Revised Draft Water Resources Management Plan

Section 9 – Environmental Appraisal

Contents

Figures

Tables

Background and Introduction

This section describes the approach we have taken to assessing the environmental impact of our options and plan as a whole, including all statutory assessments. The assessments are: Strategic Environmental Assessment (SEA), Habitats Regulations Assessment (HRA), Water Framework Directive Assessment (WFD), Biodiversity Net Gain and Natural Capital Assessment (BNG & NC), and Invasive Non-Native Species Assessment (INNS). This section is complemented by five technical reports (Appendices B, C, D, AA and BB), which describe in detail the approach taken for each type of assessment and the results of these assessments. Readers less familiar with environmental assessment terms will benefit from referring to Annex B of this section or Section 2 of the plan for a useful explanation of the environmental laws and regulations (and therefore assessments) that we need to comply with as we prepare our plan.

As part of preparing our regional plan with WRSE, we developed our SEA scoping report as a region, consulting on this with our regulators and updating our approach in line with the feedback received. Further details on this are available from WRSE's revised draft Regional Plan SEA Environmental Report and Appendix B of our rdWRMP24 (SEA). We have used WRSE's SEA scoping report to inform our SEA assessments, supplementing the regional baseline with additional local data and plans and programmes to ensure that the assessment fully captures relevant information for our supply area.

We have carried out our Stage 1 environmental assessments of our options as a region across all six assessment types above, using a GIS based approach paired with expert validation of assessment results. These assessments were used to generate environmental metrics for use in the investment modelling to develop the regional plan. More details on these assessments are available from WRSE's method statement for environmental assessment and in this Section. The resulting environmental metrics for our options are available in a supplementary report to our revised draft plan.

The results of the Stage 1 assessments were used to identify which options required detailed (Stage 2) assessments, described in the technical reports mentioned above. We have used the Stage 1 assessments and the results of detailed/Stage 2 assessments to inform the development and screening of our options. Options which have failed the stage 2 assessments and for which negative environmental impacts cannot be adequately mitigated have been rejected. For other options, the assessments have been used to inform option design to, where necessary, mitigate impacts on the environment. These option screening decisions were also fed back into the regional plan. In some cases, these assessments have identified where further investigations will be required to confirm suitable mitigation; this is discussed in further detail in this Section and the supporting appendices.

Detailed environmental assessments have been carried out for the Strategic Resource Options, or SROs, as part of the Gate 2 submission to RAPID; this work has been integrated with and fed into our overall regional and local environmental assessment process. Summarised results from these assessments are available in this Section and the supporting appendices. Further details on the methods and results for these assessments can be found in the Gate 2 submission for each SRO.

The assessments and metrics have been used to inform the multi-criteria optimisation of our plan, to achieve Best Value for people and the environment. We have used modelling under a range of scenarios to understand what a plan to achieve best value might look like, as well as understanding what a plan designed to benefit the environment and society might look like. Further details on this are available in Section 10.

Having identified our preferred and alternative plans, we have assessed the in-combination and cumulative effects of these plans. Regionally this assessment has been carried out at a water company boundary level, to capture combined impacts of multiple options on receptors at these boundaries. This approach has been described in WRSE's rdRP SEA Environmental Report. In parallel, we have carried out full statutory in-combination and cumulative effects assessments on our preferred and alternative plans, which have been fed back into the regional assessments to provide a full regional picture. The results of these, as relevant to our options and our supply area, are summarised in Sections 10 and 11, with detailed results available in Appendices B, C and D, AA and BB (SEA, HRA, WFD, BNG & NC and INNS respectively).

Changes made between dWRMP24 and rdWRMP24 (across this Section and its five accompanying appendices):

- We have updated our methodologies to incorporate further updates to national guidance and best practice, for example, updating our BNG assessments to use Defra BNG metric 3.0 across our options. We have also provided updates where we have newly rejected options on environmental grounds.
- We have made our assessments more accessible by including the underlying assessment sheets for each of our options and have incorporated further details from these into our plan documents
- For our strategic resource options, we have included more detail on impacts, mitigation and next steps from our RAPID Gate 2 submissions for these options
- We have added clearer next steps to fill any information gaps and more detail on bespoke mitigation
- We have developed a company-wide BNG strategy that better describes how we plan to achieve effective and ambitious biodiversity net gain across our plan. This is available as part of Appendix AA (BNG and NC report)

Introduction

9.1 In this section we describe the environmental assessments that have been undertaken to inform and appraise our rdWRMP24.

9.2 Six types of environmental assessment have been carried out in our rdWRMP24:

- Strategic Environmental Assessment (SEA)
- Habitats Regulations Assessment (HRA)
- Water Framework Directive Assessment (WFD)
- Biodiversity Net Gain Assessment (BNG)
- Natural Capital Assessment (NC)
- Invasive Non-Native Species Assessment (INNS)

9.3 These assessments are carried out to appraise (screen) our options, with metrics produced from these assessments then being used within our programme appraisal process, thus influencing our plan. These assessments are then also carried out to appraise our plan as a whole, to establish its overall impact.

9.4 These assessments can be carried out at different levels of detail. We have carried out assessments at appropriate levels of detail at different points in our programme appraisal, and have described where this has been the case.

9.5 In this section, for each type of assessment we have introduced the purpose, scope, and methodology followed. We then present results from the assessments that we have undertaken for individual options. Later in this section we detail the methodology followed for assessments that have been undertaken to appraise the in-combination, or cumulative, impacts of our plan. The results of these are summarised in Sections 10 and 11 of the plan and are available in detail within the assessment reports for each type of assessment (Appendices AA, BB, B, C and D).

Water Resources Planning Guideline Requirements

9.6 The Guideline 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'.

9.7 The Guideline highlights the following key environmental considerations:

- Reflect the government's 25-year Environment Plan and Environmental Improvement Plan 2023 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 regarding 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
- 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

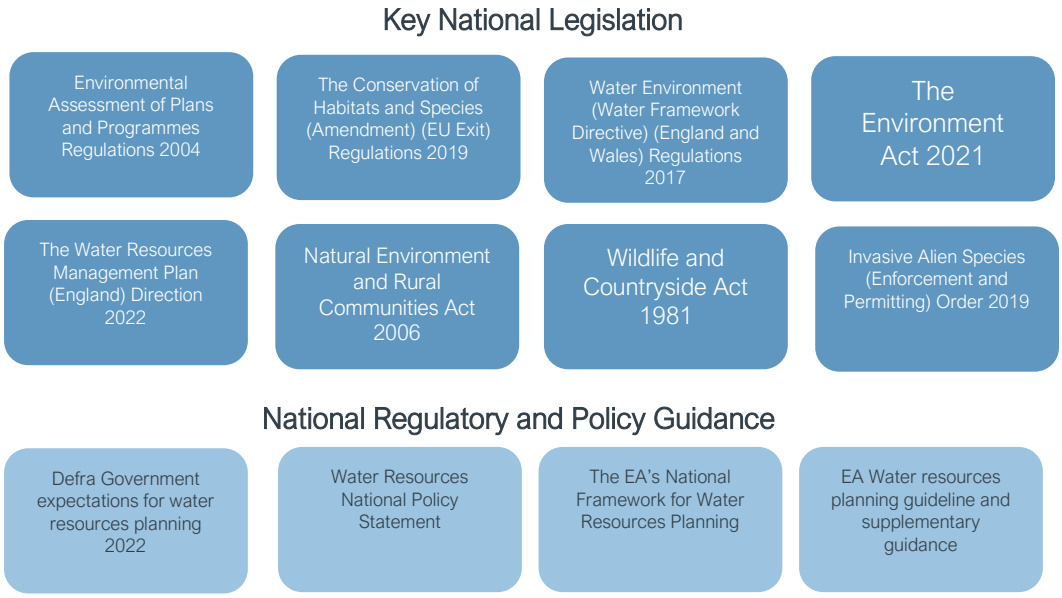
- Considering whether abstractions are truly sustainable, looking across a catchment
- Considering the requirement to demonstrate Biodiversity Net Gain (BNG) for options and the plan
- A stronger focus and detailed guidance on natural capital including the five minimum ecosystem services[1] to be considered and natural capital metrics
- Improved guidance on approaches to integrate environmental outputs into options decision-making and programme appraisal

9.8 The supplementary guidance note 'Environment and society in decision-making' 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.

9.9 The Guideline states there is a need to comply with all relevant environmental legislation, including SEA (Environmental Assessment of Plans and Programmes Regulations), and the Conservation of Habitats and Species Regulations 2017 (as amended), otherwise known as the Habitats Regulations. The results of the SEA and other environmental assessments aid 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.

Statutory Framework

9.10 A summary of the legal requirements on our WRMP in respect of environmental protection and enhancement is provided in Annex A and B of Section 2 of our plan. A simple, non-exhaustive overview is provided in Figure 9-1.



[1] These are: Biodiversity, climate regulation, natural hazard management, water purification, water regulation, as specified in WPRG Supplementary Guidance 'Environment and society in decision-making' (2022)

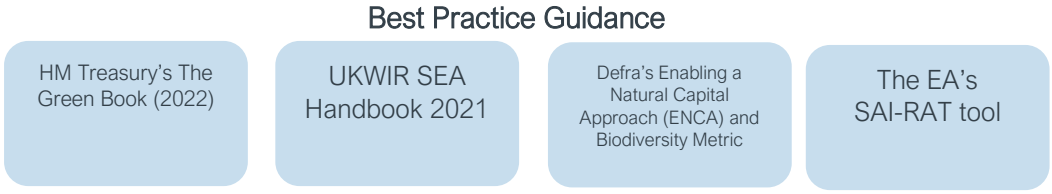


Figure 9-1: Key environmental requirements for our WRMP24

Methodology Overview - WRSE Regional Plan and WRMP24

9.11 The WRSE Regional Plan and our WRMP24 have been developed alongside one another. It is important that the environmental assessments that are used to inform the WRSE Regional Plan are consistent across the region, and so it follows that the environmental assessments applied by different companies within the WRSE region should be consistent with one another. Environmental assessments across the WRSE region have either been undertaken using consistent methodologies, or have been undertaken centrally by WRSE.

9.12 In its method statement for environmental assessment, WRSE suggests that the environmental assessments carried out at WRSE level can be used as a framework for the WRSE member water companies such as Thames Water when undertaking their WRMP24 statutory environmental assessments. This is what we have done.

9.13 To support the development of the regional plan an environmental assessment process was undertaken that included:

- Strategic Environmental Assessment (SEA)
- Habitats Regulations Assessment (HRA) (Stage 1)
- Water Framework Directive (WFD) Assessment (Stage 1)
- Biodiversity Net Gain (BNG) Assessment
- Natural Capital Assessment
- Invasive Non-Native Species (INNS) risk assessment (Stage 1)

9.14 Figure 9-2 describes the overall approach taken to environmental assessment of options as part of the regional planning process for WRSE. Figure 9-3 describes how the WRSE environmental assessment process and our process interacts to produce consistent results that have been used to assess both the options and overall plans.

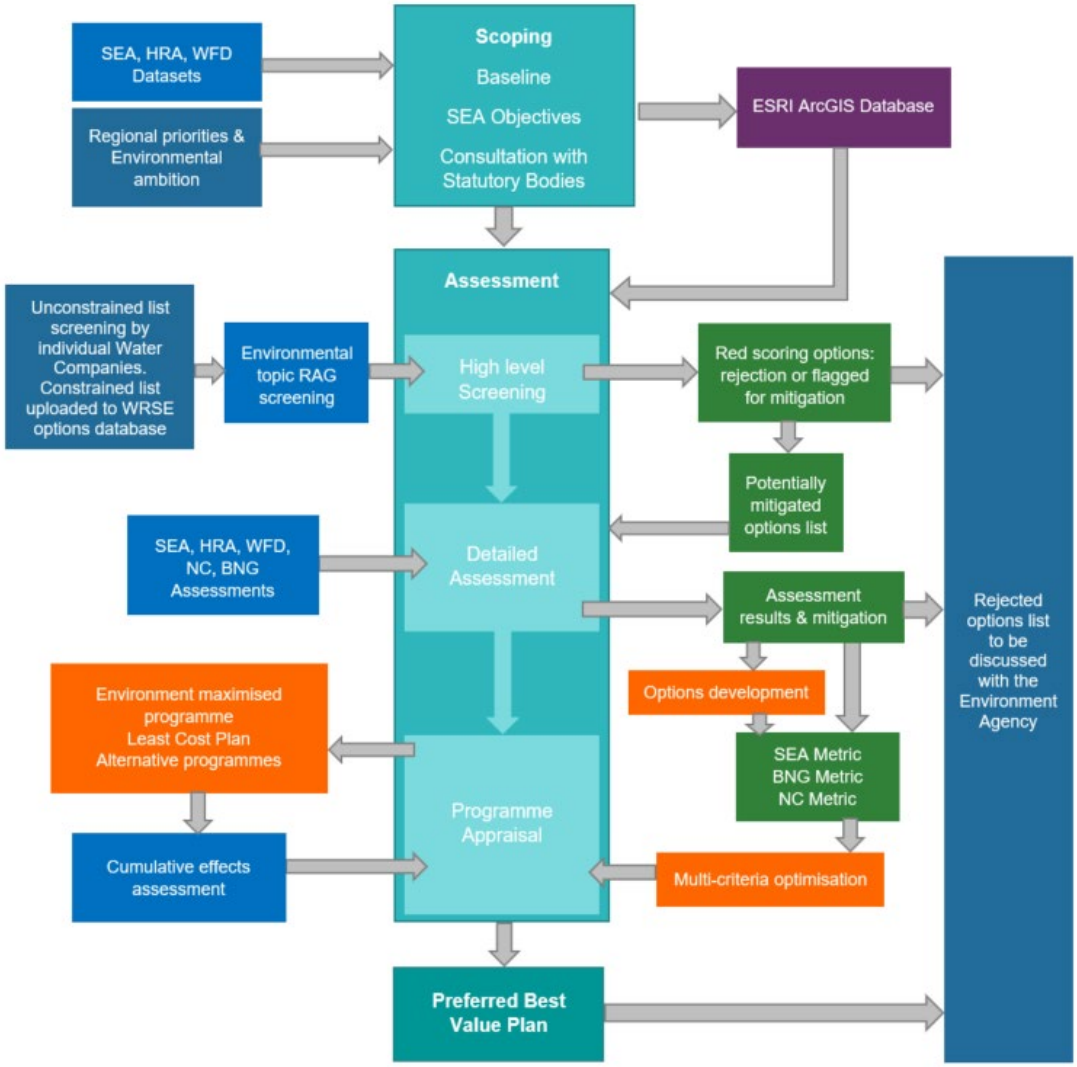


Figure 9-2: Environmental Assessment Approach, WRSE Method Statement for Environmental Assessment

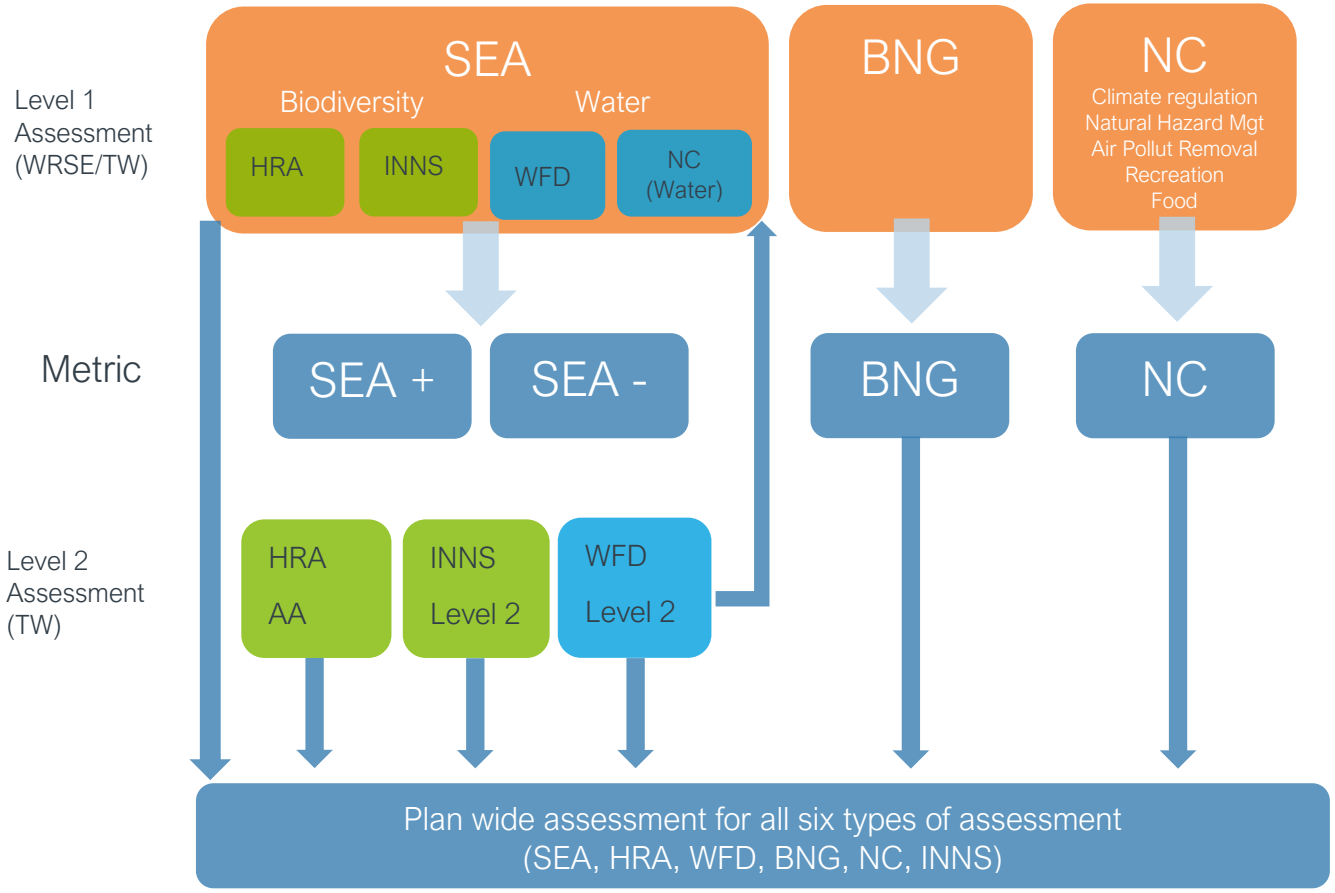


Figure 9-3: Overview of option and plan level environmental assessments undertaken for WRSE draft regional plan and our rdWRMP24

Strategic Environmental Assessment (SEA) overview and scoping

9.15 In the development of a WRMP, companies in England and Wales must follow the Environment Agency (EA) Water Resources Planning Guideline (WRPG) and consider broader government policy objectives. The WRPG highlights that where required companies must carry out a SEA for their WRMP, and as such, we have carried out a full SEA of our options and our whole plan; this has included both options selected in the plan and policy decisions made as part of the planning process. We have used the SEA assessments to 1) understand the feasibility of our options and include any needed mitigation, rejecting options where we consider that unacceptable impacts cannot be mitigated, 2) develop metrics to inform programme appraisal, and 3) assess the overall impact of our preferred and alternative plans.

9.16 The SEA of our plan involved a fully integrated environmental assessment approach, with multiple sub-assessments. While each sub-assessment fed into the SEA (Appendix B), they were also detailed enough to form standalone assessments. The sub-assessments included a Habitats Regulations Assessment (HRA) (Appendix C), Water Framework Directive (WFD) assessment (Appendix D), Natural Capital (NCA) assessment (Appendix AA), Biodiversity Net Gain (BNG) assessment (Appendix AA), and Invasive Non-Native Species (INNS) risk assessment (Appendix BB).

Purpose

9.17 The objective of an SEA, in accordance with Article I of the SEA Directive, transposed into UK law by the Environmental Assessment of Plans and Programmes Regulations (2004), is *'to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development…'.*

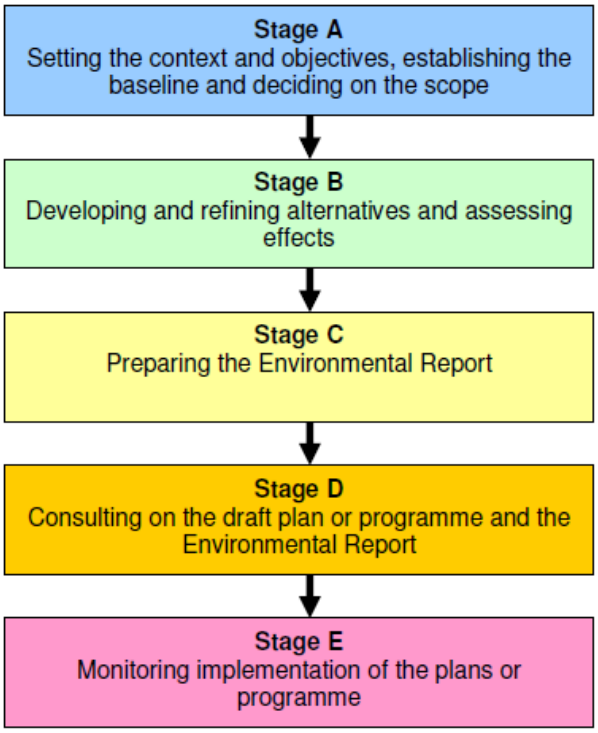
9.18 For strategic plans such as the WRMP, the purpose of an SEA is to facilitate understanding of how the developing plan may impact the setting where it will be implemented, such that this understanding can be used to shape the plan early in its development and at multiple stages to maximise opportunities for environmental benefit. Key to this process is early and continuous stakeholder engagement on the scope and delivery of the SEA and the plan to ensure that views can meaningfully be used to shape the plan to the benefit of environment and society.

9.19 To achieve this, the SEA Directive requires that plans and programmes undergo environmental assessment. It suggests that, among other factors, biodiversity, human health, population, and water should be included, which we have followed.

The SEA Process – Overview

9.20 Strategic Environmental Assessment (SEA) is required for our WRMP24 under the European Directive 2001/42/EC, more commonly known as the SEA Directive. The Directive was transposed into United Kingdom (UK) law via the Environmental Assessment of Plans and Programmes Regulations 2004, which requires an assessment of the effects of certain plans and programmes on the environment. Article 3 of the Directive requires that SEA shall be carried out for plans and programmes which are prepared for water management, set the framework for development consents, and are likely to have a significant environmental impact.

9.21 The SEA also works to inform the plan-making process through the identification and assessment of effects a plan or programme may have on the environment, including cumulative and in-combination effects. 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 9-4 presents the different stages in the SEA process.



Current Status of the SEA
The SEA for the WRMP24 is currently in Stage D of the SEA process. The Environmental Report has been updated following consultation and in line with the revised draft WRMP24.

Figure 9-4: Stages in the Strategic Environmental Assessment (SEA) process.

Source: Adapted by Mott MacDonald from the DLUHC SEA Guidance 'A Practical Guide to the Strategic Environmental Assessment Directive'.

9.22 Stage A describes the scoping process, which is set out later in this Section.

9.23 Stage B in the context of the WRMP24 comprises the assessment of our individual options (covered in this Section), and the assessment of different plans containing these options to arrive at the best value plan (covered in this Section and in Section 10).

9.24 Stage C involves preparing the Environmental Report, which is the formal report describing the outputs of the assessments in Stage B – for our WRMP24, this is Appendix B (SEA report).

9.25 Stage D is the public consultation we have be carried out on our Environmental Report and our dWRMP24 as a whole. The SEA for the draft WRMP24 (dWRMP24) was presented in an Environmental Report which was issued for consultation from November 2022 to March 2023. Comments received from the consultation process were reviewed and have been addressed where appropriate within the Environmental Report (Appendix B).

9.26 Stage E involves monitoring the delivery of our plan – our plans for this are described further in this Section and in Appendix B.

9.27 The Thames Water rdWRMP24 SEA was carried out in accordance with the following guidance:

- Water Resources Planning Guideline, 2023, Environment Agency, Ofwat, Natural Resources Wales
- Environment Agency (2022) Water resources planning guideline supplementary guidance – Environment and society in decision-making
- UK Water Industry Research (UKWIR) (2012) Strategic Environmental Assessment and Habitats Regulations Assessment – Guidance for Water Resources Management Plans and Drought Plans (ref. 12/WR/02/7)
- Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (UKWIR 2021, re. 21/WR/02/15)
- 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
- Defra (2018) A Green Future: Our 25 Year Plan to Improve the Environment.
- Defra (2023) Environmental Improvement Plan 2023
- Environment Agency (2011) Strategic environmental assessment and climate change: guidance for practitioners
- Historic England (2016) Sustainability Appraisal and Strategic Environmental Assessment – Historic England Advice Note 8
- All Company Working Group (2020) Strategic Environmental Assessment: Core Objective Identification

Environmental Targets

9.28 Defra consulted on draft Environmental Targets (ETs) in March 2022. The consultation period opened on 16 March 2022 and closed on the 27 June 2022. Legally binding environmental targets are a key commitment in the Environment Act 2021 and will help deliver the government's vision of leaving the environment in a better state than it was found and will drive forward ambitious environmental improvements by successive governments that protect and enhance our natural world.

9.29 The 2021 Act requires the government to set at least one long-term target in each of the following areas: air quality; water; biodiversity; and resource efficiency and waste reduction. It also requires targets to be set for fine particulate matter (PM2.5) and species abundance (i.e., six categories of ET in total). These targets have been set and passed into law; they are known as the Environmental Targets (England) Regulations 2023.

9.30 These targets are likely to be highly influential on environmental policy and may well provide a basis for future SEA Objectives in policies, plans and programmes (PPP) SEAs. Due to the timing of their introduction into law in relation to our planning process, these targets have not been considered with regard to setting SEA Objectives for this WRMP, however we have had wider regard to these in the context of our plan.

Scoping Summary

Introduction

9.31 The scoping stage of the SEA process (Stage A in Figure 9 - 4) sets the context and scope for the SEA and Environmental Report. During scoping, key plans and programmes are reviewed, baseline conditions and key issues and opportunities are identified, and the SEA

Framework is developed. This chapter summarises the outcomes of the scoping stage. Further detail on the relationship with other policies, plans, and programmes, as well as the scoping baseline review and future baseline are provided in Appendix B.

Scoping Consultation

9.32 Thames Water utilised the WRSE SEA Scoping Report, which was issued for formal consultation for a six-week period between 18th September and 30th October 2020 to Statutory Consultees: Natural England, Environment Agency, and Historic England. Prior to the formal consultation, the Scoping Report was issued for informal consultation to water companies and statutory consultees to gain early feedback and agreement on key elements of the process. During the formal and informal consultation period stakeholders were able to comment on the proposed scope and approach for the SEA.

9.33 Following the Scoping Report consultation period, all consultation responses were reviewed and considered. Comments were received encompassing agreement with aspects of the proposed approach, methodological questions and clarifications, and suggested modifications and enhancements to the proposed approach and SEA framework.

9.34 Consultation responses received and how these responses have been addressed within the SEA framework used by both WRSE and Thames Water are presented in full within Annex B of the Environmental Report (Appendix B).

9.35 Where changes to the approach were suggested, these were considered in detail by the WRSE and 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 WRMP
- 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

SEA Framework

9.36 The full SEA framework, with changes from the Scoping Report consultation incorporated, is shown in Table 9-1. Please note that the purpose of the assessment questions is to prompt consideration of specific issues when assessing effects related to each topic and objective.

SEA Topic	SEA Objective(s)	Assessment Questions/Sub-Themes
Biodiversity, flora, and fauna	1. To protect designated sites and their qualifying features. 2. To protect and enhance biodiversity, priority species and vulnerable habitats such as chalk rivers.	1. Is the option likely to affect the conservation status of any SPAs, SACs, Ramsar sites, and MCZ, undermine or prevent restoration of SSSI condition or affect the condition of locally designated sites?

SEA Topic	SEA Objective(s)	Assessment Questions/Sub-Themes
	3. To avoid spreading and, where required, manage invasive and non-native species (INNS). 4. To meet WFD objectives relating to biodiversity.	2. Will the option protect and enhance aquatic habitats and species, including freshwater fisheries and chalk rivers? 3. Will the option affect the marine environment, habitats, and species (including MCZs and MPAs)? 4. 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? 5. Will the option affect any habitats that support legally protected species or species of conservation concern? 6. Is there potential for contribution to achieving 'favourable' conservation status or for creation of new Section 41 of the NERC act habitats? 7. Is the option likely to have an impact on current or future Nature Recovery Network? 8. Are there any opportunities for habitat creation or restoration? 9. Will the option contribute to the loss or gain in habitat connectivity? 10. Is there a possibility for INNS to be spread/ introduced or for algal blooms to occur? 11. Is there an opportunity to improve biodiversity value through removal of INNS? 12. Will the option affect the capacity for priority habitats and species to move or adapt in response to climate change?
Population and Human Health	5. To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing. 6. To secure resilient water supplies for the health and wellbeing of customers. 7. To increase access and connect customers to the natural environment, provide education or information resources for the public. 8. To maintain and enhance tourism and recreation.	13. Does the option promote water efficiency and encourage a reduction in water consumption? 14. Will the option secure resilient water supplies for the health and wellbeing of customers? 15. Will the option allow for economic development? 16. Will the option allow for economic diversity? 17. Will the option have an effect on active lifestyles, such as impacts on active travel through disruption to pedestrian and cycle routes? 18. Will the option affect Public Rights of Way? 19. Will the option affect road or rail infrastructure? 20. Will the option minimise disturbance from noise, light, visual, and transport?

SEA Topic	SEA Objective(s)	Assessment Questions/Sub-Themes
		21. Will the local communities have been actively engaged to foster an inclusive environment and participate in decision making? 22. Will the option maintain or enhance tourism? 23. Does the option improve access to the natural environment for recreation, including those living within deprived areas? 24. Will the option have an effect on freshwater fisheries for recreational purposes? 25. Will the option have an effect on marine fisheries for recreational purposes?
Water	9. To reduce or manage flood risk, taking climate change into account. 10. To enhance or maintain surface water quality, flows and quantity. 11. To enhance or maintain groundwater quality and resources. 12. To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans. 13. To increase water efficiency and increase resilience of Public Water Supply (PWS) and natural systems to droughts.	26. Is the option vulnerable to flood risk? 27. Will the option contribute to, or reduce the risk of flooding? 28. Will the option affect surface water quality or quantity? 29. Will the option affect ground water quality or quantity? 30. Is the option likely to contribute to or conflict with the achievement of WFD objectives? 31. Will the option affect bathing waters? 32. Will the option affect protected waters for Shellfish? 33. Will the option affect chalk rivers and streams? 34. Will the option affect raw water quality? 35. Will the option reduce the flashy nature of surface waters? 36. Will the option slow the flow in upper catchments and reduce soil losses to river systems? 37. Does the option provide a reliable and sustainable water supply which meets changing demand? 38. Will the option protect and enhance the environmental resilience of the water environment to climate change, flood risk and drought?
Soil	14. To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	39. Will the option affect high grade agricultural land? 40. Will the option promote the efficient use of land? 41. Will the option prevent soil erosion and retain soil stocks as a natural resource? 42. Will the option promote soil health? 43. Will the option involve use of brownfield or greenfield land?

SEA Topic	SEA Objective(s)	Assessment Questions/Sub-Themes
		44. Will the option prevent mineral sterilisation? 45. Will the option affect soil contamination or involve remediation? 46. Is the option likely to affect geodiversity, including SSSIs of geological importance?
Air	15. To reduce and minimise air emissions during construction and operation.	47. Is the option in an air quality management area (AQMA)? 48. Will the option affect local air quality?
Climatic Factors	16. To minimise/reduce embodied and operational carbon emissions. 17. To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	49. Will the option affect carbon or other greenhouse gas (GHG) emissions? 50. 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? 51. Will the option affect carbon sequestration? 52. Is the option vulnerable to climate change effects? 53. Does the option include climate resilience measures? 54. Will the option create catchment resilience to drought? 55. Does the option enable or reduce the potential of water dependent wildlife to adapt to climate change?
Historic Environment	18. 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.	56. Will the option affect designated or non-designated historic assets, sites and features? 57. Will the option affect the setting and/or significance of a historic asset? 58. Will the option affect archaeology (including unknown archaeology)? 59. Will the option affect heritage assets at risk? 60. Will the option affect conservation areas or historic landscape/townscape areas?
Landscape	19. To conserve, protect and enhance landscape and townscape character and visual amenity.	61. Will the option have an effect on the character of the landscape or townscape including tranquillity and views? 62. Will the option improve access to the countryside? 63. Will the option create or improve green infrastructure which contributes to access to the landscape? 64. Will the option protect and enhance designated landscapes and features?

SEA Topic	SEA Objective(s)	Assessment Questions/Sub-Themes
Material Assets	20. To minimise resource use and waste production. 21. To avoid negative effects on built assets and infrastructure (including green infrastructure)	65. Will the option reuse existing infrastructure? 66. Will the option minimise the use of resources? 67. Will the option reduce the production of waste? 68. Will the option affect built assets and infrastructure, including transport infrastructure? 69. Will the option avoid negative effects on existing green infrastructure? 70. Will the option create opportunities for enhancing existing green infrastructure?

Table 9-1: Post-consultation SEA Methodology Assessment Framework

Option assessments

Environmental appraisal as part of our options appraisal process

9.37 Environmental impact is factored in at every stage of our options appraisal process, as it was for WRMP19:

9.38 1) Generic screening – The WRSE list of generic option types (as defined by WRSE based on the UKWIR Water Resources Planning Tools report) has been reviewed by us in a generic screening process to identify option types that have potential for providing feasible options for the Thames Water supply area. This screening includes consideration of any obvious and unacceptable environmental impacts as grounds for rejection at this stage (criteria are further described in Section 7 and Section 8). This screening produces the unconstrained list of options.

9.39 2a) We have then passed our demand options through primary and secondary screening stages. The purpose of Primary Screening is to review and screen out those options that do not meet the key objectives, as described in Section 8. Primary screening assesses option feasibility at a high level for acceptance or not, having regard to Technological, Financial, Environmental, Risk and Resilience and Legal constraints.

9.40 The purpose of Secondary Screening is to create a list of demand options which are considered to have a reasonable chance of implementation and of achieving a water demand saving. Secondary screening further refines the options list that has emerged from the primary screening exercise by reference to qualitative criteria[2]. The outcome of sequential Primary and Secondary screening exercises is the drawing up of a Feasible Demand Options List.

9.41 2b) We have also undertaken water resources options feasibility screening –for the option types that have passed the generic screening, we have conducted feasibility assessments, as laid out in Section 7 and our Feasibility Addenda. A staged approach has been adopted for the feasibility assessment:

9.42 Stage 1: a systematic search was conducted to identify potential new resources of each type. These collectively form the Unconstrained List of resource elements (see Appendix P) that were then screened against absolute constraints (pass/fail). These criteria include a number of planning, socio-economic and environmental considerations, specifically impacts on national and international conservation and heritage sites and water availability.

9.43 Stage 2: the performance of each potential new resource was evaluated qualitatively against a number of criteria that enabled differentiation between options of that type. These criteria include nature conservation and biodiversity, floodplain encroachment, non-traffic impact of construction on local residents, and water resources and water quality.

9.44 Stage 3: the performance of the potential new resources was assessed in further detail (e.g. including nature conservation and biodiversity, water resources and water quality, water source reliability and availability, and costing).

[2] These can be found in the Demand Management options screening report

9.45 Validation: we undertook verification and review of the final list of specific resource elements to determine the Feasible List.

9.46 Further detail relating to the criteria used at each stage of the feasibility assessment can be found within each of the feasibility reports referred to in Section 7.

9.47 3a) Demand options further screening – For the options included in the Feasible Demand Options List, we optimised these in the 'Demand Profile Calculator' and our Integrated Demand Management (IDM) model to create three demand reduction programmes for inclusion in programme appraisal within the WRSE investment model. WRSE has carried out a Strategic Environmental Assessment (SEA)[3] for the Feasible Demand Management Options for all three scenarios of Medium, High and High Plus; these assessments have been used to generate SEA metrics (benefit and disbenefit) for programme appraisal within the WRSE investment model consistent with the other types of options assessed as part of the regional planning process.

9.48 The results of this assessment for Thames Water options are presented in Appendix B.

9.49 3b) Water resources options further screening - The option elements that passed the validation stage of the feasibility assessments form the Feasible List. These options were subjected to Stage 1 environmental assessments via WRSE (across SEA, HRA, WFD, NC, BNG, INNS). Since our draft WRMP24 we have expanded our assessments to include less mature options on the feasible list, as they have been further developed.

9.50 The results of these assessments were used to generate a suite of 4 environmental metrics (SEA+, SEA-, BNG and NC). These are available in a supplementary report to our revised draft plan.

9.51 Where option elements were subject to a combined limit or were mutually exclusive with another option they have then been subjected to a further screening stage to produce the Constrained List of options for investment modelling in the WRSE model. The further screening process used the WRSE investment model to identify options which performed well and were selected for a range of different planning scenarios. Further detail on this is available in Section 7.

9.52 This screening process brought together all water resource option types and compared them using a consistent set of criteria, including environmental performance relative to other options. Where options have been rejected an explanation is provided in the Rejection Register (Appendix Q: Scheme rejection register).

9.53 We engaged our regulators throughout this process, and discussions around ongoing assessments of the options' environmental impact have resulted in us rejecting options based on poor environmental performance where appropriate. Further details are available in Appendix Q and Table 9 - 2.

9.54 Backchecking was undertaken following completion of the SROs' appraisal (including environmental appraisal) of alternative options within the SROs. The backchecking reviewed the feasibility assessments in light of any new information and, where appropriate the feasibility assessments were updated. The SRO appraisals are presented

[3] Further details are available in WRSE's draft Regional Plan Environmental Report and our Demand Options Environmental Metrics report

in the Gate 1 and Gate 2 submissions. Any updates to the feasibility assessment are included in the WRMP24 Feasibility Report Addendums.

9.55 Backchecking was also undertaken following the inter-regional reconciliation of the regional plans to reflect any change in status of the options on the Feasible List.

9.56 Feasible options which meet the criteria for Option Further Screening are included in Constrained List of options.

9.57 4) For water resource elements on the Constrained List, Conceptual Designs were prepared. The Conceptual Designs provide more detailed information on the location of the construction works, engineering and land requirements, dependencies with other elements, and construction impacts. This higher level of option information facilitated environmental assessment of the options and design of environmental and social mitigation to minimise anticipated impacts.

9.58 Where option information was updated or developed between the draft and revised draft plan, the option screening and environmental assessments were correspondingly updated. These updates have been made as a result of progression of development or mitigation work or as a result of consideration of consultation feedback. These updates can be found in Section 7 (for option information) and in the appendices covering each type of environmental assessment (Appendices B, C, D, AA and BB).

9.59 These assessments were used to inform and update the suite of four environmental metrics (SEA +, SEA -, NC and BNG) that were optimised against using WRSE's investment model to develop the emerging regional plan (in January 2022) and subsequently the draft best value plan. This exercise was repeated in 2023 incorporating updates to option information and policy to produce the revised draft regional plan and our revised draft plan.

9.60 5) Options selected in Situation 1, 4 and 8 of the revised draft best value plan (and Situation 4 of the alternative plans (Least Cost and Best Environment and Society)) and that had undergone Stage 1 assessments for HRA, WFD and INNS, underwent Stage 2 assessments where the Stage 1 assessment identified this as required. SEA, NC and BNG assessments were also revisited if more option information became available or in response to an update to regulatory methodology guidance. If any of these options 'failed' the assessment, i.e. it was deemed that the option would have an unacceptable impact that could not be adequately mitigated, the option was rejected and placed on the rejection register. In the case that the option had failed an HRA or WFD but was required as part of the plan for reasons of public interest, with no feasible less damaging alternative available, a derogation under Regulation 19 of the Water Framework Directive or the Habitats Regulations (IROPI) would be required.

9.61 6) These assessments were used as the basis for the in-combination and cumulative effects assessments carried out on the preferred plan and alternatives (SEA, HRA, WFD, NC, BNG) to understand combined and cumulative impacts of multiple selected options on environmental and social receptors within the zone of influence (ZoI) for the plan, along functional pathways. This assessment was also carried out at regional level by WRSE to understand combined and cumulative impacts of the regional plan, and the results of this used to inform the assessments for our plan.

Translating option assessments into metrics for programme appraisal

9.62 The multi-criteria optimisation approach set out in the WRPG is reflected in the approach we have taken for the regional plan and for our rdWRMP24, where the outcomes of the environmental assessments are translated into metrics to feed into the multi-criteria optimisation of the plan to arrive at a best value plan for environment and society. Figure 9-5 summarises how the option level environmental assessments have been translated into a suite of four environmental metrics for use in WRSE's investment modelling. The metrics for our feasible options are available in a supplementary report to our draft plan.

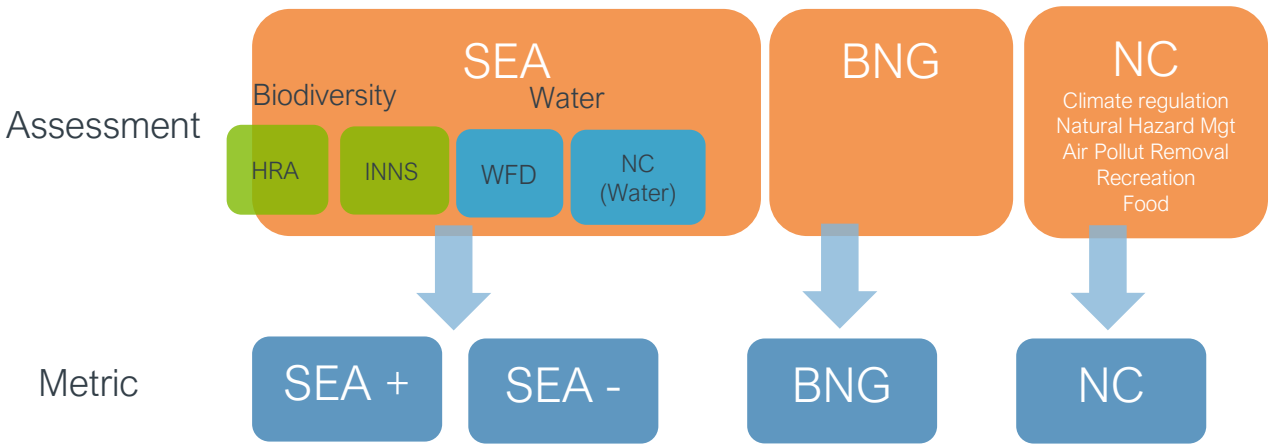


Figure 9-5: How our assessments have been translated into metrics

9.63 As described in Figure 9-5, the results of the HRA and WFD assessments fed into the SEA objectives on biodiversity and water and were in this way incorporated into the option level SEA. The results of the INNS assessment were also reported as part of the SEA under the biodiversity objective, and the qualitative assessment of option impacts on the provision of the water regulation and purification ecosystem services, undertaken as part of the NC assessment, was reported under the SEA water objective.

9.64 The SEA process produced a series of four metrics for each option to summarise the output information. The four metrics were positive construction, negative construction, positive operation, and negative operation. These were calculated for each option assessed by assigning a numerical value to each effect identified within the assessment, e.g. major positive = +8, moderate positive = +4, minor positive = +1, neutral = 0 (and -1 to -8 for corresponding negative effects), and summing to produce each metric. The positive metrics were summed, and the negative metrics summed to give a single SEA positive and SEA negative metric per option for use in the investment modelling.

9.65 The results of the NCA and BNG assessments have been converted into metrics as described below:

9.66 Natural Capital metric: A single discrete monetised value reported in £/year generated by combining the outputs of each of the five monetised natural capital metrics to provide a single figure.

9.67 Biodiversity Net Gain metric: A single score for each option showing the net change in biodiversity net gain units for each option according to the metric, after any mitigation included as part of option design has been applied.

9.68 Further details on how the environmental metrics were derived for our demand management options are available from our 'WRMP24 Demand Management options - Environmental Metrics' paper.

9.69 Section 10 contains further detail on how these metrics have been used as part of the investment modelling to optimise the plan to achieve best value.

9.70 Whilst the metrics were initially calculated based on the Stage 1 environmental assessments, when the Stage 2 assessments were undertaken the results of these have been iteratively fed back into the metrics. The metrics have been updated in response to any material updates to option information or assessment methodology in preparation for the revised draft WRMP24.

Engagement with our regulators on environmental acceptability of options

Date	Feedback and how we've actioned as needed
Dec '20	Briefing on WRMP24 options appraisal process and new options.
Jan '21	TW options list provided. Update on our option screening – Crossness Reuse rejected due to there being many more options than fit within a system based environmental constraint (cumulative impact on salinity within the middle Tideway). This option was the least best performing across options appraisal criteria (described in Section 7) and so was rejected. Update provided on WRSE catchment option screening workstream as well as all other WRSE and TW option type workstreams. Minimally impactful list of drought permits and orders for WRMP consideration initially agreed with EA; companies consulting with local EA.
Feb '21	Feedback received on option list and used to inform appraisal. Briefed EA on our review of EA data for Environmental Destination[4]. Update on WRSE catchment options and environmental metrics. Feedback requested and provided from TW for WRMP tables as regards environmental metrics.
Mar '21	Run-through of WRMP24 feasibility report update note (Non-SRO) on call. This interim note (not published) described updates to our options appraisal process; these updates have now been incorporated into Section 7 and the option feasibility reports.
April '21	Further package of environmental investigation work on Deephams Reuse completed with the aim of answering EA concerns on option. Meeting with Herts and North London team held to discuss results in context of informing option feasibility.
May '21	Option descriptions and rejection register provided to assist EA review.
July '21-	Continued engagement on work to develop our Environmental Destination scenarios.
Sept '21	Briefing on development and screening of new groundwater options and option information for all new and existing options provided for review.
Oct '21	Dedicated workshop on screening of Reuse options. Feedback verbally received.
Nov '21	Feedback on groundwater options received and used to inform options appraisal.
Dec '21	Environmental Destination update provided. Licence capping position received from EA in November – options reviewed against this, RAG'ed and Epsom removal of constraints option rejected based on risk of non-compliance with this position statement.
Jan '22-	Draft statement of common understanding (SOCU) relating to the environmental feasibility of Deephams Reuse and Lower Lee DRA sent to the EA. Liaison with Reuse SRO on

[4] Environmental Destination is described further in Sections 2 and 5.

Date	Feedback and how we've actioned as needed
	Teddington to plan programme of further work to reduce uncertainty of impacts of 75, 100 and 150 Ml/d options. Feedback on future of West Berkshire Groundwater Scheme (WBGWS) received – this has informed our understanding of need in our Kennet Valley (KV) water resource zone and optioneering to meet this need.
Feb '22	Feedback received and dedicated review meeting for Reuse option SOCUs. EA feedback received on drought options – Wansunt and Crayford options rejected as a result, with Latton already having been rejected on environmental grounds. This rejection reasoning is laid out in Appendix Q (Rejection register). EA feedback received on TW Env Destination scenarios into WRSE. EA RAG'ing of WRSE options (full TW feasible option set) received – feedback on Epsom, Wansunt, Crayford, Deephams concerns already actioned. Chingford RWP concern on sustainable abstraction - is WFD compliant but has been rejected on the grounds of availability from another water company. KGV intake capacity increase also flagged as concern but has passed WFD screening as it did at WRMP19. We will look further into the impacts of this option should further work highlight the option is required as we finalise our WRMP24.
Apr '22 – June '22	Briefing on environmental appraisal programme to date and next steps. Non-SRO INNS methodology sent for comment; feedback and agreement received via subsequent workshop. Revised Lower Lee DRA and Deephams statement of common understanding sent for comment. Feedback received on WRMP24 Feasibility report update note – this has informed development of our dWRMP24 documents. Results of further programme of work to understand impact of Teddington DRA at different sizes presented to EA and discussed; this work has evidenced that the 75 Ml/d and 100 Ml/d option may have acceptably minor impacts on the surrounding environment so as to be within limits set by the EA, subject to ongoing work. This work has been used to develop a statement of common understanding for Teddington DRA. (Update for rdWRMP24 – following EA feedback, the 100Ml/d option has now been rejected on promotability grounds, with reasoning available in Section 7).
Nov' 22 – March '23	This period covered our public consultation on our draft WRMP24, to which our regulators formally responded. Our consideration of these responses and details of changes made to our plan as a result can be found in our Statement of Response.
April 2023	We held a workshop to brief Natural England and the EA on our considerations of key topics raised in their consultation feedback and updates to be made to the plan as a result.
May 2023	We held a session with Historic England to discuss our considerations of key topics raised in their consultation feedback and updates to be made to the plan as a result.

Table 9-2: Summary of engagement with the EA on our options

9.71 In addition to the engagement described in Table 9-2, there has been regular specific engagement on the development of the strategic resource options, including environmental considerations, with our regulators via monthly meetings with the National

Appraisal Unit (NAU). This has been supplemented by topic specific briefings and workshops as needed throughout the process. Feedback received through these channels, as well as feedback received in response to the formal submission of the reports prepared as part of the RAPID Gated process, has been actioned and used to update assessments, which has in turn fed into the environmental assessment of these options within the regional plan and our rdWRMP24.

9.72 As outlined in Section 1, we have consulted with Natural England (NE) extensively throughout our planning process, discussing both approaches to, and outcomes from, environmental appraisal of our options and plan. We were provided with discretionary advice from NE on our HRA appropriate assessment of our options selected in WRSE's emerging regional plan. This feedback has informed our approach and has been incorporated into our assessment work for our draft plan.

9.73 We have worked with Natural England to develop further mitigation measures, where required, to be included in the HRA for our revised draft plan, via the workshop outlined above and in regular liaison meetings as Thames Water and as part of WRSE.

9.74 Engagement with Ofwat, NE and the EA on points relating to our and WRSE's overall approach to environmental appraisal can be found in Section 2.

Strategic Environmental Assessment (SEA)

9.75 In this section we describe the purpose of the SEA, and the methodology applied to option-level SEA within our WRMP24. As a summary, SEA has fed into our option-level assessment and appraisal processes in four distinct ways:

- Option design: Where assessment has identified that mitigation measures would be required to comply with SEA criteria, these measures have been incorporated into option design, and so feeding into option cost and carbon emissions assessment
- Screening: Options have been rejected where it is assessed that they would result in moderate or major negative impacts which cannot be solved through mitigation
- Metrics for programme appraisal: Stage 1 assessments have been used to define SEA+ and SEA- metrics. These metrics have then been used as an input to our multi-metric optimisation investment model
- Further mitigation measures, enhancement opportunities and monitoring have been recommended through the SEA to protect the environment, whilst maximising benefits.

Purpose

9.76 In line with the requirements under the SEA Directive as described in the SEA overview and scoping, we have carried out an options-level SEA assessment across our feasible options list (described in Section 7) to assess their positive and negative impacts on the receptors described in our SEA objectives and sub-themes. SEA option assessments carried out for the regional plan were used for the WRMP24 SEA assessment. The regional SEA results were reviewed and, where relevant, local information was included in the assessments as part of WRMP24, using the same framework. The regional SEA results also flagged where mitigation is needed, which helped inform further options development by us for the WRMP24. We also carried out an SEA cumulative effects assessment of the preferred and alternative plans formed from these options via programme appraisal; details of this assessment are available later in this document.

Methodology

9.77 Our detailed options-level assessment approach was aligned with WRSE's Environmental Assessment process for the regional plan. This is aligned with regulator expectations around regional and water company planning.

9.78 Each option was assessed by qualified individuals, using agreed frameworks and methodologies, and professional judgement, based on a description of the infrastructure required and a GIS map of its location / routing. The construction and operation of each option was considered against the SEA objectives set out in the central column of Table 9-1, considering the assessment criteria in the final column of the table and the evaluation criteria set out in Appendix B. The assessment indicated whether the proposed option would help meet, or hinder achievement, of the SEA objectives. If it contributed to the SEA objectives, then it was considered a positive effect. If the option hinders the SEA objective from being met, then it was considered a negative effect. The assessment against the SEA objectives was strategic in nature, being based on the early-stage design of each option; as such, it is not undertaken to the level of detail expected in a project-level Environmental Impact Assessment (EIA).

9.79 The assessment was split into construction effects and operational effects. An option may have both positive and negative effects under a SEA objective for both construction and operation, which were reported separately to provide more clarity for decision making on the timing and nature of each of the effects identified.

9.80 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. The datasets used and descriptions of scale of effect are presented in Appendix B.

9.81 Other assessments and studies being undertaken as part of the WRMP24 environmental assessments were also used to inform the SEA options assessment. The results of the HRA and WFD assessments fed into the SEA objectives on biodiversity and water. The HRA and WFD assessments can be found in Appendix C and Appendix D, respectively, and are described later in this section. The BNG and natural capital assessments are presented in Appendix AA, and are also described later in this section. The results of the qualitative assessment of option impacts on water purification and water regulation ecosystem services (undertaken as part of the natural capital assessment) were considered within the SEA objective on water. A high-level INNS risk screening exercise was undertaken based on options type to identify those options with potential for INNS risks. The results were reported as part of the SEA under the biodiversity objective. The INNS risk assessment is presented in Appendix BB, and is also described later in this section. These environmental assessments are further outlined in Appendix B.

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

9.83 A variable zone of influence (ZoI) was determined for each topic. Some key receptors and assets (such as allotments and woodland) were only considered if there was a direct intersection, due to their nature. 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 Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites, and Sites of Special Scientific Interest (SSSIs), which were considered by identification of potential pathways from the option to the receptor, based on qualifying species and habitats. The geographical scope of the SEA covered the Thames Water supply area and was extended to cover options that went beyond the Thames Water area and to cover transboundary effects.

9.84 The temporal scale of effects was considered based on whether they 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 operational road traffic). Temporary effects were considered as those which are reversible and are generally related to construction (e.g. construction traffic). The SEA covers the WRMP24 planning period to 2075 in line with the regional plan, considering options selected up to 2075. Options selected between 2050 and 2075 have a great deal of uncertainty and are likely to be revisited in subsequent planning cycles.

9.85 Where potential negative effects were identified, 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 if these were deemed insufficient to render the impact acceptable. Enhancement opportunities were also identified where the option could be used for the benefits of people and/or wildlife, e.g. reservoirs potentially provide an opportunity to establish wetland habitats, or for recreational benefits.

9.86 The effects of each option were assessed pre-mitigation and post-mitigation (residual effects). In calculating the residual effects for the SEA, it was assumed that all options would include standard environmental controls, described in Appendix B.

9.87 The SEA process produced a series of four metrics for each option to summarise the output information. The four metrics were positive construction, negative construction, positive operation, and negative operation. These were calculated for each option assessed by assigning a numerical value to each effect identified within the assessment: major positive = +8, moderate positive = +4, minor positive = +1, neutral = 0 (and -1 to -8 for corresponding negative effects), and summing to produce each metric. For each option, the positive metrics were summed to give a single SEA positive metric, and the negative metrics were summed to give a single SEA negative metric for use in the investment modelling. Further details on how these metrics are calculated are available from WRSE's draft Regional Plan Environmental Report.

9.88 It is important to note that the metric itself was generated solely for the investment modelling and was not used in the SEA process for the options assessment or the cumulative/in-combination effects assessments.

Habitats Regulations Assessment (HRA)

9.89 In this section we describe the purpose of HRA, and the methodology applied to option-level HRA within our WRMP24. As a summary, HRA has fed into our option-level assessment in three distinct ways:

- Option design: Mitigation measures identified as being required through the HRA are incorporated into option designs, and so feed into option cost and carbon assessments
- Screening: Options are rejected where they fail an HRA appropriate assessment and it is not considered that impacts can be adequately mitigated, subject to the four-step process detailed in this section
- Metrics for programme appraisal: no distinct 'HRA' metric has been produced for inclusion in our multi-metric optimisation. Option-level HRA has, however, fed into the option-level SEA, from which metrics are produced and included in our investment modelling

Purpose

9.90 A HRA includes several stages, as detailed in the Conservation of Habitats and Species Regulations 2017 (as amended), known as the Habitats Regulations, which are partly aimed at protecting the integrity of individual 'Habitats Sites' and determine if a plan or project may affect the protected features of a designated site before deciding whether to undertake, permit or authorise it. This Appropriate Assessment stage was informed by new guidance by UKWIR 2021[5] and as such the methodology has been updated where appropriate. Changes to the Habitats Regulations came into force on 1 January 2021 introduced by the Conservation of Habitats and Species Amendment (EU Exit) Regulations 2019[6].

9.91 In accordance with the terminology used in UKWIR 2021[1], the term 'Habitats Sites' refers to Special Areas of Conservation (SAC) and Special Protection Areas (SPA). HRAs are also required as a matter of UK Government policy, for potential SPAs (pSPA), and candidate SACs (cSAC). In England Ramsar sites[7] and proposed Ramsar sites are also included in the assessment in accordance with the National Planning Policy Framework (NPPF). In accordance with the terminology used in government guidance for England on Appropriate Assessment and the NPPF, sites subject to the HRA process can be collectively referred to as 'Habitats Sites'.

9.92 For any plan or project that could affect one or more Habitats Sites, the provisions of Part 6 of the Conservation of Habitats and Species Regulations 2017 (as amended) establishes the procedure that a competent national authority must follow before agreeing to the implementation of a plan or project. The procedure, known as an Appropriate Assessment, requires such plans or projects to undergo a stepwise impact assessment against the Habitats Sites' conservation objectives. A key result from the implementation of the Habitats Regulations is the designation and conservation of sites (otherwise known as Habitats sites) to maintain the favourable conservation status of protected habitats and species. These are listed in Annex I to the Habitats Directive, and the species listed in Annex II to that Directive as well as the threatened birds and regularly occurring migratory birds listed in the Annex I to the Birds Directive which naturally occur in the United Kingdom's territory. The competent authority can only agree to the plan or project if, based on the findings of the Appropriate Assessment, it has demonstrated the absence

[5] UKWIR (2021). Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans(21/WR/02/15). UK Water Industry Research (2021).
[6] As defined by national guidance 'Appropriate Assessment - Guidance on the use of Habitats Regulations Assessment. Published 22 July 2019 and Available at: Appropriate assessment - GOV.UK (www.gov.uk)
[7] Ramsar sites are wetlands of international importance that have been designated under the criteria of the Ramsar Convention on Wetlands

(rather than the presence) of an adverse effect on the integrity of the concerned Habitats Sites[2].

9.93 The HRA process includes the following stages, described in further detail within Appendix C.

- Stage 1 Screening - to check whether the proposal is likely to have a significant effect on the site's conservation objectives. If it is likely, the proposal needs to go through the appropriate assessment and if necessary derogation stages
- Stage 2 Appropriate Assessment - to assess the likely significant effects of the proposal in more detail and identify ways to avoid or minimise any effects, in order to conclude whether there will be adverse effects on site integrity
- Stage 3 Derogation - to consider if proposals that would have an adverse effect on a European site qualify for an exemption
- In exceptional circumstances, a plan or project having an adverse effect on the integrity of a Habitats Site can be approved under Regulation 64 of the Conservation of Habitats and Species Regulations 2017 (as amended) if it can be demonstrated that there is an absence of less damaging alternatives, and the plan or project is necessary for imperative reasons of overriding public interest. In such cases, adequate compensation measures must be secured to ensure that the overall coherence of the Habitat Site is maintained (which is referred to as Stage 4). Full wording of this is available within the Habitats Regulations themselves, which we have had due regard to.

HRA Approach and Methodology

9.94 As part of the environmental assessment process to support the development of the WRSE Regional Plan and our WRMP24, a Habitats Regulations Assessment (HRA) Test of Likely Significance (ToLS) (Stage 1 in the list above) was undertaken on the constrained list of water resource options (described in Section 7 and Appendix R) to identify options with potential likely significant effects (LSE) on Habitats sites. Options identified as having potential for LSE and that were selected in the WRSE Best Value Regional Plan Situations 1, 4 and 8 and Situation 4 of the alternative plans (LC, BES) were taken forward for the next stage of the HRA options assessment process, Appropriate Assessment (AA).

Screening (Stage 1)

9.95 In undertaking the HRA Screening, a number of steps were followed to identify the relevant information to inform the assessment. Information gathered to inform the screening included the identification of:

- Any SPA/SAC/pSPA/cSAC/Ramsar sites, including any marine sites or marine elements of these sites within the potential Zone of Influence (ZoI), and any known area(s) of land outside the site boundary itself, which play(s) an important role in supporting the site and its features of interest (functionally linked land)
- Potential effects resulting from the plan or project
- The ZoI of these effects, noting this may extend some distance from the site itself, it is not confined to activities on or adjacent to the site
- Any viable pathways for the project (or plan) to the receptor (designated site itself or functionally linked land)
- The features of interest of the designated site(s) in question

- The conservation objectives of the designated site, including any site sensitivities given within any supplementary advice, site improvement plan, or equivalent document published by the relevant nature conservation body
- It should be noted that mitigation is not taken into account at the screening stage

9.96 The above information was reviewed in respect of each feature of interest and potential development effect/impact pathway to inform an assessment of any likely significant effects. Key aspects and terms used in this assessment are defined below:

- Likelihood: Where an effect was considered to be potentially significant, then the assessment of its occurrence was based on the likelihood of it occurring and not certainty that it would occur. Effects are scoped in unless there was evidence to the contrary demonstrating that they would not occur; for example, if there is no valid pathway, or the absence of the species in that area, at that time.
- Significance: The significance of any effect is considered objectively, against the scale and nature of the impact in relation to those of that particular feature or condition and in relation to the extent of that feature or condition over the entire designated site. A significant effect within this assessment is one which, if it occurred, would lead to a decline in the quality or status of the habitats or distribution, abundance, etc. of feature(s) of interest.
- In combination: The assessment of in combination effects at option level as part of Stage 1 screening considers those projects or plans which:
  - Are currently in operation
  - Are actually proposed – defined by being a valid live planning application, or any referenced with a local plan where there is a strong likelihood of them being undertaken within a reasonable time period, specified within that plan. This includes both options within the WRMP24 and plans and programmes outside of it

Appropriate Assessment (Stage 2)

For options where potential 'Likely Significant Effects' or 'Uncertain Effects' were identified in the Stage 1 screening, an Appropriate Assessment (AA) is required and was carried out. The AAhas followed the below::

- Consider the impact of the project or plan on the integrity of the Habitats Sites, either alone or in combination with other projects and plans, with respect to the conservation objectives of the site and its structure and function
- Assess potential mitigation strategies where adverse impacts are identified, including setting out a timescale and identifying mechanisms through which the mitigation measures will be secured, implemented and monitored
- Conclude whether there is an Adverse Effect on Site Integrity (AEOSI) after all identified mitigation has been applied. If an AEOSI exists post-mitigation and the option is required for reasons of public interest and there are no less impactful alternatives, a derogation under IROPI would need to be sought in order to proceed with the option.

9.97 This assessment has been undertaken in accordance with the following guidance:

- UK Water Industry Research (UKWIR, 2021). Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15)
- GOV.UK (2019) Appropriate Assessment - Guidance on the use of Habitats Regulations Assessment. Published 22 July 2019

- European Commission (EU, 2018) Managing Natura 2000 sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC[8]

9.98 Potential effects may be direct or indirect and are dependent on the relationship between the source (proposed options' actions) and the receptor (the qualifying features of the Habitats Sites). The significance of an impact is relative to the sensitivity, existing condition and conservation status of the qualifying features of the site and the scale of the impact in space and time.

9.99 Potential effects on the qualifying features of the Habitats Sites are evaluated with respect to the scale, extent and nature of the impact, for example the area of habitat affected, changes in hydrodynamics, potential changes in species distribution, and the duration of the impact. Given the high-level nature of the assessment at this plan stage it is not always possible to determine the exact scale and extent of the impact, when this is the case, a precautionary approach is taken when evaluating the significance of the impact.

9.100 The relevant content of this report has been sent for consultation with the relevant nature conservation authorities and the public. This has informed the further development and assessment of options to ensure compliance with the regulations. If the competent authority considers that residual adverse effects on site integrity remain, assessment of alternative solutions or a derogation would be required.

9.101 This HRA Stage 2 Appropriate Assessment methodology has been formulated using the following approach, the results of which are described in Appendix C:

- Review the sites identified at Stage 1 and confirm any additions or exclusions
- Assessment of the construction and operation impacts of the options
- Assessment of the Habitats Sites' characteristics and identification of their conservation objectives
- Identification of the aspects of the proposed options that will significantly impact the conservation objectives of the Habitats Sites
- Best practice construction and operational mitigation has been applied as part of the assessment. For effects identified where more bespoke mitigation is required, this has been identified and where further work has been identified as required to further develop mitigation measures, this work has been described and assigned a timescale.

Potential impacts considered as part of the HRA

9.102 Following UKWIR (2021) guidance and given the nature of the proposed options, the potential impacts considered in the appropriate assessment are summarised in Table 9-3. Proposed distances are also provided following the same guidance to ascertain if, where a pathway has been identified, the impact is likely to affect the habitats or species for which the Habitats Site has been qualified. It should be noted that, in some cases, it was appropriate to use a larger area than in the ZoI in Table 9-3 (for example, where a new pipeline crosses a watercourse that runs into a Habitats Site and changes in water quality and quantity could affect habitats that are hydrologically connected).

[8] Available at: https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/Provisions_Art_._nov_2018_end ocx.pdf

Broad categories of potential impacts on European sites (with examples)	Examples of operations that may result in impacts and proposed ZoI
Physical loss Destruction (including offsite effects) e.g. foraging habitat, smothering	Development of built infrastructure associated with the pipelines, access routes. Indirect effects from a reduction in flows for example. drying out of water-margin habitat. Physical loss only has potential to be significant where the boundary of the option extends within the boundary of the European Site, or within an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European Site is designated or where natural processes link the option to the site, such as through hydrological connectivity downstream, long shore drift along the coast, or the scheme impacts the linking habitat).
Physical damage Habitat degradation Erosion Trampling Fragmentation Severance/barrier effects Edge effects	Development of built infrastructure associated with the scheme, e.g. reservoir embankments, water treatment plants, pipelines, pumping stations. Physical damage may to be significant where the boundary of the scheme extends within or is directly adjacent to the boundary of the European Site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat that supports species for which a European Site is designated, or where natural processes link the scheme to the site, such as through hydrological connectivity downstream of an option or sediment drift along the coast.
Non-physical disturbance Noise Visual presence Light pollution Air pollution	Noise from temporary construction or temporary pumping activities. Taking into consideration the noise level generated from general building activity (c. 122dB(A)) and considering the lowest noise level identified in guidance as likely to cause disturbance to waterbird species (although this guidance is designed primarily for estuarine birds it was considered appropriate to use for this plan), it is concluded that noise impacts could be significant up to 1km from the boundary of the European site. Noise from vehicular traffic during operation of the scheme Noise from construction traffic may only be significant where the transport route to and from the scheme is within 3-5Km of the boundary of the Habitat Site. Plant and personnel involved in operation of the option.

Table 9-3: Potential Impacts Considered in the Appropriate Assessment

Source: Mott MacDonald, 2022 - Adapted from: UK Water Industry Research (2021)

Limitations, assumptions and standard best-practice mitigation measures

Limitations to the Assessment

9.103 Any uncertainties and the limitations of the assessment process are acknowledged and highlighted within Appendix C. Recommendations for avoidance and mitigation measures to address potential adverse effects on the integrity of the Habitats Sites identified by the assessments are also based on the information available at the time of the assessment. It is acknowledged that the requirement for mitigation may change as the design of the scheme progresses. This is expected to be through increasing the level of detail available during later stages of option development if the relevant options are progressed.

9.104 The plan-level nature of this assessment undertaken at the plan stage means that there is lack of detailed design for all options considered. By law any option being taken forward to be implemented will be subject to an Appropriate Assessment at the project (consenting) stage, when, in the light of more information relating to the construction and design of the project, a more refined HRA assessment can be undertaken.

Assumptions during construction

9.105 The assumptions made on the mitigation measures for the scheme design, pollution control, biosecurity, disturbance, and the Construction and Environmental Management Plan (CEMP) are described within Appendix C.

Assumptions during operation

9.106 New raw water intakes are assumed to be undertaken under licensed limits.

9.107 The water treatment level will need to be appropriate to avoid the risk of spreading Invasive Non-Native Species (INNS) and pathogens, this will be fully identified at the project stage informed by a baseline study. An INNS risk assessment was undertaken as part of the WRSE regional planning process and further stage 1 and 2 INNS assessments undertaken as part of our WRMP24 development; further details are available later in this Section and also in Appendix BB.

Water Framework Directive Assessment (WFD)

9.108 In this section we describe the purpose of the option-level WFD assessments that have been carried out for our WRMP24. As a summary, these assessments have fed into our option-level assessment in four distinct ways:

- Option design: Where it is identified that mitigation measures would be required to ensure that an option would not prevent 'Good' status, and to ensure no deterioration, these mitigation measures are included in option designs, feeding into option cost and carbon assessments.
- Screening: Options are rejected where they would prevent achievement of 'Good' status of a water body, or would pose a risk of deterioration, where mitigation would not be possible, and where derogation does not apply. This is set out in further detail in Appendix D.
- Identification of further investigation needs: Where assessed as necessary for individual options, further investigation has been identified as being needed.
- Metrics for programme appraisal: no 'WFD' metric has been produced for inclusion in our multi-metric optimisation. Option-level WFD assessment has, however, fed into

the option-level SEA, from which metrics are produced and included in our investment modelling

Purpose

9.109 The Water Framework Directive (WFD) has been transposed into UK law (latest legislation covered in The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017) under which there is the obligation to meet targets for the ecological and chemical status of water bodies.

9.110 The WFD's key objectives are general protection of aquatic ecology, specific protection of unique and valuable habitats, protection of drinking water resources, and protection of bathing water. All objectives are integrated for each river basin, and the last three to specific bodies of water that are designated for drinking water abstraction, those supporting special wetlands, and bathing areas. Ecological protection should apply to all waters.

9.111 The environmental objectives of the Water Framework Directive (WFD) are the core of this UK legislation providing for long-term sustainable water management on the basis of a high level of protection of the aquatic environment. Within the Directive, Part 5 Regulation 13 sets out the "environmental objectives" for natural surface and groundwater bodies, artificial and heavily modified water bodies (HMWBs). Natural surface water bodies must, by 2027 adhere to good ecological and chemical status and groundwater bodies to good quantitative and chemical status. Artificial and HMWBs must achieve good ecological potential and good chemical status. Regulation 13 also sets out the principal of no deterioration, requiring protection from the deterioration of water status/potential.

9.112 We carry out a WFD assessment of all plan options potentially affecting the water environment as part of our legal obligation to assess whether our options do not cause deterioration and do not impact the achievement of 'Good' status for affected waterbodies.

Methodology

Overview

9.113 The All Company Working Group (ACWG), a group attended by members of all English and Welsh water companies to drive consistency in WRMPs, has developed a consistent framework for undertaking WFD assessments to demonstrate that options will not cause deterioration in status of any WFD water bodies. The assessment considers mitigation that would need to be put in place to protect water body status. The assessment also considers WFD future objectives.

9.114 Two stages of assessment are completed under the ACWG WFD approach, an initial Level 1 basic screening and a Level 2 detailed impact assessment. These are conducted/reported using a spreadsheet assessment tool which is automated based on option information for Level 1 and expert judgment based (for use by qualified individuals) for Level 2. Further information on WFD classification and the approach adopted can be found in ACWG, WFD: Consistent framework for undertaking no deterioration assessments, November 2020.

Level 1 – basic screening

9.115 The first stage of WFD assessment was completed for all feasible options potentially impacting waterbodies. Level 1 assessment follows these steps:

- Identify affected water bodies
- Breakdown option into activities involved in construction, operation and decommissioning phases
- Assign each activity an impact score (based on a predefined list)
- Consider any embedded mitigation measures
- Calculate a screening score (using a 6-point scale from -2 to 3) to 'screen out' water bodies and options with no or very minor potential impacts from further assessment. If the maximum impact score is greater than 1 (minor localised impact) then the water body will need to be taken forward into level 2 screening

9.116 The scoring system used is set out in Table 9-4 below.

Impact	Score	Description
Very beneficial	-2	Impacts that, taken on their own, have the potential to lead to the improvement in the ecological status or potential of a WFD quality element for the entire waterbody.
Beneficial	-1	Impacts that, when taken on their own, have the potential to lead to a minor localised or temporary improvement that does not affect the overall WFD status of the waterbody or any quality elements.
No/minimal	0	No measurable change in the quality of the water environment or the ability for target WFD objectives to be achieved.
Low	1	Impacts that, when taken on their own, have the potential to lead to a minor localised, short-term and fully reversible effects on one or more of the quality elements but would not result in the lowering of WFD status. Impacts would be very unlikely to prevent any target WFD objectives from being achieved.
Medium	2	Impacts that, when taken on their own, have the potential to lead to a widespread or prolonged effect on the quality of the water environment that may result in the temporary reduction in WFD status. Impacts have the potential to prevent target WFD objectives from being achieved.
High	3	Impacts when taken on their own have the potential to lead to a significant effect and permanent deterioration of WFD status. Potential for high impact on preventing target WFD objectives from being achieved.

Table 9-4: Impact scoring system used for WFD Assessments

9.117 The outcomes of the WFD Level 1 assessments of our plan options are summarised later in this section and in Appendix D. Where waterbodies and option impacts were screened in for assessment, they have been taken forward to Level 2 assessment.

Level 2 – detailed impact screening

9.118 The second stage of WFD assessment has been completed for options that were screened in at Level 1, following the steps:

- Waterbody-scale detailed assessment of impacts to each WFD quality element for each activity proposed as part of an option
- Assessment of data confidence level and design certainty – confidence levels are assigned for each assessment, based on the quality and availability of both physical data and design information about the option at the time of assessment (note, the confidence/certainty is expected to be low during this initial WRMP assessment and increase over time). Where the confidence levels are medium or low, the requirements for further data or design information in order to raise this confidence level for future stages of plan development will be listed
- Identification of further mitigation needs
- Assessment of impacts after mitigation (scoring on a 6-point scale)
- Should a risk of deterioration be identified after applying feasible mitigation, the option is rejected, or if the option is required and there are no less impactful alternatives, a derogation under Regulation 19 of the Water Framework Directive is set out
- Identification of activities to improve certainty of assessment outcomes and timescales for these

9.119 The WFD Level 2 assessment outcomes are summarised later in this section and in Appendix D.

9.120 Where waterbodies and option impacts have been identified, recommendations have been made for increasing the confidence in the assessment. This is expected to be through increasing the level of detail available during later stages of option development if the relevant options are progressed.

Limitations and assumptions

9.121 As the options set out in the WRMP are still in the early stages of design development a precautionary approach has been exercised because of residual uncertainty. The WFD assessment has the following limitations and assumptions, with further assumptions detailed in Appendix D.

- The ACWG approach uses the current officially reported baseline in the 2022-2027 Cycle 3 River Basin Management Plans (RBMPs)

Biodiversity Net Gain and Natural Capital Assessment (BNG & NC)

9.122 In this section we describe the option-level BNG and NC assessments that have been undertaken for our WRMP24.

9.123 Natural capital assessment has resulted in the calculation of a monetised value, reported in £/year, calculated using methods described in this section. This value is an input to our investment modelling and is one of the metrics considered in the multi-metric optimisation approach.

9.124 Biodiversity net gain assessment has been incorporated into our options assessment and appraisal process in two ways:

- Option costing: Where it has been identified that construction of an option would result in a biodiversity net gain of less than 10%, it has been ensured that a cost allowance for offset measures necessary to ensure a biodiversity net gain of 10% is allowed for.
- Metrics for programme appraisal: The BNG metric that results from the BNG assessment has been used as an input to our investment modelling, and is one of the metrics considered in the multi-metric optimisation approach.

Purpose

9.125 Natural capital (NC) refers to the elements of the natural world that provide benefits to society and includes aspects such as woodland, grassland, freshwater, marine, urban greenspace and wetland habitats. The benefits that are provided vary from regulating services such as natural flood management to cultural services such as recreational value.

9.126 Biodiversity net gain (BNG) refers specifically to the combination of habitats present within a site and their ability to support biodiversity. Each habitat is given a distinct score that relates to its area, condition, distinctiveness and connectivity. The change in habitat due to the construction and operation of the regional plan options informs the overall BNG score and whether they are likely to contribute to a net gain in biodiversity. The Environment Act 2021 has specified a requirement for developments requiring planning permission (such as some of our WRMP options) to demonstrate at least a 10% BNG; this will come into force in November 2023.

9.127 Environmental net gain is an approach to development that aims to leave the natural environment in a measurably better state than before the plan or scheme is implemented. There is currently no defined methodology for the incorporation of environmental net gain within regional water planning guidance. However, in line with the Guidelines, the emerging regional plan's environmental net gain will align with HM Government's 25 Year Environment Plan commitments and targets of:

- Conserving and enhancing Sites of Special Scientific Interest (SSSIs) (Wildlife and Countryside Act (1981) as amended)
- Furthering the purposing of the Habitats Directive (and Regulations) Conservation of Habitats and Species Regulations (2017) as amended
- BNG for habitats and species of principal importance for the conservation of biodiversity – (Natural Environment and Rural Communities Act (2006)[9]

9.128 Our rdWRMP24 aims to demonstrate whether it has achieved Environmental Net Gain (ENG) through the individual assessment such as Biodiversity Net Gain (BNG) and wider environmental gains quantified through the Natural Capital assessment, both for the

[9] Environment Act 2021. legislation.gov.uk. Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted
[9] DEFRA (2018). 25 Year Environment Plan. Available at: 25 Year Environment Plan - GOV.UK (www.gov.uk)
[9] Wildlife and Countryside Act 1981. Legislation.gov.uk. Available at: Wildlife and Countryside Act 1981 (legislation.gov.uk)
[9] The Conservation of Habitats and Species Regulations 2017 (legislation.gov.uk)
[9]Natural Environment and Rural Communities Act 2006. Legislation.gov.uk. Available at: Natural Environment and Rural Communities Act 2006 (legislation.gov.uk)

options and the preferred and alternative plans as a whole. The summary of the net gain for our plan is described in Section 11.

Methodology

9.129 Throughout the period during which we have been developing our plan, there have been developments and updates to various options, as part of an iterative options appraisal process. Within this period, there have been updates to the ENCA guidance and Defra BNG metric, based on feedback and literature, which we have updated our assessments in line with. We have used ENCA guidance (August 2021) and Version 3.0 of the Defra BNG metric across the assessments for our feasible option set. When running the investment model, whereby assessment occurs on a comparative basis, the same version of the NC and BNG guidance was used for consistency.

9.130 The Guidelines recommend that companies must consider the environment and society when developing the WRMP, stating that natural capital assessments and biodiversity net gain should be used to inform decision-making. The natural capital approach is similarly supported by the Government's ambition to deliver environmental net gain, as set out in the 25 Year Environment Plan and Defra's Guiding Principles.

9.131 WRSE's draft regional plan therefore specifically aims to provide a reliable Natural Capital Assessment (NCA) that is suitable to the regional scale but provides a framework to be built upon within the individual water company WRMPs. To ensure that a Natural Capital Approach was incorporated in a consistent way across the WRSE Regional Plan, WRSE developed a recommended approach to NCA, the quantification of impacts and the valuation of benefits and impacts. We used this methodology for our WRMP24. The NCA and BNG have been produced in line with best practice and guidance available at the time the assessments were undertaken, including:

- Defra (2021) Enabling a Natural Capital Approach
- HM Treasury and government finance (2022) The Green Book: appraisal and evaluation in central government
- Natural England (2021) The Biodiversity Metric 3.0 auditing and accounting for biodiversity (JP039)
- Natural England (2020) NERR076 Natural Capital Indicators: for defining and measuring change in natural capital
- Water Resources Planning Guideline (2023) and Supplementary Planning Guidance 'Environment and Society in Decision-Making' (2022)

Principles of the Natural Capital Approach

9.132 In line with the EA guidance on Environment and Society in Decision-making the WRSE regional plan NCA methodology has been developed in accordance with the following principles:

- The assessment will include the valuation of natural capital assets and ecosystem services within the footprint of each option and their zone of influence (see Appendix AA)
- The assessment methodology uses the most relevant qualitative, quantitative and/or monetary valuation approaches for the NCA. The assessment of the option's impact on the natural capital metrics will be undertaken in a sequential manner with an initial

qualitative assessment, followed by a quantitative analysis and finally a monetised assessment if enough confidence exists in the values.

- Not all ecosystem services can be monetised within the NCA however those that are will be assessed against a consistent methodology. This monetised value will be a single figure defined by the maximum natural capital benefit. The cost of the option will not be considered within this assessment as it is captured elsewhere within the multi criteria assessment.
- Ecosystem services that are not monetised will be quantified and incorporated into the regional plan decision-making process within the SEA assessment
- The NCA will be undertaken using open-source data in accordance with the guidance for regional assessments and to ensure that the approach is consistent across the entire study area
- The assessment criteria have been designed to enable the maximisation of the potential benefits from the regional plan and resulting company plans

Stage 1: Defining the Natural Capital Baseline

9.133 As part of the NCA of the feasible options within the regional plan, a natural capital baseline has been developed for the study area. This baseline has been developed using open-source data as described in NECR285[10] to generate a Natural Capital account of the stocks within the Thames Water region. The list of stocks considered within the accounts and the methodology for mapping them are shown in Appendix AA. The methodology used to map natural capital utilised the same breakdown of stocks as the National Natural Capital Atlas where possible. However, the list has been supplemented with additional abiotic stocks and key habitats that are vital to the Thames Water region such as chalk streams and rivers.

9.134 The Natural Capital baseline has reported the total quantity of each stock within the study area. Monetary valuation of the Natural Capital baseline is not included within the Natural Capital Baseline due to the availability of data.

Stage 2: Option Level Natural Capital Assessment

9.135 A natural capital assessment has been undertaken on the options in accordance with the Water Resources Planning Guideline ('Guidelines') and Enabling a Natural Capital Approach[11] (ENCA) requirements. ENCA is recommended for use by HM Treasury's Green Book: appraisal and evaluation in central government (2022) and represents supplementary guidance to the Green Book.

9.136 In August 2021, ENCA updated its guidance. Assessments on the options selected within the best value plan and alternative plans have used this guidance. The August 2021 ENCA guidance (GOV.UK, 2021) includes updated values within the Asset Databook and Service Databook. Within the Service Databook, the carbon reduction tab now includes the Department of Business, Energy and Industrial Strategy (BEIS) (2022) carbon values - a set of values produced by the government to be used in policy appraisal and evaluation, reflecting the latest evidence.

[10] Natural England, (2020) National Natural Capital Atlas: Mapping Indicators
[11] GOV.UK. 2021. Enabling a Natural Capital Approach guidance. Available online at: https://www.gov.uk/government/publications/enabling-a-natural-capital-approach-enca-guidance/enabling-a-natural-capital-approach-guidance [Accessed April 2022].

9.137 The impact of the options on the Natural Capital stocks was reported for each option quantitatively. This impact was reported for during construction and post construction to give an estimation of the impact of the option's whole lifecycle. The results of the stock assessment were reported in total losses and gains within each option's zone of influence.

9.138 The results of the change in natural capital stocks informed the assessment against the eight ecosystem services listed below using the Natural England logic chains, set out in Figure 9-6.

9.139 The assessment was informed by the option type, option description and any embedded mitigation. The outputs of the NCA were compared to the pre-construction provision of impacted services to assess the impact of the options. Five ecosystem services were monetised (subject to the screening process set out below), and the results of the assessment reported as a discrete monetary figure, water purification and water regulation were assessed qualitatively, and biodiversity has been assessed via the Biodiversity 3.0 Metric[12].

Figure 9-6: Ecosystem Services valuation logic chain

9.140 The ecosystem services reviewed to assess the impact on natural capital include:

- Carbon Sequestration (Climate Regulation)
- Natural Hazard Management
- Water Purification
- Water Regulation
- Biodiversity and Habitats
- Air Pollutant Removal
- Recreation & amenity value
- Food production

9.141 Ecosystem Services Screening

During the initial phase of the NCA, the seven ecosystem services listed (excluding Biodiversity and Habitat, assessed by the 3.0 Metric) were reviewed and scoped in or out due to the geographical or socio-economic context of the option and its zone of influence. Water Purification and Regulation were considered under the Water topic of the SEA. Specific guidance on the screening process for individual metrics is provided in Appendix AA.

[12] Natural England, Defra (2021). Available at:
ARCHIVE SITE for the Biodiversity Metric 2.0 and the Biodiversity Metric 3.0 (nepubprod.appspot.com)

Stage 3: Reporting of results

9.142 The changes in natural capital stocks have been reported for each option within Appendix AA, with the results of the ecosystem services screening and detailed assessment. The resulting natural capital metrics have been aggregated into a single metric per option that has been incorporated within the WRSE investment model. The impacts of each option against the individual natural capital metrics has also been reported to allow for further analysis and optimisation.

9.143 The results of the NCA assessments have been incorporated into WRSE decision making processes through the conversion of the results into a metric as described below:

- Natural Capital metric: A single discrete monetised value reported in £/year generated by combining the outputs of each of the five monetised natural capital metrics to provide a single figure

9.144 The results of the NCA assessments for the options selected in our best value and alternative plans have been presented in Appendix AA.

Biodiversity Net Gain Assessment Methodology

9.145 The BNG requirement, as outlined in the Guideline, recommends that WRMPs should look to provide a BNG across the plan of at least 10%, to follow the mitigation hierarchy as is standard best practice; this involves prioritising avoidance or minimisation of loss through sensitive design, followed by on-site and then off-site offsetting. The option assessments used the most-up-to-date guidance available at the time to undertake the assessment, and to inform the regional plans.

9.146 Defra and Natural England have developed a biodiversity metric to provide ecologists, developers, planners and other interested parties with a means of assessing changes in biodiversity value (losses or gains) brought about by development or changes in land management. In July 2021, Defra and Natural England launched The Biodiversity 3.0 Metric, which superseded the use of the Biodiversity 2.0 Metric. This was updated by version 3.1 of the metric in April 2022.

9.147 The 3.0 Metric presents significant improvements for measuring and accounting for habitat losses and gains. It encourages users to create and enhance habitats where they are most needed to help establish or improve ecological networks through rural and urban landscapes. By linking to current and future habitat plans and strategies, including the future Local Nature Recovery Strategies (LNRS), the 3.0 Metric incentivises habitat creation and enhancement where most needed. It also 'rewards' landowners who undertake work early, creating or enhancing habitats in advance, allowing them to generate more biodiversity units from their land. Condition assessment approaches have also been significantly updated and simplified for 3.0 Metric and some key changes made. All option assessments have been updated in line with the 3.0 Metric for both investment modelling and reporting.

9.148 The government anticipates the Metric to become the industry standard for biodiversity assessments for on-land and intertidal development types in England. As laid out in the Environment Act 2021, biodiversity net gain must be measured using the latest statutory version of the Defra BNG metric. The Metric essentially underpins the Environment Act's provisions for mandatory biodiversity net gain in England, subject to any necessary adjustments for application to major infrastructure projects. The Act further specifies the

requirement of biodiversity reports to include specified quantitative data relating to biodiversity, and as such any tool for which evaluation is predominantly qualitative is not recommended.

9.149 Since the publication of the Version 3.0 BNG metric, Version 3.1 has been made available, and subsequently Version 4.0. Version 3.0 has been used for WRSE's regional plan and our rdWRMP24 because this allows us to remain consistent with the assessments carried out for the most recent (Gate 2) submissions to RAPID for the strategic resource options. This approach has been discussed and agreed with our regulators. We understand that the next iteration of the metric will be the version expected to be used to calculate mandatory net gain as part of a planning application, with subsequent versions expected to be used appropriate to the time of application; we will follow this as part of developing options proceeding to planning.

9.150 Biodiversity net gain or net loss must be considered at both the option and programme level and a biodiversity optimised programme suggested as part of wider environmental (best value) optimisation. Each option should look to maximise biodiversity net gain and any required mitigation should be included in the option cost.

9.151 A biodiversity baseline has been developed from spatial data sets of habitats inventories (see Appendix AA) and assessed in line with the Defra BNG 3.0 Metric. The Natural Capital account has been used to identify the biodiversity value of the footprint of each option prior to construction. The post construction land use including agreed mitigation has been used to calculate the post construction biodiversity score.

9.152 As this assessment has been carried out using only open-source data a precautionary approach has been applied, assuming that where not specifically known, habitats will be assigned the moderate habitat score. This is considered a suitable methodology for the scale of the WRMP Methodology updates.

Reporting of results

9.153 The results of the BNG assessments have been incorporated into WRSE decision making processes through the conversion of the results into a metric as described below:

- Biodiversity Net Gain metric: A single score for each option showing the net change in biodiversity units for each option according to the metric

9.154 The results of the BNG assessments for the options selected in our best value and alternative plans have been presented in Appendix AA.

Opportunities

9.155 The potential opportunities for the options to enhance NC and BNG were considered following the NCA and BNG assessments, utilising the data and results to inform the most appropriate potential opportunities for enhancement of the options and wider benefits.

9.156 This has informed the development of our BNG strategy for WRMP24 which describes the opportunities we will be using to achieve this gain in line with the recommended mitigation hierarchy. The strategy also describes further work required to develop our understanding of opportunities local to our options which can maximise landscape scale gain by supporting local nature recovery strategies.

Assumptions and Limitations

9.157 The assumptions that have been used within the assessments are described within Appendix AA.

- Natural capital stocks presumed temporarily lost are expected to be reinstated/compensated

Invasive Non-Native Species Assessment (INNS)

9.158 In this section we describe the option-level INNS assessments that have been undertaken for our WRMP24. INNS assessment has informed our options assessment and appraisal process in the following ways:

- Option design: Mitigation measures identified as being required through INNS assessments are incorporated into option designs, and so feed into option cost and carbon assessments.
- Screening: Options are rejected where they fail an INNS assessment and where impacts are known to be unmitigable
- Metrics for programme appraisal: no distinct 'INNS' metric has been produced for inclusion in our multi-metric optimisation. Option-level INNS assessment has, however, fed into the option-level SEA, from which metrics are produced and included in our investment modelling

Purpose

9.159 Under the Guidelines and under the law (Invasive Alien Species (Enforcement and Permitting) Order 2019), we have a duty when developing WRMP options to effectively avoid and manage risk of INNS transfer along existing or new pathways.

9.160 We have undertaken INNS risk assessments using agreed standard methodologies to identify existing pathways for INNS and where we think options may potentially create new pathways for INNS to be transferred across waterbodies. We have used these assessments to ensure that our plan protects our region from further INNS incursion and explores opportunities to reduce the impact of INNS on our native wildlife.

Scope of assessment

9.161 The scope of this assessment is to identify and evaluate the potential for the different options within the dWRMP24 to spread invasive non-native species (INNS) – plants and animals which can spread, and cause harm to the environment and cost to the economy[13] - such as zebra mussel (*Dreissena polymorpha*)[14] and Himalayan balsam (*Impatiens glandulifera*)[15].

9.162 The aims of this assessment are to:

- Undertake a high-level 'Level 1 screening' of required priority options
- Use the results of the Level 1 screening to identify priority options for a more detailed assessment

[13] GB Non-Native Species Secretariat (2022) *Non-native species.* [online] Available at: <Non-native species » NNSS (nonnativespecies.org)>
[14] GB Non-Native Species Secretariat (2016) *Zebra mussel.* [online] Available at: <Zebra Mussel » NNSS (nonnativespecies.org)>
[15] GB Non-Native Species Secretariat (2019) *Himalayan balsam.* [online] Available at: <Himalayan Balsam » NNSS (nonnativespecies.org)>

- For those options initially assessed as having a Low, Medium, or High risk - undertake a more detailed 'Level 2 assessment'
- Present the results of the assessments, and also present the results of the Strategic Resource Option (SRO) assessments in order to document the INNS risk of all options within the best value plan and alternatives

Methodology

Level 1 screening

Overview

9.163 A Level 1 screening was undertaken in order to highlight INNS risk, and to identify options requiring a more detailed Level 2 assessment.

9.164 This methodology is based on the concept of risk as the product of the frequency and severity of INNS being transferred as the result of a water resource management option. Therefore, the methodology involves an assessor determining a Frequency of Impact and Severity of Impact which are combined to give an overall Magnitude of Risk.

Frequency of Risk rating

9.165 Table 9-5 below shows the criteria for determining the Frequency of Impact rating.

Frequency of Impact	Criteria
None	No additional frequency of impact risk beyond risk associated with existing operations.
Infrequent	Only occurs in emergency or during situations not considered part of the normal running of the scheme.
Periodical	Will happen during start up or shut down, or periodically during routine maintenance or operation of the option.
Regular	Will occur throughout the regular operation of the option.

Table 9-5: Frequency of Impact risk criteria used to assess INNS risk

Severity of Risk rating

9.166 Table 9-6 below shows the criteria for determining the Severity of Impact rating.

Severity	Criteria
None	No additional severity of impact risk beyond risk associated with existing operations.
Very Low	Treated water, effluent or groundwater.
Low	Existing pathway between waterbodies or treated water / groundwater / Effluent with no INNS risk being transferred.
Medium	Change in volume of transfer between waterbodies which are already connected.

High	New pathway between waterbodies not current connected or potential to introduce new INNS not currently observed in the UK.

Table 9-6: Severity of Impact risk criteria used to assess INNS risk

Magnitude of Risk rating

9.167 Once Frequency of Impact and Severity of Impact have been determined for a WRMP option, the results are combined in the Magnitude of Risk calculation matrix (shown in Table 9-7), in order to generate an overall Magnitude of Risk. If 'none' is selected for Frequency of Impact and/or Severity of Impact, 'no additional risk' is assigned as the Magnitude of Risk level.

Frequency / Severity	None	Infrequent	Periodical	Regular
None	No additional risk	No additional risk	No additional risk	No additional risk
Very Low	No additional risk	1 = Very Low	1 = Very Low	1 = Very Low
Low	No additional risk	2 = Low	2 = Low	3 = Low
Medium	No additional risk	3 = Low	4 = Moderate	4 = Moderate
High	No additional risk	4 = Moderate	5 = High	6 = High

Table 9-7: Magnitude of Risk calculation matrix used to determine INNS risk

Level 2 Assessment

Overview

9.168 Options with a Level 1 screening result presenting a Low, Medium or High INNS risk were put forward for further assessment in the form of a more detailed Level 2 assessment.

9.169 SROs have been subject to separate assessments, the methodology and results of which are documented within their respective Gate 2 reports. These results are summarised within Appendix BB.

9.170 The Level 2 assessment methodology utilised the SRO Aquatic INNS Risk Assessment Tool (SAI-RAT) developed by APEM Ltd on behalf of the Environment Agency (EA) to quantify the INNS risk associated with each option, based on the conceptual design information currently available.

9.171 Risk assessments are processes by which the level of risk presented by certain hazards can be assessed, where hazards are anything that can cause harm. The level of risk is typically the combination of the probability and extent of the harm which could be caused. In the case of this tool, the hazard is the potential movement of INNS along key pathways, and the risk is the probability of that movement occurring combined with the extent of the harm this could cause. The tool takes a pragmatic pathway and source-pathway-receptor model approach to the assessment of INNS risk relating to assets and raw water transfers.

9.172 The SAI-RAT takes the form of a Microsoft Excel spreadsheet, into which data and information about water transfer options are entered by the assessor to automatically generate an overall risk score. Risk scores are presented as a percentage of the highest potential score, with a higher score signifying an increased risk of introducing and transferring INNS. Risk scores are categorised as Low, Medium or High, as shown in Table 9-8[16].

Percentage (%)	Category
0 - 33	Low
34 - 66	Medium
67 - 100	High

Table 9-8: Risk score categories

9.173 The SAI-RAT requires a significant amount of information about options to be entered in order to assess the level of risk. As WRMP options are in an early stage of conceptualisation, the full range of information was not available for WRMP options. It is likely that a failure to complete fields in the absence of information would result in the general under-estimation of risk. Therefore, an alternate approach was adopted for the assessment of INNS risk for non-SRO WRMP options. This approach uses pre-determined default values for criteria where information is not yet available. Appropriate default 'assumed values' were agreed during a workshop in June 2022 attended by water companies undertaking INNS risk assessments for WRMP24, and assessors working on their behalf. We consulted with the EA on this approach and received agreement that it is sufficiently precautionary and therefore fit for purpose. The use of assumed values in this way gives an estimation of a typical interaction with a pathway or asset, allowing a cautious assessment of risk to be made in the absence of specific information.

9.174 The decision process for entering information into this risk assessment tool is shown below:

- For any given criterion, if information is available for the option, then this should be entered into the tool
- If information is not available, 'Unknown' should be selected if available
- If 'Unknown' is not available to select, then an assumed value should be entered according to the pre-agreed criteria

[16] APEM Ltd (2021). SRO Aquatic INNS Risk Assessment Tool (SAI-RAT) – User Guide. Produced on behalf of the Environment Agency

Assessing Social Effects

9.175 The social impact of our options and plans was assessed considering a broad range of impacts including human health and wellbeing, economic benefits, education and access to green space. These were assessed via our option and plan based SEA assessments, measuring impacts against four objectives under the SEA topic Population and Human Health – further details on these objectives and the assessment questions/sub-themes under them are available in Table 9-1 (SEA Framework). We also considered our customers' preference for different options within a dedicated customer preference metric that was used alongside the resilience and environmental metrics within the WRSE investment model to generate the best value plan. Further information on this is provided in WRSE's method statement on engagement with customers (Sept 2021).

Option level assessment results

9.176 This chapter summarises the key option level assessment results across the five assessment types. Further detail on these results is available from Appendices B, C, D, AA and BB. These results have been used in option screening and to inform our assessments of the overall environmental impact of the best value and alternative plans – information on the approach taken to these plan-based assessments is available later in this document, with results available in the appendices and headline results in Sections 10 and 11.

SEA

9.177 Option level SEA results across all feasible options are described in summary tables in Annex F of Appendix B and are also described in further detail within the same appendix.

9.178 The effects across Situation 4 of the best value and alternative plans are fairly similar due to a lot of overlap between the options selected. The demand management, TUBs and NEUB options selected are the same across the three plans. The BES plan contains a smaller Abingdon Reservoir option (75Mm3) therefore, there will be fewer environment effects both positive and negative due to the smaller footprint (both the LCP and BVP include the 150Mm3 version). The BES plan also selects Beckton desalination, in contrast to Situation 4 of the LCP and BVP. Major negative operation effects for energy use have been identified for the Beckton Desalination scheme; we will look to mitigate these impacts as feasible as the option is developed in further detail. Overall the BVP selects fewer groundwater options than the other two plans. Minor environmental effects have been identified for the groundwater options, therefore, this does not represent a significant difference in environmental performance across the plans.

9.179 BVP Situation 1 contains more options than BVP Situation 4, therefore, cumulatively there will be more effects as more options are being implemented. There are additional options selected in Situation 1 to Situation 4, such as Beckton Desalination which has major negative operation effects for energy use.

9.180 BVP Situation 8 contains fewer options than BVP Situation 4, therefore, cumulatively there will be fewer effects as fewer options are being implemented. BVP Situation 8 does not contain any additional options than those selected in BVP Situation 4.

9.181 Under the Biodiversity objective, minor positive residual effects for operation were identified for the demand management options as they aim to reduce water demand, leaving more water in the environment.

9.182 Major positive residual operational effects were identified for SESRO due to the new reservoir habitat created as part of the option.

9.183 No major residual effects have been identified under the Biodiversity objective for any option. SESRO identified moderate residual negative effects due to permanent loss of priority habitat, woodland and protected species and habitats for the reservoir footprint; this habitat will be restored beyond the quantity and quality lost (as feasible given the loss of irreplaceable habitat) as part of the SESRO scheme. Much of this is achievable on the reservoir site itself. Several options required HRA AA due to likely significant effects on Habitats Sites. However, the AAs concluded that with appropriate mitigation there would be no adverse effects on site integrity.

9.184 Major residual negative effects have been identified for SESRO against the Landscape objective, owing to the potential impact on the North Wessex Downs AONB. We have started to explore how the significant landscape impacts might be managed and mitigated when the scheme is designed as part of our Gate 2 submission to RAPID. We will continue to develop our thinking on these issues, in close liaison with the local community and our regulators as the design of the scheme develops.

9.185 For the operation phase, a majority of options have been assessed as resulting in either major or minor beneficial effect on the delivery of a reliable and resilient water supply, which is expected given the nature of the options. Many options have also been assessed as resulting in either major or minor beneficial effects on reducing vulnerability to climate change risks and hazards, depending on the amount of abstraction reduction the option enables in more vulnerable areas that would be exacerbated by drought conditions. The SESRO 150Mm3 option has been assessed as resulting in major beneficial effects during operation across a number of objectives.

HRA

9.186 Screening for (and subsequent) HRA Level 1 assessment was carried out for all options put forward for investment modelling to develop the plan. Options selected in Situations 1, 4 and 8 of the Best Value Plan and Situation 4 of the alternative plans (LC and BES) were passed forward to Level 2 HRA assessment (Appropriate Assessment) where Level 1 assessment indicated the presence of Likely Significant Effects. The HRA assessment process concluded that no options selected as part of the Best Value or alternative plans are likely to result in adverse effects on the integrity of Designated Sites with appropriate mitigation applied.

9.187 In the absence of mitigation, the options that have progressed to Stage 2 Appropriate Assessment (AA) have the potential to adversely affect the integrity of Designated Sites through different impact pathways during construction and/or operation. This being said, based on current option understanding appropriate to the current planning stage, and assuming that all proposed mitigation measures are implemented it is considered that there will not be a significant change in the below or any other conservation objectives:

- The extent and distribution of qualifying species.
- The structure and function of the habitats of qualifying species.
- The supporting processes on which habitats of qualifying species rely for three out of the four options evaluated.

9.188 Further details on the assessment results are provided in Appendix C. Our BNG strategy and the opportunities explored via the SROs to enhance NC and BNG as part of option design also offer opportunities to support Habitats sites in the vicinity of the options in our plan. Further information on this is available in Appendix AA and the Gate 2 documents for each SRO.

WFD

9.189 Screening for (and subsequent) WFD Level 1 assessment was carried out for all options put forward for investment modelling to develop the plan. Options selected in Situations 1, 4 and 8 of the Best Value Plan and Situation 4 of the alternative plans (LC and BES) were passed forward to Level 2 WFD assessment where Level 1 assessment identified

that this was required. Subject to their progression through the approvals process, of those options which have been screened in for assessment at Level 2, further investigation is proposed for the BVP options set out in Table 9-9, noting that at this stage the conclusion is that any deterioration risk is capable of being avoided or mitigated.

9.190 At this stage the Level 2 assessments have assessed a potential risk of deterioration to some waterbodies due to two of these options (Southfleet and Greenhithe licence disaggregation and Addington Groundwater), requiring that further investigations are completed before these options can proceed. Addington groundwater scheme has been selected in 2037 for Situation 1 of the BVP and in 2070 in Situation 4 of the BVP, allowing time to complete necessary investigations, and refine the proposed mitigations, before proceeding. The Southfleet and Greenhithe scheme has been selected in 2036 in Situation 1 of the BVP and in 2065 for Situation 4 of the BVP, also allowing time to complete necessary investigations, and refine the proposed mitigations, before proceeding. Therefore, at this plan level, it is concluded that the risk of deterioration is capable of being avoided or mitigated. Further information on proposed next steps for further investigation and further development of mitigation measures for all options identified as requiring this is available in Appendix D.

Option ID	Option title	Waterbodies proposed for further investigation
TWU_GUI_HI-TFR_RZ5_ALL_sewtogui	South East Water to Guilford	GB70610019: Basingstoke Canal
TWU_LON_HI-GRW_ALL_ALL_addington gw	Groundwater Addington	GB40601G602200: Epsom North Downs Chalk
TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg	Southfleet Greenhithe new WTW	GB40601G500300: North Kent Medway Chalk GB40601G501800: West Kent Darent and Cray Chalk
TWU_SWX_HI-GRW_ALL_ALL_moulsford gw	Moulsford 1	GB40601G600900: Berkshire Downs Chalk
TWU_SWX_HI-GRW_ALL_ALL_woods farm do	Woods Farm Increase DO	GB40601G60090: Berkshire Downs Chalk
TWU_SWX_HI-IMP_SWX_CNO_oxc-dukes cutswox	Oxford Canal - Duke's Cut (SWOX) - Construction	GB70410212: Coventry & Ashby Canal GB70910513: North Oxford Canal GB70910511: Grand Union Canal, Braunston to Leamington Spa GB70910196: Oxford Canal, summit pound GB70610197: Oxford Canal, summit to Aynho GB70610198: Oxford Canal, Aynho to Thrupp GB70610542: Oxford Canal, Thrupp to Thames And associated surface water bodies

Option ID	Option title	Waterbodies proposed for further investigation
TWU_SWX_HI-TFR_SWX_ALL_dukescut-farmoor	Dukes Cut to Farmoor	GB106039030333: Thames (Leach to Evenlode) GB70610542: Oxford Canal, Thrupp to Thames
TWU_LON_HI-GRW_RE1_ALL_asrhorton kirby	ASR Horton Kirby	GB40601G501800: West Kent Darent and Cray Chalk
T2ST	T2ST	GB40701G501200: River Test Chalk

Table 9-9: Thames Water WRMP24 BVP Level 2 assessed options subject to further investigation

9.191 The BVP (Situation 1) contains 11 options which are not included in the core BVP (situation 4), and also does not include three options which are included in the core BVP (situation 4). When compared to the core BVP (situation 4), the BVP (situation 1) includes options that could lead to additional potential cumulative effects on eight additional water bodies. The cumulative effects assessment has not identified any additional water bodies at increased risk of WFD deterioration due to these combination of options.

9.192 The BVP (situation 8) contains no new options which are not already included in the BVP (situation 4). However, BVP (situation 4) contains 16 options which are not included in BVP (situation 8). The cumulative effects assessment for this plan does not require assessment of 11 of the waterbodies identified in the core BVP (situation 4) and has not identified any additional water bodies at increased risk of WFD deterioration due to these combination of options.

9.193 The LCP includes four additional options, which are not included in the core BVP (situation 4) and does not include two options which are in the core BVP (situation 4). When compared to the core BVP (situation 4), the LCP includes options that could lead to additional potential cumulative effects on two additional water bodies and changes to cumulative effects in one water body. The cumulative effects assessment has not identified any additional water bodies at increased risk of WFD deterioration due to these combination of options.

9.194 The BESP includes seven additional options, which are not included in the core BVP (situation 4) and does not include seven options which are in the core BVP (situation 4). When compared to the core BVP (situation 4), the BESP includes options that could lead to additional potential cumulative effects on three additional water bodies and changes to cumulative effects in two water bodies. However, the cumulative effects assessment has not identified any additional water bodies at increased risk of WFD deterioration due to these combination of options.

INNS

9.195 All options out forward to investment modelling were screened and a high level (Level 1) INNS risk assessment carried out as necessary to highlight any areas of risk across the option set. Further details on this are available in WRSE's method statement for Environmental Assessment and WRSE's draft Regional Plan SEA Environmental Report.

Level 1 screening

9.196 Options selected within Situations 1, 4 and 8 of the Best Value Plan and Situation 4 of the alternative plans were screened to assess the risk of spreading INNS. Twelve WRMP options are SROs and therefore are required to have a more detailed Level 2 assessment; a Level 1 screening was therefore not undertaken for these options. The options screened in were assessed using the EA's SAI-RAT tool.

9.197 The Abingdon to Farmoor pipeline option scored a risk magnitude of High and therefore was progressed to a Level 2 INNS risk assessment.

9.198 The Oxford Canal to Duke's Cut option and Duke's Cut to Farmoor transfer option scored a risk magnitude of High and therefore was progressed to a Level 2 INNS risk assessment.

9.199 The Thames Lee Tunnel (TLT) extension from Lockwood Pumping Station (PS) to the KGV Reservoir intake scored a risk magnitude of Moderate and therefore was progressed to a Level 2 INNS risk assessment.

9.200 Beckton Desalination scored a risk magnitude of Low and therefore was progressed to a Level 2 INNS risk assessment.

9.201 Medmenham intake (53 Ml/d) scored a risk magnitude of Low and therefore was progressed to a Level 2 INNS risk assessment.

Level 2 assessment

9.202 The following conclusions have been drawn from the results of the Level 2 detailed assessment:

1. Overall risk scores of the assessed options, as assessed using SAI-RAT, are as follows:
   - The Abingdon to Farmoor pipeline option was given a result of Medium risk (risk score 38.63%)
   - The Oxford Canal to Duke's Cut option was given a result of Low risk (risk score 31.69%). The Duke's Cut to Farmoor transfer option was given a result of Medium risk (risk score 59.25%)
   - The Thames Lee Tunnel (TLT) extension from Lockwood Pumping Station (PS) to the KGV Reservoir intake was given a result of Medium risk (risk score 49.75%)
   - Beckton Desalination was given a result of Medium risk (risk score 43.07%)
   - Medmenham intake (53 Ml/d) was given a result of Low risk (risk score 26.26%)

2. The greatest risk associated with the six non-SRO options progressed to level 2 is the transfer of raw water between currently connected or unconnected waterbodies– which could create a new pathway for INNS to be transferred and introduced or strengthen an existing one, including risks associated with pipe bursts. As part of preparing our revised draft plan we have looked to incorporate suitable mitigation measures (across both design and biosecurity) to reduce these risks to an acceptable level; if this is was not deemed possible the options were to be rejected. The proportionality of any potential measures is also considered as part of this review. We discussed our review of potential mitigation measures for options selected in our draft plan in a workshop with the EA.
3. For the Oxford Canal to Farmoor option (made up of two components as above), It is considered that the risk level at this stage does not indicate requirement for specific

mitigation to be added to the option. However, mitigation requirements will be reviewed as the option design progresses.

4. For the TLT extension from Lockwood PS to the KGV reservoir option, proposed mitigation includes adding in the capacity for water to pass directly into KGV Reservoir, rather than into the River Lee as currently set out. The requirement for more extensive mitigation options is dependent on better understanding of the way the transfer will be operated. At present this is not clear and therefore, there is no clear requirement for other mitigation at present.
5. For the Abingdon to Farmoor pipeline option, the SESRO SRO includes space for a WTW which is likely to substantially reduce the risk presented by this option. Additional space and capacity could be found within the planned site to contain any process required for mitigation.

- Our review of options newly selected in the revised draft plan

6. For the Beckton desalination option, the principal risk associated with this option is the transfer of raw water through the intake pipeline (from the intake in the tidal Thames to the new desalination plant) and transfer of raw water between the storage lagoons and the desalination plant could form a new pathway for INNS transmissions in the event of a pipeline burst or leak between the source and receptor. The current proposed site of the Beckton Desalination plant lies to the north of Beckton Sewage treatment works which is to the west of the River Roding. The River Roding flows into the tidal Thames downstream of the abstraction point of the River Thames, therefore a pipe burst may functionally create a new connection and result in the transfer and introduction of new INNS. As the option is developed, mitigation proportionate to the level of risk will be considered and the EA will be consulted to determine the level of mitigation measures required in relation to the potential risk of INNS transfer.
7. For the Medmenham Intake option, the principal risk associated with this option would be the spread of INNS through pipe bursts between source and receptor. However, the current proposed pipeline route does not cross any channels, with the closest being Hamble Brook which is approximately 150m away at its closest point. As the option is developed, mitigation proportionate to the level of risk will be considered and the EA will be consulted to determine the level of mitigation measures required in relation to the potential risk of INNS transfer.

9.203 The options related to the SROs have been subject to separate assessments (where appropriate). The assessment process undertaken for all SROs follows the same process as described above, however as more information is typically available, the Level 2 assessment are undertaken in greater detail, with the headline results provided here (assuming no mitigation is incorporated):

1. For the London Reuse SRO, the options at most presented minor or negligible risks of INNS transfer. As the option design progresses consideration will be given to the development of mitigation to target specific risk and broader mitigation measures which are most likely to be feasible and effective for the control of INNS.
2. Two BVP options relating to the Severn to Thames Transfer were subject to a Level 2 assessment:

- The River Vyrnwy bypass, which under 180 Ml/d and 205 Ml/d options were assessed as 52% and 53% respectively
- The Deerhurst (Severn) to Culham (Thames) transfer was assessed based upon three operational volumes of 300Ml/d, 400Ml/d and 500Ml/d, scoring 47%, 48% and 50%, respectively. The sweetening flow of 20Ml/d was also assessed scoring 48%. The destination of the transfer is a WTW which is located within the same operation catchment as the abstraction location. Thus, the risk of transferring INNS during all three scenarios is considered to be low during the normal operation of the transfer.
- The findings of the Gate 2 INNS risk assessments will continue to inform future design iterations, including design mitigation

3. The SESRO SRO required the assessment of one BVP option, which was given a risk score of 57.90% for the assets and 61.63% for the baseline transfer components. Potential options for mitigation are provided in the Gate 2 Report Appendix A6.3 INNS Mitigation Measures Appraisal and the outcomes are summarised in the Gate 2 Report Table 6.24 and Table 6.25. The findings of the Gate 2 INNS risk assessments will continue to inform future SESRO design iterations, including design mitigation for the raw water transfers and plans for the recreational use of the asset, including appropriate biosecurity measures.
4. The Culham to Speen transfer option was assessed as part of the T2ST SRO and resulted in risk scores of 35.73% for the transfer component, and 10.94% for the asset component (for both Option B and C). The risk score of 35.73% is considered to be an overestimate of the INNS risk, as treatment of raw water at the new WTW at the intake location prior to transfer will eliminate any INNS at source (which is not accounted for within the SAI-RAT). Additionally, transfer via a pipeline rather than an open water course will reduce the likelihood the introduction of INNS along the transfer route.

9.204 Further details on Level 1 and 2 INNS assessments undertaken are available in Appendix BB.

9.205 Further information on mitigation measures considered as part of development of the SRO options is available within the Gate 2 documentation for each SRO. The findings of the Gate 2 INNS risk assessments will continue to inform future design iterations, including design mitigation and appropriate biosecurity measures.

BNG and NC

9.206 Option level assessments for BNG and NC are provided in Appendix AA.

9.207 The NCA, BNG and ecosystem services assessments for options selected in Situations 1, 4 and 8 of the best value plan and Situation 4 of the alternative plans (LC and BES) identified the following:

9.208 NCA: Our natural capital assessments have identified that our preferred and alternative plan options may cause both temporary and permanent loss of natural capital stocks in the absence of mitigation, which we have committed to achieving to deliver at least 10% biodiversity net gain as part of scheme delivery. The plan may cause the permanent loss of ancient woodland, that once lost cannot be replaced – this is a potential risk posed by the SESRO and T2ST SROs. It should be noted that this has been assessed on a precautionary basis, using option information appropriate to this stage of planning but that

which is in some respects quite high level. Whilst the loss of the ancient tree within the proposed footrprint for SESRO is unfortunately unavoidable, this will be appropriately compensated with suitable nature restoration as agreed with our regulators. Within the design for T2ST there is scope to adjust the routing of the pipeline corridors to avoid ancient woodland; this will be further examined as part of the Gate 3 development work for the scheme. . As part of further work to develop our options to minimise environmental impacts following our draft plan, we have reviewed our options for opportunities to re-route to avoid impacts on ancient woodland. This has been possible for all options selected in our best value and alternative plans which impact ancient woodland apart from the two SROs mentioned above - further details are available in Appendix AA (Biodiversity Net Gain and Natural Capital report).

9.209 Ecosystem services: The plan presents opportunities to improve the existing habitats along the route through post construction remediation and the replacement of low value habitats with higher value habitats. Without mitigation, the potential permanent loss of ancient woodland, , active flood plain, arable and pastoral habitat could result in the permanent loss of several ecosystem services that the stock provides in synergy, including carbon sequestration, natural hazard management, air pollution removal, and food production. Following on from our draft plan have looked further at how these impacts can be minimised, and offset through creation of high quality compensatory habitat. The BVP delivers a positive impact on recreation & amenity value ecosystem services, with the provision of services associated with SESRO and other schemes.

9.210 BNG: Without mitigation, the plan is likely to result in a loss of BNG habitat units due to the permanent loss of natural capital assets during construction, due to the nature of the options involved. Mitigation and enhancement opportunities for the plan to ensure achievement of at least 10% gain across our plan have been proposed within Appendix AA via our BNG strategy for our WRMP24, which works to deliver BNG in an effective, holistic manner, supporting local nature recovery strategies and introducing environmental net gain.

9.211 For the 150Mm3 SESRO option, the creation of 6,552.91 habitat units and 498.41 river units on-site will ensure that SESRO provides a significant biodiversity net gain, leaving the natural environment in a measurably better state than it was beforehand. Additional lengths of hedgerow linear features need to be created, retained or enhanced on-site or off-site in order for SESRO to reach the ≥10% net gain target for hedgerows.

9.212 The mitigation required to achieve a minimum of 10% BNG was calculated for each of the three London Recycling SROs. Areas of land which may be suitable for mitigation have been identified using scoring criteria with the highest scoring sites potentially offering more effective, functioning mitigation. Subject to planning and wider stakeholder engagement, details of timelines for implementation will strengthen the confidence of the assessment at future stages.

Assessment of Alternative Programmes and WRMP24 Decision-Making

Role of SEA in programme appraisal and decision-making

9.213 The options we have developed have fed directly into the regional planning process for WRSE by providing opportunities to address strategic water resource management issues. WRSE has adopted a best value approach for the regional plan. In the context of water resources planning, this means seeking solutions that not only secure supplies for customers, but also increases the overall benefit to customers, the wider environment and society. An investment model has been used with information on options inputted and different scenarios run to select options based on programmed parameters to derive best value and alternative plans.

9.214 The options selected by the investment modelling for the best value and alternative regional plans have then been used to identify the options included in the best value and alternative plans described in our WRMP24. In this way, the best value plan approach adopted for the regional planning process has fed directly into the best value plan approach adopted for the emerging WRMP24, as set out in Appendix B. The collaborative interaction between the two processes has resulted in a streamlined approach to the environmental assessment process, as well as ensuring consistency across water company assessments.

Establishing Alternative Programmes

9.215 Our planning process has been undertaken with WRSE on a regional basis. In line with the Environment Agency's definition, WRSE'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 society.

9.216 There are three key points where the SEA process has influenced the development of the Regional Plans and Thames Water's WRMP24:

- Individual scheme level – all feasible demand and supply-side schemes (that would deliver an increased deployable output) were subject to an assessment against the full SEA framework of objectives, set out in this Section
- Investment modelling –- the findings of the SEA assessments (informed by the HRA, WFD, INNS), NC and BNG assessments were translated into metrics that were then fed into the multi-criteria optimisation for the options selection and the programme appraisal. When running the investment model, this allowed runs to be calibrated according to those options that provide the most benefits or to exclude options with the highest environmental risk. The approach undertaken by WRSE (and Thames Water) is set out in Section 10
- These metrics enabled the environment to be directly considered in analysis and selection of programmes of options at an early stage in the planning process. For incorporation of the environmental assessments into modelling, it was assumed that recommended mitigation measures will be applied, e.g. the SEA metric findings were based on the predicted residual effects on the environment

9.217 Programme appraisal – a Best Value Plan and two alternative programmes were selected for consideration/assessment through the SEA process. These programmes are set out below along with a justification for why they were progressed:

- Best Value Plan (BVP) – The Guideline states in Section 9.1 that:
  'The aim of the regional plan and the WRMP is to present a best value plan.'

  This programme meets all the legal/regulatory requirements, policy expectations and objectives of the plan. It is therefore a reasonable plan and was progressed for consideration through the SEA process

- Least Cost Plan –- The Guideline states in Section 10.4 that:
  'You should produce a least cost programme as a benchmark to appraise your other programmes against. The least cost plan should meet your statutory requirements and be informed by your SEA and HRA. The least cost plan should include policy expectations around demand management.'

  This programme meets all of the legal/ regulatory requirements, policy expectations and objectives of the plan. It is therefore a reasonable alternative and was progressed for consideration through the SEA process

- Best Environmental and Society Plan – The Guideline states in Section 10.3 that:
  'You should present in your WRMP a programme that represents a 'Best Environment and society' programme in your programme appraisal. The 'best environment and society' programme should be one that is formed using this guidance and therefore takes into account the Strategic Environmental Assessment, Habitats Regulations Assessment, Biodiversity Net Gain and Natural capital where appropriate…You should explain in your plan how you have considered your Best Environment programme, as part of your programme appraisal, and what influence it has had on your preferred programme.

  This programme meets all the legal/regulatory requirements, policy expectations and objectives of the plan. It is therefore a reasonable alternative and was progressed for consideration through the SEA process

9.218 It is important to remember that a significant number of investment model runs were carried out by WRSE as part of programme appraisal, and as a result there could be any number of different permutations of schemes that could form alternative programmes. However, not all alternative programme runs will be 'reasonable alternatives' and therefore need to be considered within the SEA process. These programmes will not necessarily be deliverable or desirable across a number of factors including carbon impact, cost and customer acceptability, nor may they align with WRSE's policy positions. The three alternative programmes outlined above are in line with the emerging regional context and address the key choices for Thames Water across the planning horizon.

9.219 It is worth noting that the SEA cumulative assessment undertaken at both regional and company (TW) level has been carried out for Situation 1, 4 and 8 of the BVP and Situation 4 of the alternative plans described above. As described in Section 10, there are nine situations for each plan, with the same supply-demand balance pathway considered per plan. Further details on the features of these pathways can be found in Appendix B and Section 10.

The Environmental and Social impact of our best value plan and its alternatives

Regional plan approach

9.220 The WRSE regional best value plan underwent SEA and WFD cumulative effects assessment, and HRA in-combination assessment. The approach taken to this is described in WRSE's regional plan SEA Environmental Report.

Approach to SEA cumulative effects assessment

9.221 To meet legislative requirements, an SEA cumulative effects assessment, specific to our rdWRMP24, was also undertaken on the preferred and alternative plans, the results from which are included in Section 10 and 11 alongside other plan-wide environmental assessments and in detail within Appendix B. A cumulative effects assessment was undertaken to consider the intra-plan effects of each selected programme as a whole, as well as its inter-plan effects with other plans (e.g. development schemes in Local Plans) and programmes. The rdWRMP24 cumulative effects assessment considers transfers which are outside the Thames Water area or in close proximity to the plan boundary with potential pathways affecting receptors outside the plan area.

Approach to HRA in-combination assessment

9.222 As part of Stage 1 and 2 of the HRA process, assessment has examined whether the selected options in combination could cause likely significant effects or adverse effects (depending on the stage of assessment).

9.223 Stage 2 involves the consideration of the predicted adverse effects of the plan on the integrity of Habitats Sites with respect to the Site's structure, function, and conservation objectives.

9.224 Additionally, where mitigation has been proposed to avoid or minimise likely significant effects, this stage includes assessment of the likely effectiveness of any mitigation applied.

9.225 A key outcome of the Appropriate Assessment is to identify whether the integrity of the Habitats Site(s) is likely to be adversely affected by the plan/project, and we have assessed whether options in-combination within the plan are likely to result on adverse effects on these sites.

9.226 We have also assessed as to whether the options selected within the plan could have adverse effects on Habitats sites in combination with other plans and projects.

9.227 The results of these assessments are available in summary in Sections 10 and 11 and in detail in Appendix C.

Approach to WFD cumulative effects assessment

9.228 For WFD, a cumulative effects assessment has been carried out for the Thames Water WRMP24 BVP options. The cumulative effects assessment aims to identify and assess any additional, cumulative risk of deterioration in WFD status on water bodies caused by activities from multiple options taking place within them.

9.229 All water bodies scoped in and assessed for each option at Level 1 are compiled, in addition to information on major planning developments or allocations (hereafter referred to as planning projects). From here an intra-plan and inter-plan effects assessment is undertaken using this information. Methodology for each assessment is outlined in Appendix D.

9.230 The results of these assessments are available in summary in Sections 10 and 11 and in detail in Appendix D.

Approach to NC and BNG cumulative effects assessment

9.231 The cumulative intra-plan effects assessment for the Best Value and alternative plans, found in Appendix AA, considers the option assessments as a whole and the habitat units that would need to be gained in order to achieve a 10% net gain in BNG.

9.232 The cumulative inter-plan effects assessment for NCA and BNG considers the major planning applications, allocations, and major projects, that have been reviewed as part of the project, in conjunction with the Best Value Plan, and provides a high-level overview of the potential impacts, mitigation and enhancement opportunities to increase BNG and the provision of ecosystem services. We have built on our assessment in the preparation of our rdWRMP24 with the development of a BNG strategy for WRMP24 which describes how we plan to achieve this gain making use of various opportunities, as well as next steps for further development of these opportunities.

9.233 The results of these assessments are available in summary in Sections 10 and 11 and in detail in Appendix AA, which also contains our BNG strategy.

Approach to INNS cumulative effects assessment

9.234 The cumulative intra-plan effects assessment for the Best Value and alternative plans, found in Appendix BB, aims to identify additional risks posed by delivery of multiple options affecting the same waterbody(ies).

9.235 A bespoke methodology has been developed for this assessment which provides a pre-screening stage to guide the use of the SAI-RAT tool to efficiently assess the risk posed by combinations of options. This has been discussed with the Environment Agency. Further details on this methodology and the results of these assessments can be found in Appendix BB.

Next steps and progress against these from draft plan

Mitigation Measures

9.236 Mitigation measures have been suggested as part of the SEA options assessment process. These measures have also been collated and presented in Appendix B. Where possible (given programme constraints and the stage of planning the WRMP represents) 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. We are committed to delivering all mitigation measures identified by the SEA and HRA as part of plan delivery.

Key actions to take forward

9.237 We will continue discussion of these assessment results with our regulators to ensure that where potential risks have been highlighted that can be feasibly mitigated, that there is a detailed plan to adequately mitigate through:

- further investigation of impacts and/or
- design of mitigation measures

9.238 This will naturally be more imperative for options selected earlier in the planning period. Where adequate mitigation is deemed not to be feasible upon completion of further work, the option will be rejected in accordance with our options appraisal process and an alternative option within our plan will be pursued.

9.239 Options which have been assessed as having a Medium or High INNS risk may not be considered appropriate if this level of risk cannot be mitigated. For options selected in the best value and alternative plans, we have reviewed the mitigation for these to ensure that effects are mitigatable, subject to any necessary further development work. For options which are likely to be implemented, the INNS risk associated with the construction phase will be assessed and mitigated through best practice.

9.240 Where Level 2 assessments were already available for options selected within our plans, because they had been selected at WRMP19, for our draft plan we used these assessments instead of undertaking a new assessment. In line with Natural England feedback, we have reviewed these assessments in the preparation of our revised draft plan to ensure that they remain valid using the most up to date data available.

9.241 The draft WRMP24 was published for public consultation, which was open for 14 weeks from Autumn 2022 into the early part of 2023. Following consultation, responses were reviewed, and the Environmental Report (SEA) and other environmental assessment reports updated as appropriate. A log of consultation comments is provided within our Statement of Response accompanying our revised draft WRMP24.

9.242 Following adoption of our WRMP24, a Post-Adoption statement will be produced which outlines how the SEA process has influenced the development of the WRMP24, how consultation comments were taken into consideration and how the WRMP24 will be

monitored. This summary will provide enough information to make it clear how the Thames Water WRMP24 was influenced because of the SEA process and consultation.

9.243 Stage E 'Monitoring implementation of the plan' of the SEA process will be carried out by Thames Water. Proposed monitoring is described in Appendix B. It is likely that monitoring of our WRMP24 will be incorporated with the annual monitoring process. Monitoring proposals have been developed as part of the SEA process and presented in the revised draft plan SEA Environmental Report.

Opportunities to enhance the environment

9.244 Opportunities have been considered to ensure that the natural environment is left in a better condition than pre-construction conditions for the BVP. This is described in our BNG strategy within Appendix AA and will be achieved by one or more of the following:

- On-site: Improve the existing habitats on-site through post construction remediation and replacement of low BNG value habitats with higher BNG value habitats
- Off-site: Purchase suitable areas of off-site land within the local area and/or at a regional scale to offset BNG decrease by improving the existing habitats within the off-site land and/or by replacing existing habitats with higher BNG value habitats
- On-site and off-site: Improve existing habitats and/or replacement of low BNG value habitats with higher BNG value habitats as part of catchment management schemes
- As a last resort, purchase biodiversity credits to achieve gain, either as part of WRSE or on a company basis, via the new statutory biodiversity credits scheme

9.245 As a core principle, where possible, the BVP aims to not only reinstate lost habitat, but also provide a greater or more diverse habitat than is lost, to achieve overall BNG as mandated under law for options requiring planning permission or a DCO. The latter will be achieved by identifying local sites of ecological interest and proposing measures, through enhancements to our existing landholdings or in partnership with local landowners, planning authorities and NGOs. Any options would need to be taken forward based on a comprehensive understanding of the interaction between natural systems and between natural systems and social uses of land.

9.246 We are considering opportunities to create and improve habitat on-site and off-site through local schemes, NRNs and wildlife corridors in order to achieve a 10% net gain in BNG units and increase the provision of ecosystem services, therefore aiding in developing more resilient options for the future provision of water in our region. Our BNG strategy represents the first iteration of our plan to realise these improvements.


Thames
Water