulations Assessment*; and WFD Level 2 assessment – within Appendix G – *Water Framework Directive Assessment*, for specific supply side options contain additional description of mitigation relevant to the focus of those assessments, which can be found in the relevant Sections of those reports.
- 8.1.2 The identified mitigation generally falls into two categories. The first is primary (or embedded) mitigation; generally, actions that are taken to avoid impacts occurring by incorporating them into the options development process. For example, 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.
- 8.1.3 The second type of mitigation is secondary (or reductive) mitigation. This is where an impact cannot be avoided, and the focus is on reducing the impact or providing some form of compensation. For example, using renewable energy to reduce carbon emissions. Additional actions such as further investigations and risk assessments can also form and lead to actions which are secondary mitigation.
- 8.1.4 How the secondary mitigation is secured will depend on the type of mitigation and the consenting route. For some projects, EIAs will require a systematic review of impacts and the appropriate mitigation. The actions to mitigate the impacts will be identified and documented, for example, in a CEMP. Statutory stakeholders such as the EA, Natural England and Historic England will also seek to secure mitigation, through engagement in the consenting process, with the local planning authority and/or planning inspectorate. The granting of consent will include the mitigation (for example, a schedule of commitments, planning conditions, etc.) and ESW will be required to discharge those requirements.
- 8.1.5 Mitigation and enhancement measures specific to each option are presented within their relevant SEA tables and within Appendix K – *SEA Assessment Matrices*. In addition to this, mitigation measures identified within the more in-depth Level 2 assessments undertaken under the HRA and WFD processes for supply side options are available in their respective discipline appendices. All this information has informed the identification of significant effects presented in Sections 5, 6, and 7.
- 8.1.6 The HRA Appropriate Assessment secondary mitigation measures may include but are not limited to: biosecurity measures to ensure appropriate removal and/or management control of INNS at source; the use of directional drilling at watercourses of specified sizes; completion of further studies including hydrological modelling of the abstraction on specified rivers; pre-construction surveys for breeding or resting species within the Zol; and reinstatement of habitats that have been disturbed during construction. All assessments have been undertaken on concept designs of options. The results of the assessments, including mitigation and monitoring

currently proposed will be re-visited at a project level, as the projects progress through detailed design. Based on the current level of detail available for the final WRMP24, a number of established mitigation measures are given which can be assumed for all options. These measures are defined as industry-wide best practice measures to address common risks in the construction and development sectors and thus are proven to reduce the risk of the identified effects as far as is reasonably possible. Option specific mitigation and monitoring measures are also outlined. In-combination these measures will be applied to the construction of the final option and constitute mitigation to avoid or reduce adverse effects on Habitats Site integrity and therefore are only mentioned at the AA stage and are outlined within Appendix F – *Habitats Regulations Assessment*.

- 8.1.7 The WFD Level 2 assessment secondary mitigation measures may include but are not limited to: fish and eel screening; adjustment of abstraction conditions to limit changes to hydrological regime; use of licence capping; creation of habitat refuges; and sealing of shafts to ensure minimal groundwater egress after construction.
- 8.1.8 The reported significant effects in these disciplines’ respective appendices (and Section 7) are post-mitigation (residual) effects of the SEA findings and have assumed relevant and applicable mitigation measures are incorporated. As the mitigation measures identified below have been considered in the option assessment process, they all contribute to reducing effects that have been identified as a result of the final WRMP24.

Table 8-1: Proposed Mitigation Measures

SEA Topic	SEA Objective(s)	Mitigation
Biodiversity, flora and fauna	1.1 To protect designated sites and their qualifying features.	<ul style="list-style-type: none"> • A programme of works should be established as early as possible to enable any investigations, surveys and mitigation to be established and give sufficient time for consultation with relevant bodies. The programme should consider any seasonal constraints to avoid adverse effects on sensitive receptors (e.g., breeding birds). • Undertake HRA AAs for the options being considered as part of the preferred plan and the alternatives. Mitigation incorporated in the AA should be implemented for the project. Undertake further assessment of environmental impacts through the design development and consenting process, which may include Environmental Impact Assessment. For mitigation measures for supply side options that underwent HRA AA refer to Appendix F. • Best practice methods are to be implemented during construction to minimise disturbance effects, prevent the spread of INNS, and habitat loss. This includes refining pipeline alignment or using trenchless techniques to avoid woodland habitat, particularly Ancient Woodland and biodiversity action plan (BAP) Priority Habitat. Best practice mitigation methods are to be implemented to prevent the spread of INNS during construction, such as washing work boots on site, as well as the appropriate selection of other pollution prevention measures. To ensure that the operation does not lead to a transfer of invasive species, appropriate filtration species must be in place. Treatment at the upgraded WTW would prevent any non-native species being transferred further. However, there still may be residual risk. Pollution prevention measures are to be implemented, including the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction. • Route re-alignment is recommended if it is possible to avoid direct impacts with the SSSI, Ramsar, SAC, SPA and MPA, or to avoid the most high-value habitats.
	1.2 To protect and enhance biodiversity, priority species and vulnerable habitats such as chalk rivers.	
	1.3 To avoid spreading and, where required, manage invasive and non-native species (INNS).	
	1.4 To meet WFD objectives relating to biodiversity.	

SEA Topic	SEA Objective(s)	Mitigation
		<ul style="list-style-type: none"> Abstraction from rivers will be taken at appropriate times to mitigate against effects on water-dependent designated sites. For mitigation measures for supply side options that underwent WFD Level 2 assessment refer to Appendix G. Ecology surveys will be required at further design stages to determine the effects and mitigation that will be required. It is assumed that the recommended mitigation will be implemented, therefore residual operational effects will be lessened, although this would not negate the need for a potential appropriate assessment. Ensure best practicable means to prevent loss of habitat during construction, e.g., trenchless techniques to avoid ecologically sensitive locations. Habitat will be reinstated upon completion, and compensatory habitat is to be considered to replace damaged or lost habitat. A new reservoir has significant opportunities for benefits to ecology. Operational residual impacts are also lessened assuming the implementation of this adequate mitigation.
Soil	2.1 To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	<ul style="list-style-type: none"> Undertake further assessment of environmental effects through the design development and consenting process, which may include Environmental Impact Assessment. Best practice construction techniques are to be implemented to prevent the disturbance of contaminated material. Damage to agricultural land will be lessened through design, to reduce the option footprint and the construction working area. This will restrict the amount of land permanently taken or temporarily disturbed. Temporary loss should be on non-best and most versatile (BMV) land where possible, and only on BMV land where there are no alternatives. Additional construction phase mitigation is also to be implemented to further reduce potential damage to agricultural land. The ground will be reinstated, meaning that long term residual effects on agricultural soils as a result of pipeline construction are unlikely. The new reservoir, pumping stations, desalination plant, and effluent re-use plant will all result in a permanent loss and subsequently residual effects are identified. Permanent loss should be on non-best and most versatile (BMV) land where possible, and only on BMV land where there are no other alternatives. The reinstatement or reprovision of land will be required post-construction.
Water	<p>3.1 To reduce or manage flood risk, taking climate change into account.</p> <p>3.2 To enhance or maintain surface water quality, flows and quantity.</p> <p>3.3 To enhance or maintain groundwater quality and resources.</p> <p>3.4 To meet WFD objectives and support the achievement of environmental objectives</p>	<ul style="list-style-type: none"> Undertake further assessment of environmental impacts through the design development and consenting process, which may include Environmental Impact Assessment. Best practice measures will be implemented to reduce the impact on flooding during the construction phase, however the risk still remains during construction, meaning short term flood risk effects may remain. A Flood Risk Assessment (FRA) is to be undertaken and above-ground infrastructure will be designed to be flood resilient. Floodplain compensation may be required. Best practice methods during construction to reduce contamination of surface waters and groundwater. Pollution prevention measures are to be implemented, including the use of directional drilling or other trenchless techniques where pipelines are to cross watercourses. With mitigation, residual construction effects are considered negligible. Operational impacts will remain on river flow from abstraction and potential transfer of INNS, but

SEA Topic	SEA Objective(s)	Mitigation
	<p>set out in River Basin Management Plans.</p> <p>3.5 To increase water efficiency and increase resilience of water supplies and natural systems to droughts.</p>	<p>residual impacts are lessened assuming implementation of adequate mitigation.</p> <ul style="list-style-type: none"> The monitoring and / or modelling of river flows is required to determine when surface water can be abstracted. Groundwater levels will also be monitored and / or modelled to minimise the effect on them. Specific mitigation measures will be identified through monitoring. For mitigation measures for supply side options that underwent WFD Level 2 assessment refer to Appendix G. Further assessment of the effects under the WFD would be required for those waterbodies detrimentally affected. If there is a likelihood of deterioration to, or prevention of future improvement to the ecological status of the waterbodies, evidence would be required to demonstrate that there are no reasonable alternative options that would avoid these effects. If no alternative options are available, consideration would need to be given to the presence of reasons of overriding public interest, and mitigation measures would need to be secured.
Air	4.1 To reduce and minimise air emissions during construction and operation.	<ul style="list-style-type: none"> Undertake further assessment of environmental effects through the design development and consenting process, which may include Environmental Impact Assessment. Best practice mitigation measures are to be implemented during construction to minimise air pollution. Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is reasonably possible. Ensure all vehicles switch off engines when stationary – no idling vehicles. Ensure water suppression is used during demolition, excavation and other earth-moving operations. Any demolitions or concrete breakout to be undertaken in suitable weather conditions i.e., avoiding windy conditions. For demand management, consider shift of employee fleet to electric vehicles to lessen impact from maintenance, audit, and installation visits. however, short term air quality effects may remain.
Climatic Factors	<p>5.1 To minimise/reduce embodied and operational carbon emissions.</p> <p>5.2 To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.</p>	<ul style="list-style-type: none"> Undertake further assessment of environmental impacts through the design development and consenting process, which may include Environmental Impact Assessment. The use of renewables for the energy supply during construction and operation will be investigated, as well as the use of materials with lower embodied carbon. A carbon footprint study could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will become available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain. Seek alternatives to energy intensive activities, such as pumping, where practicable alternatives could be used. The sustainable use of water should be ensured to reduce the vulnerability of the local environment. Traffic resulting from construction related road closures and/or diversions is to be monitored, and a traffic/travel plan could be drawn up to ensure that excess vehicular emissions are avoided where possible. For demand management, consider shift of employee fleet to electric vehicles to lessen impact from maintenance, audit, and installation visits
Landscape	6.1 To conserve, protect and enhance landscape	<ul style="list-style-type: none"> Undertake further assessment of environmental impacts through the design development and consenting process, which may include Environmental Impact Assessment.

SEA Topic	SEA Objective(s)	Mitigation
	and townscape character and visual amenity.	<ul style="list-style-type: none"> • Best practice measures are to be implemented to minimise effects during construction, although temporary effects during construction may remain. Measures will be incorporated to reduce landscape and visual impact of construction, such as through avoiding unnecessary tree and vegetation removal. • Land affected by transfer pipelines will be reinstated upon completion, meaning that, with appropriate mitigation, no residual effects are likely to remain during operation. • Measures will be incorporated to reduce landscape and visual impact of substantive above ground infrastructure, such as the new reservoir and embankment, for example the planting of trees to screen and reduce the height of any embankment. However, although design features will likely improve the aesthetics, the landscape will remain changed. • If possible, re-routing the pipeline would minimise the damage and disruption to woodland, including Ancient Woodland. The utilisation of directional drilling or other trenchless techniques would reduce construction effects.
Historic Environment	7.1 To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	<ul style="list-style-type: none"> • Undertake further assessment of environmental effects through the design development and consenting process, which may include Environmental Impact Assessment. • Best practice measures are to be implemented to protect designated and non-designated heritage assets and to minimise effects on their setting during construction. Temporary works to be situated away from listed buildings and scheduled monuments where appropriate. • Measures will be incorporated to reduce setting impact of the reservoir and embankment, for example the planting of trees to screen and reduce the height of any embankment. However, although design features will likely reduce the setting impact, there may be residual effects. • The preferred mitigation for effects on listed buildings, registered parks and gardens and conservation areas (specific to ESW-TRA-019, and ESW-EFR-002A) is to re-route the pipeline; however, if this is not possible then careful construction and reinstatement to its original condition with no detrimental effect on the character, appearance, or design of the RPG or conservation area should be implemented. • Further work is likely to be required to determine the significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to the potential loss of archaeological remains. Archaeological investigations should be carried out prior to commencing construction and the findings will inform detailed mitigation, which will be agreed with the relevant authorities. • Further work is likely to be required to collate data related to non-designated cultural heritage assets. This will then be used to inform the development of the design at the next stage of assessment. • Further studies will be undertaken as option design progresses, including consultation with LPA advisor and a review of the Historic Environment Record. • Early engagement with regional Historic England office, particularly in locations where there is potential for nationally significant remains.
Population and Human Health	8.1 To maintain and enhance the health and wellbeing of the local community, including	<ul style="list-style-type: none"> • Undertake further assessment of environmental effects through the design development and consenting process, which may include Environmental Impact Assessment.

SEA Topic	SEA Objective(s)	Mitigation
	economic and social wellbeing.	<ul style="list-style-type: none"> Where possible, avoid works near to the most sensitive health receptors. Plan construction traffic movements to avoid routes with sensitive receptors and avoid peak traffic hours.
	8.2 To secure resilient water supplies for the health and wellbeing of customers.	<ul style="list-style-type: none"> Best practice mitigation measures, for example noise management, air quality, and traffic management, are to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.
	8.3 To increase access and connect customers to the natural environment, provide education or information resources for the public.	<ul style="list-style-type: none"> The direct land take of recreational sites will be avoided where possible, and any recreational land affected is to be reinstated to at least original condition. However, temporary effects are likely to still occur during construction. There could be potential to enhance any affected cycleways as part of the works, for example during re-instatement.
	8.4 Maintain and enhance tourism and recreation.	<ul style="list-style-type: none"> Operational benefits could be enhanced by incorporating education and information resources within the reservoir design, for example in trails and information boards. They could also be enhanced by incorporating recreational activities into the reservoir design, such as fishing, sailing, and canoeing.
Material Assets	9.1 Minimise resource use and waste production.	<ul style="list-style-type: none"> Undertake further assessment of environmental effects through the design development and consenting process, which may include Environmental Impact Assessment.
	9.2 Avoid negative effects on built assets and infrastructure.	<ul style="list-style-type: none"> Opportunities will be sought after to implement sustainable design measures (design to reduce footprint, selection of materials) and re-use excavated material to reduce the impact. However, it is likely that negative effects will remain. Ensure best practice methods to reduce waste through accurate planning. Production of a waste management plan which details what waste will be generated during construction, as well as to highlight opportunities for re-use or recycling of materials. Minimise waste generation and adopt the waste hierarchy process. Best practice measures, including a Traffic Management Plan, are to be implemented to minimise disturbance during construction works. However, minor, and temporary effects are likely to still occur.

8.1.9 Additional mitigation, in the form of corporate initiatives (identified in Table 3-1, and reviewed in full in Appendix C), will help to improve the performance of the final WRMP24. WRMP’s must aim to support, and where possible, strengthen corporate strategies as set by their respective water company. As a result, this final WRMP24 will be subject to the objectives and commitments as set out in these strategies, such as ESW’s Environment Strategy (2021) – which sets out guidance on overall assets and operations management to avoid environment effects.

8.1.10 The SEA has identified a large array of mitigation measures to help the BVP achieve SEA objectives 1-21 through the options and delivery scheme selected with the final WRMP24. ESW will be responsible for embedding these measures, the secondary mitigation, additional mitigation, and the wider suite of supporting environmental assessments info information provided to the internal team and contractors for the design and consenting of each option within the scheme delivery.

8.1.11 Note that the selected options are those which at this stage of option development have the lowest / acceptable environmental impacts. Any options with unacceptable environmental impacts were considered unfeasible. However, as detailed design progresses for the selected options and more information becomes available, if environmental compliance issues emerge, and, identified mitigation is not considered sufficient, or mitigation is unlikely to sufficiently

mitigate significant effects then previously rejected, alternative supply side options would be re-visited.

8.2 Enhancement Opportunities

8.2.1 The SEA identified numerous enhancement measures across the option assessments, these included:

- There could be potential to enhance cycleways, bridleways and public right of way networks as part of the works, for example during re-instatement.
- Operational benefits could be enhanced by incorporating education and information resources within the design, for example in trails and information boards.
- There could be specific enhancements for the reservoirs, such as incorporating recreational activities into the reservoir design, such as fishing, sailing, and canoeing. This would need to be done sensitively, whilst recognising and minimising INNS risks.
- Development of sites as a tourism/ recreational asset, which may in turn provide jobs.
- Opportunities to create habitat as part of a reservoir – the new reservoirs have significant potential opportunities for ecology.
- Opportunity to improve existing habitats through post construction remediation.
- Opportunities for sustainable design measures and re-use of material.

9 Monitoring

9.1 Monitoring Proposals

9.1.1 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 final WRMP24 is being successfully implemented. Monitoring is required to track environmental effects to show whether they arise as anticipated in the SEA appraisal, to help identify any adverse effects and trigger deployment of any of the mitigation measures. The Department for Communities and Local Government (DCLG) guidance states that it is inappropriate to monitor everything, but that 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.

9.1.2 Negative effects or uncertainty identified during the SEA process focused on effects on ecology, carbon emissions, landscape, and the historic environment. Whilst key monitoring parameters should focus on those areas with more significant anticipated environmental risks, all anticipated risks, including minor risks, should be accounted for within the monitoring programme where it is practicable to do so. Any site-specific monitoring requirements for options included within the BVP will be developed during the planning process closer to the time of implementation. Table 9-1 presents the SEA monitoring proposals for the final WRMP24. The indicators have been adapted to those developed as part of the SEA Framework in Table 3-2. Indicators have also been chosen to record the potential benefits that the final WRMP24 achieves (e.g., recreational assets created, waste recycle/re-used).

9.1.3 The need and triggers for monitoring will vary. Some of the monitoring is already collected by ESW and reported to Ofwat and the EA. Some of the monitoring information is available from publicly available sources and can be used by ESW to identify sensitivities in particular locations. It is likely that the need for detailed monitoring will be determined on a case-by-case basis as projects (options) identified in the final WRMP24 come forward for development. The magnitude of changes and sensitivity of receptors will inform a proportionate approach to monitoring based on the mitigation measures in place and the potential for negative environmental and social effects,

9.1.4 These monitoring recommendations are based on the BVP as outlined in this report. As options are brought forward for development, further requirements may be set out in planning applications, or in any ESW voluntary best-practice monitoring plans accompanying scheme development. Monitoring proposals are to be discussed with relevant key regulatory bodies and stakeholders. ESW should agree monitoring activities that will be proportionate to the anticipated environmental risks, including their geographical and temporal scope, with the EA, NE, and any other affected third parties. It is ESW's responsibility to ensure that appropriate monitoring is carried out. This monitoring is important to build up an understanding of the developing environmental risks associated with the implementation of the final WRMP24, but also to share knowledge, best practice, lessons learned and innovation.

Table 9-1: Monitoring Proposals

SEA Objective	Proposed Indicators	Proposed Timescale	Commentary
To protect designated sites and their qualifying features.	Area (ha) and number of statutory and non-statutory ecological sites what will be harmed or lost to WRMP options SSSI monitoring	During and post-construction	ESW are responsible for collecting data on condition of specific protected sites.
To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	Area of blue and green infrastructure created % of habitat creation or existing habitat enhancement	During and post-construction	ESW are responsible for collecting data on BNG Units lost and provided for each project,
To avoid spreading and, where required, manage invasive and non-native species (INNS).	% of INNS risks mitigated	A construction related INNS risk assessment should be conducted in the future.	ESW to undertake INNS risk assessments and implement risk management for all relevant projects.
To meet WFD objectives relating to biodiversity.	Ecological status of water bodies	Annually	ESW to undertake WFD assessments for all relevant projects. Monitor status of water bodies (relevant to projects) using publicly available information.
To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	Area of agricultural land (by grade) lost to WRMP options	During construction	ESW to record area of land that is required for development by projects.
To reduce or manage flood risk, taking climate change into account.	% of flood risks noted in FRA for projects mitigated	During construction	ESW already collect and make use of publicly available data from sewerage undertakers on properties that experience flooding from public sewers, which would help identify if the risk of flooding has increased.
To enhance or maintain surface water quality, flows and quantity.	Chemical status of water bodies The monitoring of river flows (to inform surface water abstraction approach)	Annually	ESW to access publicly available information and/or commissions studies where project-level risks are identified. ESW to work with EA to understand river flows and any impacts on available abstraction.
To enhance or maintain groundwater quality and resources.	Number of geological sites affected Groundwater quality testing Groundwater levels	Annually	ESW to access publicly available information and/or commission studies where project-level risks are identified.
To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	Achievements against WFD objectives	Annually	ESW to access publicly available information and review level of performance against WFD objectives in order to identify project-level sensitivities.
To increase water efficiency and increase resilience of water	Number of supply disruptions per annum	Annually	ESW already collect and report data on supply restrictions.

SEA Objective	Proposed Indicators	Proposed Timescale	Commentary
supplies and natural systems to droughts.			
To reduce and minimise air emissions during construction and operation.	Local air quality monitoring	During construction	ESW will consider recording information on vehicle movements and compliance with designated construction traffics routes if required. Project level air quality assessments will be used to identify sensitive receptors where monitoring may be required.
To minimise/reduce embodied and operational carbon emissions	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 Number of options that utilise existing infrastructure Volume of waste generated Waste disposal method by %	Annually	ESW already collecting information as part of monitoring progress toward NWG's Emission Possible Plan to achieve net zero by 2027.
To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	% of climate risks mitigated	Every five years	ESW already have access to freely available information on different types of flooding (internal/external) and this would be used to identify areas where resilience of the assets is not being achieved.
To conserve, protect and enhance landscape and townscape character and visual amenity.	Number of WRMP options including additional landscaping	Post-construction	ESW would record the amount of landscaping provided and the number of complaints received regarding visual amenity.
To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	Number of historic assets damaged by a WRMP option Number of historic assets enhanced by options	During and post-construction	ESW to collect information at project level on cultural, historic and industrial heritage. Access information from Historic England on condition of protected features. ESW to record actions that have avoided or enhance historic assets.
To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	Number of complaints	During construction phases	ESW to collect information on, and formerly acknowledge, all complaints received during construction at project level.
To secure resilient water supplies for the health and wellbeing of customers.	% of people with deficits for each WRMP	Annually	ESW already collect information on water supply performance.

SEA Objective	Proposed Indicators	Proposed Timescale	Commentary
To increase access and connect customers to the natural environment, provide education or information resources for the public.	Number of public rights of way (PRoW) closures or diversions	During construction phases	ESW to collect data to monitor any difference between predicted and actual impacts.
	Number, type, and area of community assets created Km of new footpath/cycleway created	Post-construction	
Maintain and enhance tourism and recreation	Number of tourism assets created	Post-construction	ESW to collect visitor numbers to existing recreational sites.
Minimise resource use and waste production	% of A-Rated, recycled, re-used material used in infrastructure options	Annually	ESW to collect information on material and waste
	Number of options that utilise existing infrastructure		
	Volume of waste generated		
	Waste disposal method by %		
Avoid negative effects on built assets and infrastructure	Number of complaints Number of road closures or diversions	During construction	ESW to collect information during construction period.

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

- 9.2.1 The final WRMP24 and its options have been assessed at a high strategic level. The options that form the final WRMP24 (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.
- 9.2.2 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 final WRMP24.
- 9.2.3 The final WRMP24 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 final WRMP24 has taken future population growth into account and as such will support Local Plan policies on housing and development. The final WRMP24 will also have indirect links to plans relating to health and well-being, housing, and the environment.
- 9.2.4 The final WRMP24 will also have direct links to other ESW plans such as the Drought Management Plan and other water company’s plans. The final WRMP24 will interact with and support the emerging ESW 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 Temporary Use Bans (TUBS), also known commonly as hosepipe bans, and non-essential use bans. The Drought Plan also includes supply side schemes such

as amending compensation discharges and increasing groundwater abstraction. Nine 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 ESW to take more of its licensed abstraction quantities.

9.2.5 Links are possible with other water company's plans and strategies, particularly where water trading and transfers cross water company boundaries. An option which was considered as part of the WRMP19 plan for Anglian Water is being considered as part of ESW's Best Environment & Society Plan and adaptive programmes. A number of the final WRMP24 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.

9.2.6 The final WRMP24 covers the 25-year period from 2025 to 2050. Through WRE ESW 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 final WRMP24 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.
- 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 re-use at key locations on the east coast

10 Conclusions and Next Steps

10.1 Conclusion

- 10.1.1 Water companies have a statutory obligation to produce a WRMP which sets out how a company intends to maintain the balance between supply and demand for water over a minimum 25-year period. To meet this statutory obligation, ESW have followed the Water Resource Planning Guideline to produce the WRMP24, a management plan that efficiently delivers resilient, sustainable water resources for customers and the environment, both now and in the long term, within the Essex and Suffolk region.
- 10.1.2 This report is the Environmental Report prepared for the Essex and Suffolk WRMP24 to meet legislative requirements at a national and international level and provides details for WRMP24 including a plans and programmes review, baseline information, and key issues and opportunities specific to the Essex and Suffolk region, included in the Scoping Report. The SEA process and other environmental assessments assess the effects of certain plans and programmes prepared for water management plans and options on the environment and sets the framework for development consents. The SEA also works to inform the decision-making process through the identification and assessment of both the 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.
- 10.1.3 In producing the final WRMP24, ESW undertook a Baseline Supply Forecast. This forecast confirmed the amount of WAFU in MI/d in each of their WRZ across the planning period. This was then compared against forecast demand to present a supply demand balance. A summary of this is provided in Section 2.2. To address identified supply deficits in their WRZ's, ESW have produced a WRMP comprising the BVP (the preferred plan), as well as some alternative plans and Adaptive Programmes. These plans are described in Section 2.2, and have been assessed in Section 6. These plans have also been assessed for potential cumulative effects in Section 7.
- 10.1.4 The options comprising these plans, and thus included as part of the Essex and Suffolk final WRMP24, are presented in Section 2.8. They include both supply side and demand management options, and where appropriate, have been subject to the full suite of environmental assessment as outlined in Section 5. The results of these assessments are also presented in Section 6, including a summary of BVP SEA results split by anticipated construction and operational effects for each option, as well summaries of specific environmental assessments, such as HRA, WFD, and BNG.
- 10.1.5 For the SEA results, in terms of construction effects, no significant positive effects are found to result from the BVP; however, 13 of the 18 options are found to result in significant negative effects for SEA Objectives. This is not a surprising result for a WRMP, as the plan is required to deliver a supply demand balance and thus often contains a programme of new infrastructure building over the 25-year plan period.
- 10.1.6 The BVP performs well across the operational findings of the SEA, which by their nature tend to be longer-term, either permanent, or for the lifespan of the Plan, or the assets delivered. Significant residual negative effects are anticipated to SEA Objectives across eight of the 18 options covering the topics: Biodiversity, Water, Climatic Factors. Significant residual positive effects are anticipated to SEA Objectives for five of the options for Biodiversity, Water and Population topics.

10.2 Next Steps

- 10.2.1 A draft version of the Environmental Report was published for consultation to Defra in October 2022 and to the public in December 2022, allowing interest stakeholders and customers to review and comment upon the proposals. Following the closure of the consultation period, all consultation responses were recorded in a log (Appendix B) and have been carefully reviewed and considered. The Environmental Report has been updated where appropriate to reflect these comments, as well as any proposed changes to the rdWRMP24. The feedback received from the consultation process played a significant role in shaping the further iterations of theWRMP24.
- 10.2.2 Consequently, the revised version of the Environmental Report was issued for the next stage of the WRMP process alongside the rdWRMP24 and ESW's Statement of Response. This report has been updated subsequent to this, taking regard to regulatory feedback, and submitted alongside ESW's final WRMP24.
- 10.2.3 Following adoption of the final WRMP24, a Post-Adoption statement will be produced which outlines how the SEA process has influenced the development of the WRMP, how consultation comments were taken into consideration and how the WRMP will be monitored. This summary will provide enough information to make it clear how the final WRMP24 was influenced (if at all) as a result of the SEA process and consultation.
- 10.2.4 Stage E 'Monitoring implementation of the plan' of the SEA process will be carried out by ESW. It is likely that monitoring of the final WRMP24 will be incorporated with the annual monitoring process. Monitoring proposals will be developed as part of the SEA process and presented in the Environmental Report.

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