



HABITATS REGULATIONS ASSESSMENT

Final Water Resources Management Plan 2024

Information to support an assessment under Regulation 63 of the
Conservation of Habitats and Species Regulations 2017

South Staffordshire Water

Ricardo ref. ED14898

Issue: 4

11/10/2024

Customer:

South Staffordshire Water PLC (South Staffs Water)

Customer reference:

ZHY1167 Consultancy Support to Water Resources West (WRW) / South Staffs Water Water Resources Management Plan 2024 (WRMP24)

Confidentiality, copyright and reproduction:

This report is the Copyright of South Staffs Water and has been prepared by Ricardo Energy and Environment (Ricardo). The contents of this report may not be reproduced, in whole or in part, nor passed to any organisation or person without the specific prior written permission of South Staffs Water.

Contact:

Rachel Ashmole, Ricardo Energy & Environment
Bright Building, Manchester Science Park, Pencroft Way, Manchester M15 6GZ, UK

T: +44 (0) 1235 753 085

E: rachel.ashmole@ricardo.com

Author:

Claire Pitcher, Eve Loxham, Emilie Gorse, Ryan Hale

Approved by:

Rachel Ashmole

Signed



Ricardo reference:

ED14898

Date:

11/10/2024

Ricardo is certified to ISO9001, ISO14001, ISO27001 and ISO45001.

Ricardo, its affiliates and subsidiaries and their respective officers, employees or agents are, individually and collectively, referred to as the 'Ricardo Group'. The Ricardo Group assumes no responsibility and shall not be liable to any person for any loss, damage or expense caused by reliance on the information or advice in this document or howsoever provided, unless that person has signed a contract with the relevant Ricardo Group entity for the provision of this information or advice and in that case any responsibility or liability is exclusively on the terms and conditions set out in that contract.

Front Cover Image:

Blithfield Reservoir, South Staffs Water

CONTENTS

EXECUTIVE SUMMARY	0
1. INTRODUCTION	1
1.1 BACKGROUND AND PURPOSE OF REPORT	1
1.2 CONSULTATION	2
1.3 STRUCTURE OF THE REPORT	2
2. METHODOLOGY	3
2.1 CONTEXT AND STAGES OF THE HRA PROCESS	3
2.2 GUIDANCE	4
2.3 APPROACH TO HRA STAGE 1 SCREENING	5
2.3.1 Identifying European sites	5
2.3.2 Sources of information	6
2.3.3 Thresholds	6
2.4 APPROACH TO STAGE 2 APPROPRIATE ASSESSMENTS	9
2.5 REVIEW OF POTENTIAL IN-COMBINATION EFFECTS	9
2.6 KEY CHALLENGES AND ASSUMPTIONS	11
2.6.1 Uncertainty and plan-level mitigation	11
2.6.2 WRMP development parameters and relevance to HRA	12
2.6.3 In-combination effects with SROs	12
3. SOUTH STAFFS WATER'S WRMP24	13
3.1 INTRODUCTION	13
3.2 SOUTH STAFFS WATER SUPPLY SYSTEM AND WATER RESOURCE MANAGEMENT PLANNING	13
4. HRA STAGE 1 SCREENING	19
4.1 EXISTING LICENCES	19
4.2 POTENTIAL LIKELY SIGNIFICANT EFFECTS OF WRMP24 FEASIBLE OPTIONS	19
4.2.1 Demand management options	19
4.2.2 Supply-side options	20
4.3 HRA STAGE 1 SCREENING CONCLUSIONS FOR PREFERRED PROGRAMME OPTIONS	24
4.3.1 Demand side options	24
4.3.2 Supply side options	24
4.4 HRA STAGE 1 SCREENING CONCLUSIONS FOR ADAPTIVE PATHWAY	24
5. STAGE 2 APPROPRIATE ASSESSMENT: RIVER MEASE SAC	26
5.1 INTRODUCTION	26
5.2 EUROPEAN SITE SUMMARY	26
5.2.1 Site description	26
5.2.2 Qualifying features screened into Stage 2 Appropriate Assessment: baseline	26
5.2.3 Condition, threats, and pressures	28
5.3 ASSESSMENT OF EFFECTS	30
6. STRATEGIC IN-COMBINATION ASSESSMENT	35
6.1 BETWEEN-OPTION 'IN-COMBINATION' EFFECTS	35
6.2 IN-COMBINATION EFFECTS WITH OTHER SOUTH STAFFS WATER PLANS	35
6.2.1 Drought Plan	35
6.3 BETWEEN-COMPANY IN-COMBINATION EFFECTS	35
6.3.1 WRMPs and Drought Plans	35
6.4 IN-COMBINATION EFFECTS WITH OTHER PLANS AND PROGRAMMES	36
6.4.1 Effects with other strategic plans and water resource demand	36
6.4.2 Effects with major projects	36

7. HRA CONCLUSIONS	37
7.1 OVERVIEW	37
7.2 PREFERRED PROGRAMME: STAGE 1 SCREENING	37
7.3 ALTERNATIVE PLAN: STAGE 2 APPROPRIATE ASSESSMENT	37
APPENDIX A EFFECT PATHWAY ASSUMPTIONS	1
WATER RESOURCE SENSITIVE FEATURES	1
ESTUARINE BIRDS AND FRESHWATER FLOWS	1
BAT SPECIES AND FUNCTIONAL LAND	2
BIRDS AND CONSTRUCTION NOISE / VISUAL DISTURBANCE	2
APPENDIX B STANDARD MITIGATION AND AVOIDANCE MEASURES	4
OVERVIEW	4
GENERAL MEASURES AND PRINCIPLES	4
Scheme Design and Planning	4
Pollution Prevention	4
GENERAL MEASURES FOR SPECIES	5
APPENDIX C HRA STAGE 1 SCREENING	6

EXECUTIVE SUMMARY

Water companies in England and Wales have a statutory requirement to prepare a Water Resources Management Plan (WRMP) every five years. The purpose of these WRMPs is to set out a strategy for a particular supply area over a 25-year period (statutory minimum) to maintain a supply-demand balance. This statutory requirement is defined under the Water Act 2003. This Habitats Regulations Assessment (HRA) accompanies the South Staffs Water WRMP24.

A water company must ensure its final WRMP meets the requirements of the Habitats Regulations before implementation. The requirement for a HRA is established through Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. This directive, known as the Habitats Directive, is transposed into national legislation by the Conservation of Habitats and Species Regulations 2017; commonly referred to as the Habitats Regulations. Under Regulations 63, any plan or project which is likely to have a significant effect on a European site (either alone or in-combination with other plans or projects) and is not directly connected with, or necessary for the management of the site, must be subject to a HRA to determine the implications for the site in view of its conservation objectives. Under UK Government policy, wetland sites designated under the international Ramsar Convention 1971 should also be subject to HRA, and are also referred to as 'European sites' in this context.

The HRA needs to consider whether there are any likely significant effects (LSE) arising from construction or implementation activities and/or operation of any of the options considered in the WRMP24. Ricardo was commissioned by South Staffs Water to undertake a HRA of a 'feasible' list of options in its WRMP24. By considering HRA from the outset, the intention has been to seek to avoid options being included in the WRMP24 that would lead to adverse effects on European Sites.

This HRA documents the HRA Stage 1 Screening for the 'feasible' list of options in the WRMP24. It also identifies those options where Stage 2 Appropriate Assessment would be needed if the option were to be included in the preferred programme of the WRMP24. This report provides the legislative background, consultation process, Plan overview, methodology for the HRA and the results of the Stage 1 Screening assessment process. Tables with the HRA Stage 1 assessments for each scheme are given in the Appendix. A total of 3 demand management and 16 supply options were assessed. Colour coding has been assigned to represent the outcome of the assessment of each scheme, where 'green' is no LSE and 'amber' is LSE cannot be ruled out and where further assessment/information regarding the scheme will be required as part of a Stage 2 Appropriate Assessment if that option were to be included in the preferred programme of the WRMP24.

LSE cannot be ruled out (i.e. 'amber') for 14 of feasible options and one supply option is assessed as having no LSE (i.e. 'green'). LSE is identified (i.e. 'red') for the remaining feasible option with significant risk of an adverse effect during operation.

The preferred programme is made up of demand-side measures only, targeted at leakage reduction, water efficiency measures and fitting of enhanced meter technology. For demand-side measures that are likely to require some form of physical intervention or amendment to infrastructure (e.g. pipe repair), some instances of effect pathways might be conceivable but it is not possible to predict or identify specific locations where such measures might be applied and so effects on specific European sites cannot be identified. However, it is very likely that adverse and/or significant effects could be avoidable at a scheme level. Therefore, from an HRA perspective, the options are 'screened in' (as an effect pathway is conceivable) but as a meaningful appropriate assessment is not possible, the assessment is necessarily deferred to the project level.

As part of South Staffs Water ongoing review of the modelling outputs, preferred programme and adaptive pathways during early 2024, the need to include a supply-option was identified. The option of raising Blithfield dam by 2m is selected in an adaptive pathway if the demand management options are deemed to fall short of target (refer to overarching WRMP24 for further details). A Stage 2 Appropriate Assessment has been completed for this option, as it would be required to be on-line in 2036.

1. INTRODUCTION

1.1 BACKGROUND AND PURPOSE OF REPORT

The Water Act 2003 requires that all water companies in England and Wales prepare and maintain Water Resources Management Plans (WRMPs). These plans set out how public water supply (PWS) will be maintained over a minimum of 25 years in a way that is economically, socially and environmentally sustainable. The WRMPs must be revised every five years.

Consultation on South Staffs Water's draft WRMP (including the HRA Report, Issue 1, 23/09/2022) took place over a period of 14 weeks between November 2022 and February 2023. Comments received during this period informed subsequent changes to Habitats Regulations Assessment (HRA) report of the revised draft WRMP24 (rdWRMP24). South Staffs Water received permission from Defra to publish their WRMP24 in a letter dated 21 August 2024. This HRA Report will accompany the final WRMP24, both of which will be published in October 2024.

The WRMP24 sets out the water companies preferred resource and demand management options ('the preferred options') for meeting predicted deficits in the water available for public water supply, and for ensuring security of supply. South Staffs Water's WRMP24 does not require any supply options during the planning period of 2025 to 2050 in order to meet the deficit. This is because an ambitious demand management programme provides the required level of savings. However, the company has explored a wide range of supply options in parallel and tested both demand and supply options to ensure the preferred plan delivers the best value for both customers and the environment. As part of further testing undertaken since the submission of the rdWRMP24, one supply-side option was identified within an adaptive pathway, should the demand management reduction not be sufficient.

South Staffs Water's WRMP24 was developed within a regional water resources planning framework covering all or part of the operational areas of Dŵr Cymru Welsh Water (DCWW), Severn Trent Water (STW), South Staffordshire Water (SSW) and United Utilities Water (UU)¹ that is managed by Water Resources West (WRW). WRW prepared a Regional Plan² for the period 2025 to 2085 that addresses long-term regional and inter-regional, multi-sectoral water resources management pressures and draws on water resource options from the member water companies' WRMP24s, as well as the Strategic Resource Options (SROs) being taken forward by the companies.

A water company must ensure its final WRMP meets the requirements of the Habitats Regulations before implementation. The requirement for a HRA is established through Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, hereby referred to as the 'Habitats Directive', in Articles 6(3) and 6(4). The Habitats Directive is transposed into national legislation by the Conservation of Habitats and Species Regulations 2017 (as amended)³, commonly referred to as the Habitats Regulations.

Regulations 63 and 64 transposed the provisions of Articles 6(3) and 6(4) of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') as they related to plans or projects in England and Wales.

¹ Hafren Dyfrdwy operates in mid-Wales and borders the WRW Regional Plan area; no Hafren Dyfrdwy water resources zones are included in the regional plan and so Hafren Dyfrdwy is an associate rather than core member of WRW.

² EA (2020) *Water Resources National Framework: Appendix 2: Regional planning*.

³ The 2017 Regulations have been amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 to reflect the UK's exit from the EU, although these largely carried forward the provisions and terminology of the 2017 Regulations and do not fundamentally alter their interpretation. This report therefore primarily refers to the 2017 Regulations and (where appropriate for clarity) the relevant provisions of the Habitats Directive.

Regulation 63 states that if a plan or project is “(a) is likely to have a significant effect on a European site⁴ or a European offshore marine site⁵ (either alone or in-combination with other plans or projects); and (b) is not directly connected with or necessary to the management of the site” then the competent authority must “...make an appropriate assessment of the implications for the site in view of that site’s conservation objectives” before the giving consent or authorisation. The plan or project can only be given effect if it can be concluded (following an ‘appropriate assessment’) that it “...will not adversely affect the integrity” of a site, unless the provisions of Regulation 64 are met.

This assessment process is known as HRA⁶. An HRA determines whether there will be any ‘likely significant effects’ (LSE) on any European site as a result of a plan’s implementation (either on its own or ‘in-combination’ with other plans or projects)⁷ and, if so, whether there will be any ‘adverse effects on site integrity’⁸.

1.2 CONSULTATION

Natural England and the Environment Agency were consulted on the proposed HRA methodology in April 2021 as part of the wider WRW consultation exercise. Natural England and the Environment Agency were also consulted on the SEA Scoping Report in April 2021.

Consultation on South Staffs Water’s draft WRMP (including the HRA Report) was undertaken between November 2022 and February 2023 along with a draft HRA. South Staffs Water produced a revised draft WRMP24 (rdWRMP24) for submission alongside the Statement of Response in May 2023 and an updated HRA Report was produced to take account of stakeholder comments and support the submission of the rdWRMP24. This HRA Report has since been updated to reflect South Staffs Waters need for an adaptive pathway in the event of underachieving demand reduction targets. South Staffs Water received permission from Defra to publish their WRMP24 in a letter dated 21 August 2024. This HRA Report will accompany the final WRMP24, both of which will be published in October 2024.

1.3 STRUCTURE OF THE REPORT

The report is divided into the following sections:

Section 1: Introduction

Section 2: Methodology

Section 3: South Staffs Water’s WRMP24

Section 4: HRA Stage 1 Screening

Section 5: Stage 2 Appropriate Assessment: River Mease SAC

Section 6: Strategic in-combination assessment

Section 7: HRA conclusions

⁴ As noted, the 2019 amendment to the Habitats Regulations largely carried forward the provisions and terminology of the 2017 Regulations, and so the term ‘European site’ is currently retained and for all practical purposes the definition is essentially unchanged. European sites are therefore: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agreed the site as a ‘Site of Community Importance’ (SCI) (if this was before 31 Jan 2020); any classified Special Protection Area (SPA); and any candidate SAC (cSAC). However, the term is also commonly used when referring to potential SPAs (pSPAs), to which the provisions of Article 4(4) of Directive 2009/147/EC (the ‘new wild birds directive’) are applied; and to possible SACs (pSACs) and listed Ramsar Sites, to which the provisions of the Habitats Regulations are applied a matter of Government policy (NPPF para. 181; TAN5 para. 5.1.3) when considering development proposals that may affect them. “European site” is therefore used in this document in its broadest sense, as an umbrella term for all of the above designated sites. Note, it is likely that this term will be supplanted at some point in the future although an appropriate UK-wide alternative has not yet been agreed (e.g. the NPPF in England has adopted the term ‘Habitats sites’ to refer collectively to those sites defined by Regulation 8; the *Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019* does not offer a direct alternative to “European site” but uses the term ‘National Site Network’ in place of ‘Natura 2000’).

⁵ ‘European offshore marine sites’ are defined by Regulation 18 of The Conservation of Offshore Marine Habitats and Species Regulations 2017; these regulations cover waters (and hence sites) over 12 nautical miles from the coast.

⁶ The term ‘Appropriate Assessment’ has been historically used to describe the process of assessment; however, the process is more typically referred to as ‘Habitats Regulations Assessment’ (HRA), with the term ‘Appropriate Assessment’ limited to a specific stage within the process.

⁷ Also referred to as the ‘test of significance’.

⁸ Also referred to as the ‘integrity test’.

2. METHODOLOGY

2.1 CONTEXT AND STAGES OF THE HRA PROCESS

The responsibility for undertaking the HRA lies with South Staffs Water as the plan making authority.

An HRA determines whether there will be any 'likely significant effects' (LSE) on any European site as a result of a plan's implementation (either on its own or 'in-combination' with other plans or projects)⁹ and, if so, whether there will be any 'adverse effects on site integrity'¹⁰.

Guidance recognises four key steps in the HRA process as follows:

1. Stage 1 Screening – the identification of Likely Significant Effects (LSEs) of a plan or project on a European designated site either alone or in-combination. The test is a trigger for further assessment, and therefore the bar is set low i.e., is there a risk or possibility of an adverse effect. At this stage mitigation measures should not be taken into account, in accordance with the People over Wind (Court of Justice of the European Union (ECJ) Case C-323/17); this reinforces the idea of screening as a 'low bar' and makes 'appropriate assessments' more common.
2. Stage 2 Appropriate Assessment and the 'integrity test' – which involves closer examination of the project or plan and 'screened in' European designated sites to determine whether those sites will be subject to 'adverse effects on integrity'. The scope of such assessments is not set, and some may not be particularly detailed, especially where standard mitigation measures are available which are known to be effective. The level of assessment must be sufficient to ensure that there is no 'reasonable scientific doubt' that adverse effects on site integrity will not occur.
3. Stage 3 – Alternative Solutions – where adverse effects or uncertainty remain after the inclusion of mitigation in Stage 2, alternative ways where alternative solutions that meet the plan objectives are identified and consideration of their effects are given in comparison to those in the plan. A plan or project which has adverse effects on the integrity of a European site cannot be permitted if alternative solutions are available, except where the criteria for imperative reasons of overriding public interest are met (IROPI, see Stage 4).
4. Stage 4 Imperative Reasons of Overriding Public Interest – where there are no alternatives that have no or lesser effects on European sites, and the IROPI criteria are met, compensatory measures are developed and secured.

The stages as described above, are used to ensure compliance with the Habitats Regulations and so principally reflect the stepwise legislative tests applied to the final, submitted project or plan; **there is no statutory requirement for HRA (or its specific stages) to be completed for draft plans or similar developmental stages.**

Consequently there is flexibility for the HRA process to be run in a manner that provides maximum benefit for plan-development and sound decision-making, whilst still ultimately meeting the legislative tests.

In practice, HRAs of WRMPs usually have two functional components: they informally guide each water company as it considers which water resource options will be included in the published plan; and subsequently provide a formal assessment of the published WRMP against Regulation 63. A degree of separation between these functions is therefore sometimes necessary, and the rigid application of the stages to the emerging or interim stages of strategic plans¹¹ is not always appropriate, reducing the clarity and usefulness of the HRA as a plan-shaping process for both plan-makers and consultees. For

⁹ Also referred to as the 'test of significance'.

¹⁰ Also referred to as the 'integrity test'.

¹¹ Particularly those (such as WRMPs) where the guideline HRA stages do not map easily on to the agreed or statutory stages in the plan development process.

WRMPs this is especially true for the assessment of the emerging feasible options and the application of the 'People over Wind' (PoW)¹² case.

Therefore, whilst the principles of HRA have been applied to the emerging WRMP and the feasible options, **the specific tests associated with Regulation 63 are applied to the preferred programme of options only**. The overarching HRA process for the WRMP has therefore included the following key steps:

An initial '**risk review**' of the **supply-side**¹³ **feasible options**, to assist South Staffs Water's selection of the preferred programme options (i.e. 'HRA as a process'). The review of the feasible options applied the normal principles and practices associated with 'HRA screening' but also took account of the deliverability of the options including potential mitigation opportunities¹⁴.

The **assessment of the preferred programme of options** against the provisions of Regulation 63, comprising formal 'screening' and an 'appropriate assessment' designed to meet the legislative tests (this report).

2.2 GUIDANCE

The HRA has been undertaken in accordance with the key guidance document UKWIR (2021). *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans*. UK Water Industry Research Limited, London.

Other relevant guidance and case-practice has been considered, as detailed in the WRW Method Statement and summarised below:

- Defra (2021). Policy paper: Changes to the Habitats Regulations 2017 [online] .
- UK Government (2019). Appropriate assessment: Guidance on the use of Habitats Regulations Assessment [online] .
- Tyldesley, D. & Chapman, C. (2021). The Habitats Regulations Assessment Handbook [online]. DTA Publications Limited .
- UK Government (updated April 2023). Water resources planning guideline [online] .
- Natural England (2020). Guidance on how to use Natural England's Conservation Advice Packages in Environmental Assessments. Natural England, Peterborough.
- European Commission (2018). Managing Natura 2000 sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. European Union, 1-86.
- Defra (2012). The Habitats and Wild Birds Directives in England and its seas: Core guidance for developers, regulators & land/marine managers [online] .
- PINS Note 05/2018: Consideration of avoidance and reduction measures in Habitats Regulations Assessment: People over Wind, Peter Sweetman v Coillte Teoranta. [withdrawn].
- SNH (2019). SNH Guidance Note: The handling of mitigation in Habitats Regulations Appraisal – the People Over Wind CJEU judgement [online] .

¹² *People Over Wind and Sweetman v Coillte Teoranta* (C-323/17)

¹³ Demand-side options designed to reduce treated water use (such as metering, provision of water butts or leakage reduction options) are not systematically reviewed at this stage as they are invariably generic and geographically unspecified activities or groups of actions that cannot negatively affect any European sites (or be meaningfully assessed at the strategy level). Since they will form part of the adopted WRMP they are formally subject to Regulation 63 as part of the final HRA, but this is typically a simple screening exercise or 'down-the-line' deferral, depending on the nature of the option.

¹⁴ Applying a PoW-compliant 'screening' assessment to the feasible options would have little value for plan-development since mitigation opportunities, including effective and well-established measures for marginal effects, would be ignored. All options with 'likely significant effects' would therefore be treated equally, with no distinction between options that would (from an HRA perspective) be easily achievable in practice and those that would be extremely challenging or impossible. The review of the feasible options is not therefore intended to be, or replicate, a formal and fully compliant 'HRA screening' or be a 'draft HRA' or similar. It takes a broad view of the 'HRA-related risk' associated with an option that captures both the risk to South Staffs Water and the delivery of the WRMP within the statutory timescales (for example, the data collection required to definitively demonstrate that an option is acceptable might not be achievable in the time available for delivery of the WRMP) and the risks of the option to European site integrity (i.e. where adverse effects would appear to be an unavoidable outcome of the option as presented). The terminology intentionally reflects a typical RAG risk assessment to provide clarity for South Staffs Water and to avoid the perception of premature assessment conclusions.

2.3 APPROACH TO HRA STAGE 1 SCREENING

The objective of the HRA is to establish firstly whether any of the measures included in the WRMP24 are likely to have a significant effect on European sites (alone or in-combination with other supply schemes in the plan, or with other plans and projects).

For each of the preferred options, and alternatives in the WRMP24, the assessment considers whether there are any LSEs arising from construction and/or operation of the option (either alone or in-combination) on one or more European sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs), as well as internationally designated Ramsar sites:

- SPAs are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC; 'Birds Directive') for the protection of **wild birds and their habitats** (including particularly rare and vulnerable species listed in Annex 1 of the Birds Directive, and migratory species).
- SACs are designated under the Habitats Directive (92/43/EEC) and target particular **habitats** (Annex 1) **and/or species** (Annex II) identified as being of European importance.
- The Government also expects, as a matter of policy, potential SPAs (pSPAs), possible/proposed SACs (pSACs), compensation habitat and Ramsar sites to be included within the assessment.
- Ramsar sites support **internationally important wetland habitats** and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

For ease of reference throughout the HRA process, these designations will be collectively referred to as "European sites", despite Ramsar designations being made at the international level.

The HRA Stage 1 Screening process will identify whether each option (either alone or in-combination with other plans or projects) is likely to have significant effects on European designated sites. The purpose of the screening stage is to determine whether any part of the plan is likely to have a significant effect on any European site (including areas of compensation habitat, areas of functional land, and the ability for abstractions to occur for the management of designated wetland sites). This is judged in terms of the implications of the plan for a site's conservation objectives, which relate to its 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated¹⁵, and Ramsar criterion). Significantly, HRA is based on a rigorous application of the precautionary principle. Where uncertainty or doubt remains, an impact should be assumed, triggering the requirement for Appropriate Assessment of that scheme or plan.

The screening stage also has to conclude whether any in-combination effects would result from the various schemes within the plan itself, or from implementation of the plan in-combination with other plans and projects, and whether these would adversely affect the integrity of a European site.

2.3.1 Identifying European sites

The initial list of European sites for screening has been derived by adopting a distance-based threshold of 10km from each option component, plus exceptional, longer impact pathways. The use of a '10km threshold plus exceptional pathways' approach is based on precedent set for previous HRAs of plans through consultation with statutory consultees and the Impact Risk Zone (IRZ) mapping provided by Natural England for screening of impacts to designated sites in England. It is based on the premise that most significant effects on qualifying species and habitats will occur within a maximum 10km radius of the source of impact, except where there are exceptional pathways such as major downstream or coastal dispersion effects, or larger foraging and dispersal distances for mobile species (e.g., bats, migratory fish).

In addition, the HRA Stage 1 Screening has identified any habitat outside the designated site that also supports the qualifying species populations that use the European site in question. This off-site 'functionally linked land' (or sea) is particularly relevant to mobile qualifying species (e.g., birds, bats, invertebrates, fish, otters). The precautionary principle applies equally to functionally linked land, so where there is insufficient information to ascertain that there would be no LSE, an Appropriate

¹⁵ Annexes are contained within the relevant EC Directive.

Assessment will be required. However, this does not mean that every possible parcel of land within reach of the European site's qualifying populations must have been surveyed. The 'Boggis' case¹⁶ establishes that there must be at least credible evidence that there could be a functional link between the location of option effects and the European site.

2.3.2 Sources of information

Data on the European sites and their interest features has been collected from the Joint Nature Conservation Committee (JNCC) and Natural England websites. These data include information on the attributes of the European sites that contribute to and define their integrity, current conservation status and the specific sensitivities of the site, notably the site boundaries and the boundaries of the component SSSIs; the conservation objectives; the condition, vulnerabilities and sensitivities of the sites and their interest features; the current pressures and threats for the sites; and the approximate locations of the interest features within each site (if reported); and designated or non-designated 'functional habitats' (if identified).

The following sources of published information were used:

- Site citations.
- Site Register Entries.
- Standard Data Form (SPA/SAC) or Information Sheet (Ramsar site).
- Conservation Objectives and Supplementary Advice on Conservation Objectives (for SPAs/SACs¹⁷).
- Site Improvement Plans (SIPs).
- Regulation 33 information for European Marine Sites or Conservation Advice for Marine Protected Areas¹⁸.
- Environment Agency Review of Consents information.
- SSSI Impact Risk Zones (in England), which apply equally to European sites.
- Site condition assessment has been integrated with SSSI assessments through Common Standards Monitoring (CSM) and marine condition assessments (for SAC marine features only).
- Definitions of Favourable Conservation Status (where available for species/habitat).
- Favourable Condition Tables are set out for every SSSI that underpins a European site and can often be applicable to the European site's qualifying features.
- Article 12 (SPA) and Article 17 (SAC) status reports.

2.3.3 Thresholds

The UKWIR guidance¹⁹ includes accepted 'zones of influence' for certain impacts, as repeated in **Table 2.1**, however the best and latest information should always be used to inform an assessment. Where possible, robust universal assumptions regarding the sensitivities of European site interest features will also be specified and applied at screening, for example:

- most breeding passerines will not be water-resource dependent.
- for groundwater sources and groundwater fed habitats, the EA consider that significant effects as a result of ground water abstractions are unlikely on European sites over 5km from the abstraction²⁰.
- wide-ranging marine / marine dependent species associated with marine sites that are not directly connected to the hydrological zone of influence are not typically considered to be both

¹⁶ Boggis and Another v Natural England: Court of Appeal, 20 Oct 2009

¹⁷ The conservation objectives for Ramsar sites are taken to be the same as for the corresponding SACs / SPAs (where sites overlap); SSSI Favourable Condition Tables will be used for those features not covered by SAC/SPA designations.

¹⁸ Natural England & the Countryside Council for Wales' advice given under Regulation 33(2)(a) of the Conservation (Natural Habitats, &c.) Regulations 1994, as amended.

¹⁹ UKWIR (2021). Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans. UK Water Industry Research Limited, London.

²⁰ National EA guidance: Habitats Directive Stage 2 Review: Water Resources Authorisations – Practical Advice for Agency Water Resources Staff

sensitive and exposed to the effects of the options (except in certain relatively unique circumstances, such as some desalination schemes).

Sites over 10km from the options that are not hydrologically linked and which do not support wide-ranging mobile species are considered sufficiently remote such that any environmental changes will be effectively nil, and so there will be 'no effects' on sites beyond this distance (and so no possibility of 'in-combination' effects).

Table 2.1 Potential Impacts of Plan Options (Source: UKWIR, 2021)

Broad categories of potential impacts on European Sites, with examples	Examples of activities responsible for impacts (<i>example distance considerations in italics</i>)
Physical loss: <ul style="list-style-type: none"> Removal Smothering 	<p>Development of infrastructure associated with option, e.g., new or temporary pipelines, transport infrastructure, temporary weirs. Indirect effects from a reduction in flows e.g., drying out of water-margin habitat.</p> <p><i>Physical loss is likely to be significant where the boundary of the option 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 option to the site, such as through hydrological connectivity downstream of an option, long shore drift along the coast, or the option impacts the linking habitat).</i></p>
Physical damage: <ul style="list-style-type: none"> Sedimentation/silting Prevention of natural processes Habitat degradation Erosion Fragmentation Severance/barrier effect Edge effects 	<p>Construction activity leading to permanent and/or temporary damage of available habitat, sedimentation/siltation, fragmentation, etc.</p> <p><i>Physical damage is likely to be significant where the boundary of the option 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 option to the site, such as through hydrological connectivity downstream of an option or sediment drift along the coast.</i></p>
Non-physical disturbance: <ul style="list-style-type: none"> Noise Visual presence Human presence Light pollution 	<p>Noise from temporary construction or temporary pumping activities.</p> <p><i>Taking into consideration the noise level generated from general building activity (c. 122dB(A)) and considering the lowest noise level identified in appropriate guidance as likely to cause disturbance to estuarine bird species, it is concluded that noise impacts could be significant up to 1km from the boundary of the European site^{21,22}</i></p> <p>Noise from vehicular traffic during operation of an option.</p> <p><i>Noise from construction traffic is only likely to be significant where the transport route to and from the option is within 3-5km of the boundary of the European site²³.</i></p> <p>Plant and personnel involved in in operation of the option.</p> <p><i>These effects (noise, visual/human presence) are only likely to be significant where the boundary of the option extends within or is adjacent to the boundary of the European site, or within/adjacent</i></p>

²¹ Environment Agency (2013) Bird Disturbance from Flood and Coastal Risk Management Construction Activities. Overarching Interpretive Summary Report. Prepared by Cascade Consulting and Institute of Estuarine and Coastal Studies.

²² Cutts N, Hemingway K and Spencer J (2013) The Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects. Produced by the Institute of Estuarine and Coastal Studies (IECS). Version 3.2.

²³ British Standards Institute (BSI) (2009) BS5228 - Noise and Vibration Control on Construction and Open Sites. BSI, London.

Broad categories of potential impacts on European Sites, with examples	Examples of activities responsible for impacts (<i>example distance considerations in italics</i>)
	<p>to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European Site is designated).</p> <p>Options that might include artificial lighting, e.g., for security around a temporary pumping station.</p> <p><i>Effects from light pollution²⁴ are more likely to be significant where the boundary of the option is within 500m of the boundary of the European site.</i></p>
<p>Water table/availability:</p> <ul style="list-style-type: none"> • Drying • Flooding/stormwater • Changes to surface water levels and flows • Changes in groundwater levels and flows • Changes to coastal water movement 	<p>Changes to water levels and flows due to increased water abstraction, reduced storage or reduced flow releases from reservoirs to river systems. Potential for changes to habitat availability, for example reductions in wetted width of rivers leading to desiccation of macrophyte beds.</p> <p><i>These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the option and the European site, and sometimes whether the option is up or down stream from the European site.</i></p>
<p>Toxic contamination:</p> <ul style="list-style-type: none"> • Water pollution • Soil contamination • Air Pollution 	<p>Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems.</p> <p><i>These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the European Site. However, these effects are dependent on hydrological continuity between the option and the European Site, and sometimes whether the option is up or down stream from the European site.</i></p> <p>Air emissions associated with plant and vehicular traffic during construction and operation of options.</p> <p><i>The effect of dust is only likely to be significant where site is within or in close proximity to the boundary of the European site^{25,26}. Without mitigation, dust and dirt from the construction site may be transported onto the public road network and then deposited/spread by vehicles on roads up to 500m from large sites, 200m from medium sites, and 50m from small sites as measured from the site exit.</i></p> <p><i>Effects of road traffic emissions from the transport route to be taken by the project traffic are only likely to be significant where the protected site falls within 200 metres of the edge of a road affected²⁷.</i></p>
<p>Non-toxic contamination:</p> <ul style="list-style-type: none"> • Nutrient enrichment (e.g., of soils and water) • Algal blooms • Changes in salinity • Changes in thermal regime • Changes in turbidity • Changes in sedimentation/silting 	<p>Changes to water salinity, nutrient levels, turbidity, thermal regime due to increased water abstraction, discharges, storage, or reduced compensation flow releases to river systems.</p> <p><i>These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the option and the European site, and sometimes whether the option is up or down stream from the European site.</i></p>

²⁴ Institute of Lighting Professionals (2020) Guidance Notes for the Reduction of Obtrusive Light GN01/20.

²⁵ Highways Agency (2003) Design Manual for Roads and Bridges (DMRB), Volume 11.

²⁶ Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction v1.1.

²⁷ NE Internal Guidance – Approach to Advising Competent Authorities on Road Traffic Emissions and HRAs V1.4 Final - June 2018

Broad categories of potential impacts on European Sites, with examples	Examples of activities responsible for impacts (<i>example distance considerations in italics</i>)
<p>Biological disturbance:</p> <ul style="list-style-type: none"> • Direct mortality • Changes to habitat availability • Out-competition by non-native species • Selective extraction of species • Introduction of disease • Rapid population fluctuations • Natural succession 	<p>Killing or injury due to construction activity.</p> <p><i>Likely to be a risk where the boundary of the option 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).</i></p> <p>Creation of new pathway for spread of non-native invasive species.</p> <p><i>This effect is only likely to be significant where the option is situated within the European site or an upstream tributary of the European Site, but also for inter-catchment water transfers.</i></p>

2.4 APPROACH TO STAGE 2 APPROPRIATE ASSESSMENTS

The ‘appropriate assessments’ are an extension of the assessment processes undertaken at the screening stage, with significant effects (or areas of uncertainty) examined to determine whether there will be any adverse effects on the integrity of any European sites taking into account the conservation objectives.

The presentation of the assessments depends on the nature of the options and European sites that might be exposed to effects. In this case the assessments are ‘European site led’ (i.e. each assessment section relates to a specific European site), rather than being ‘option by option’; this tends to simplify the ‘in-combination’ assessment and minimises repetition of information relating to the interest features / sensitivities (etc.) of the sites).

Shared evidence applicable to multiple sites or features (for example, in relation to birds and construction noise) are provided in **Appendix A** and **Appendix B** to reduce repetition.

The appropriate assessments are ‘appropriate’ to the nature of the WRMP as a strategic plan, the option under consideration, and the scale and likelihood of any effects; for example, exhaustive examination of feature sensitivities and possible effect pathways is not undertaken for options that would have previously been ‘screened out with mitigation’ if there is a high degree of confidence in the mitigation measures. The assessments include inter-option ‘in-combination’ assessments.

2.5 REVIEW OF POTENTIAL IN-COMBINATION EFFECTS

HRA requires that the effects of other projects, plans or programmes be considered for effects on European sites ‘in-combination’ with the WRMP. There is limited guidance on the precise scope of ‘in-combination’ assessments for strategies, particularly with respect to the levels within the planning hierarchy at which ‘in-combination’ effects should be considered, although guidance is provided by the ACWG.

Broadly, it is considered that the South Staffs Water WRMP24 could have the following in-combination effects:

- Within-plan effects, i.e. separate options within the WRMP affecting the same European site(s); these are addressed as part of the option assessment process outlined above.
- Between-plan abstraction effects, i.e. effects with other abstractions, in association with or driven by other plans (for example, other water company WRMPs);
- Other between-plan effects, i.e. ‘in-combination’ with non-abstraction activities promoted by other plans – for example, with flood risk management plans.
- Between-project effects, i.e. effects of a specific option with other specific projects and developments.

In undertaking the ‘in-combination’ assessment it is important to note the following:

- The WRMP development process explicitly accounts for land-use plans, growth forecasts and population projections when determining future treatment and water management requirements.
- The detailed examination of non-water company consents for 'in-combination' effects can only be undertaken by the Environment Agency (or Natural Resources Wales) through their permitting procedures.
- Likely water resource demands of known major projects are also taken into account during the development of the WRMPs, unless otherwise noted.

Therefore:

- It is considered that (for the HRA) potential 'in-combination' effects in respect of water-resource demands associated with known plans or projects will not occur since these demands are explicitly considered when developing the WRMP and its associated and related plans (including the SROs). The main exception to this is other water company WRMPs, which are developed concurrently.
- With regard to other strategic plans, the list of plans included within the SEA of the emerging South Staffs Water WRMP24 is used as the basis for a high-level 'in-combination' assessment. The SEA is used to provide information on the themes, policies and objectives of the 'in-combination' plans, with the plans themselves examined in more detail as necessary. Plans are obtained from the SEA datasets or internet sources where possible.
- With regard to projects:
 - The WRMP development process explicitly accounts for the water-resource demands of known major projects (e.g. power station decommissioning; large-scale housing development) during its development, and so these 'in-combination' effects are not considered in detail.
 - Potential 'in-combination' effects between individual options and Nationally Significant Infrastructure Projects (NSIPs) identified by The Planning Inspectorate, and other known major projects, are assessed.
 - It is not possible to produce a definitive list of minor existing or anticipated planning applications within the zone of influence of each proposed option to review possible local 'in-combination' effects.

In accordance with the legislation, the following approach will be adopted for the in-combination assessment:

- STEP 1 – Does the Scheme have no discernible effect, whatsoever, on the European site? If not, then there's no need for in-combination assessment, as logic dictates it can't have in-combination effects.
- STEP 2 - Does the Scheme, alone, have an adverse effect on the European site? If so, then there's no need for in-combination assessment as consent cannot be given unless the HRA Stages 3 and 4 derogation tests are met, in which case all residual effects of the scheme acting alone will be compensated for.
- STEP 3 – Does this Scheme have a discernible effect, but one which is not 'significant' in the context of the Habitats Regulations (i.e. adverse effect on site integrity) alone? If so, then an in-combination assessment is required.
- STEP 4 – Identify the other Plans/Projects that also have discernible effects that (1) aren't an adverse effect alone but (2) might act in-combination with effects of your Project. It is normal practice to agree this list of potential in-combination Plans/Projects with the Competent Authority before doing the assessment.
- STEP 5 – Assess these other Plans/Projects in-combination with this Project.

2.6 KEY CHALLENGES AND ASSUMPTIONS

The fundamental nature of the WRMP (a long-term strategic plan with specific projects) presents a number of distinct challenges for a 'strategic' or plan-level HRA and it is therefore important to understand how the WRMP is developed, its objectives, and hence how it might consequently affect European sites.

2.6.1 Uncertainty and plan-level mitigation

HRAs of plans and strategies typically have to deal with a degree of uncertainty; very often, it is not possible to provide a detailed assessment of the effects of a proposal as many aspects simply cannot be fully defined at the strategy-level in the planning hierarchy. This is particularly true for options that will only be required over longer-term planning horizons, which are inevitably less defined than options that are required in the near term.

Where the available information is fundamentally insufficient to complete a meaningful appropriate assessment, then case-practice (both for WRMPs and strategic plans in general) suggests some assessment may be deferred 'down the line' to a lower planning tier provided that certain criteria are met.

This is usually only appropriate where there is sufficient certainty that the proposal can (with the implementation of established scheme-level measures that are known to be effective) avoid adverse effects on the integrity of European sites; and/or if appropriate investigation schemes are identified to resolve the uncertainty and commitments are made within the plan to not pursue an option if adverse effects are identified through these investigations.

Case-practice in WRMP HRAs²⁸ suggests it may be acceptable to include preferred programme options with residual uncertainties provided that:

- there is sufficient flexibility within the terms of the WRMP to ensure adverse effects can be avoided at the project level (e.g. the plan does not dictate specific pipeline routes or yields that cannot be deviated from); and/or
- the option is not required within the first five years of the plan period, so allowing time for additional investigations to be completed; and
- the uncertainty that this creates is mitigated at the plan-level by the inclusion of alternative options which:
 - will meet the required demand / deficit should the Preferred Programme option prove to have an unavoidable risk of adverse effects on the European sites in question; **and**
 - will not themselves have any adverse effect on any European sites.

Note, this is not intended to provide a mechanism for the inclusion of options where there appears to be no reasonable way of avoiding adverse effects. It should be noted that this flexibility is perhaps desirable in any case, since it is possible that a 'no adverse effect' option might be subsequently proven to have adverse effects when brought to the design stage. This approach allows for the WRMP to be compliant with the Habitats Regulations since certainty over outcomes for the plan as a whole is provided.

However, it is important to note that some uncertainties will remain (particularly with regard to 'in-combination' effects) and for some options it will only be possible to fully assess any potential effects at the pre-project planning stage when certain specific details are known; for example: construction techniques; site specific survey information; the precise timing of implementation; or the status of other projects that may operate 'in-combination'. In addition, it may be several years before an option is employed, during which time other factors may alter the baseline or the likely effects of the option.

²⁸ For example, in relation to UU's WRMP14.

2.6.2 WRMP development parameters and relevance to HRA

The modelling underpinning the WRMP development and option selection process incorporates several assumptions that influence the scope of the HRA:

- The WRMP development process takes account of the existing consents regime, and any known (or reasonably anticipated) amendments that are likely to be required (e.g. following WINEP investigations or similar) since there has to be a starting point / basis for the assessment (i.e. the modelling / optioneering process cannot start with the assumption that no current consents are reliable). Any required licence amendments are factored into the supply-deficit calculations, and the Environment Agency will have confirmed that these are valid for the planning period when the WRMP modelling is undertaken. The existing consents regime (taking into account any required sustainability reductions) is therefore 'the baseline'²⁹ and, by extension the HRA of the WRMP necessarily focuses on the additional effects introduced by the WRMP options and does not (and cannot) reassess or reconfirm the existing consents regime.
- In some instances, when considering water that may be available from existing sources, consultees have indicated that consideration of 'recent actual' abstraction is more appropriate than the currently licenced maximum, particularly for waterbodies that are considered 'over-licensed'; it is understood that these licences have been identified to South Staffs Water during the plan-development process and factored into the supply-demand balance calculations.
- The modelling takes account of predicted local and regional growth when identifying risk areas and potential solutions, based (*inter alia*) on Local Plans and population growth models. 'In-combination' effects with respect to land-use plans and specific options are therefore inherently considered and accounted for as part of the WRMP option development process (i.e. an option that does not account for local growth is not a solution) and this can be relied on by the HRA. Likewise, the modelling accounts for climate change.
- Unless otherwise stated by the Environment Agency during the options development process, it is assumed that the relevant Catchment Abstraction Management Strategy (CAMS) documents are correct and reliable, and that there is 'water available' where this is confirmed by the CAMS.

2.6.3 In-combination effects with SROs

With regard to schemes involving multiple water companies (particularly some SROs) the assessment will necessarily focus on those European sites directly exposed to the activities proposed and managed by South Staffs Water, rather than sites that will only be affected by those scheme elements proposed and managed by other water companies; i.e. when undertaking the 'in-combination' assessment of a scheme that appears in multiple plans the effects from source/donor will be considered distinct from supply/beneficiary.

For example, the source/donor plan will only consider the implications of the abstraction, etc on relevant European sites and water bodies within its catchment (and downstream catchments where relevant), and the supply/beneficiary plan would consider any implications on European sites / water bodies from the application of the supplied water within its catchment(s)³⁰. This approach is intended to ensure unnecessary duplication is avoided, and pragmatism will be applied to address indirect, downstream effects and effects on functional habitat.

²⁹ It is recognised that, occasionally, the sustainability reductions agreed through the RoC process have been subsequently shown to be insufficient to address the effects of PWS abstraction on some sites; it is assumed that these will be identified to the water companies as part of the WRMP development process.

³⁰ Note: for the Severn Thames transfer we would expect the in-combination assessment of impacts on the Severn to feature in both WRW and WRSEs plans. This is due to the complex interaction of releases and abstractions particular to this scheme.

3. SOUTH STAFFS WATER'S WRMP24

3.1 INTRODUCTION

This section provides an overview of the water resources management planning process, the South Staffs Water supply system and South Staffs Water's WRMP24. For further detail, reference should be made to the overarching plan.

Water resources management planning is undertaken by all water companies in England and Wales in order to ensure reliable, resilient water supplies over the long-term planning horizon. The process includes forecasting how much water will be available and how much water customers will need over the planning period (assessing supply and demand). If a potential deficit is identified in the supply demand balance, the WRMP will determine how best to close the gap.

Water companies in England and Wales have a statutory requirement to prepare a WRMP every five years and this has been described above in **Section 1**. South Staffs Water's WRMP24 consultation programme commenced in April 2021 and on the 21 August 2024, the Secretary of State gave South Staffs Water permission to publish their final WRMP24 including associated environmental assessments.

South Staffs Water has identified feasible options from an unconstrained list containing a much greater breadth of options which are being investigated further. The feasible list is a set of options that South Staffs Water considers suitable to be included in the options programme appraisal process to determine the preferred mix of solutions for meeting any potential future supply deficits.

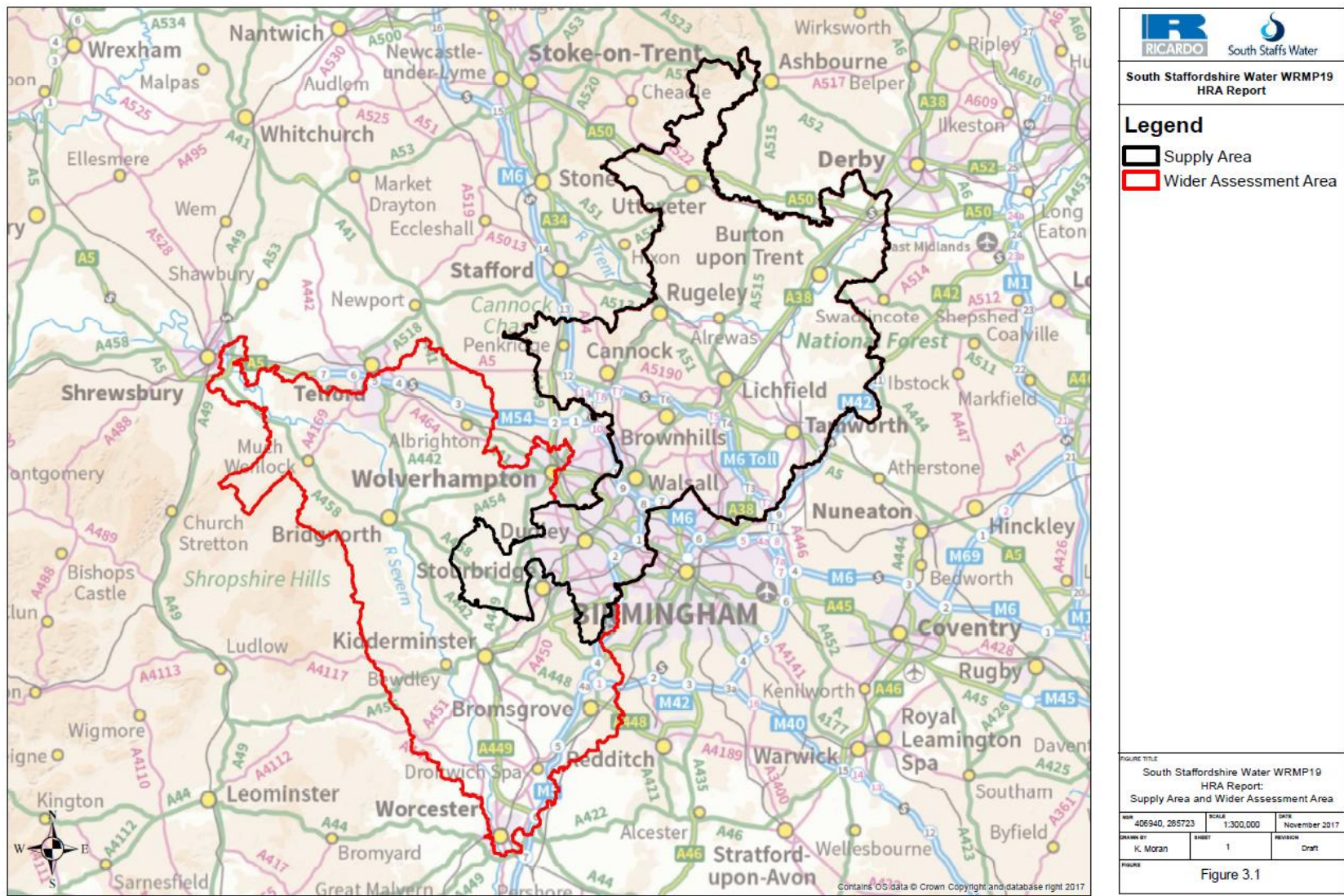
The feasible options have been assessed to understand the costs, the benefits to the supply-demand balance, the effect on carbon emissions and the environmental and social effects (through the SEA, HRA and WFD assessments). The options have subsequently been compared through a comprehensive options appraisal process to determine the 'best value' programme of options to maintain a supply-demand balance over the planning period.

3.2 SOUTH STAFFS WATER SUPPLY SYSTEM AND WATER RESOURCE MANAGEMENT PLANNING

South Staffs Water is a water-only company, providing high quality water services over an area of 1,500km² in the West Midlands, South Staffordshire, South Derbyshire, North Warwickshire and North Worcestershire areas (see **Figure 3.1**). South Staffs Water provides drinking water to over 1.3 million people across some 500,000 households, as well as 35,000 businesses, and supplies some 331 million litres per day. The company provides a bulk water supply transfer to Severn Trent Water of up to 40Ml/d for the Wolverhampton area from the River Severn at Hampton Loade, as well as a number of other small bulk exports (less than 2 Ml/d). Water is supplied through 8,300 km of water mains and fed from multiple sources including one impoundment reservoir (Blithfield Reservoir), one river abstraction with bankside storage (River Severn) and 25 groundwater sites. Groundwater sources and surface water sources (rivers and reservoirs) provide 60% and 40%, respectively, of the total volume of water put into supply. For water resource planning purposes, South Staffs Water's supply area is managed under one Water Resource Zone (WRZ) as shown in the figure below. The figure below also indicates the geographical extent of the SEA which encompasses an area beyond the South Staffs Water supply area to include the River Severn catchment area that supports the company's abstraction from the River Severn. This is also applicable to the HRA.

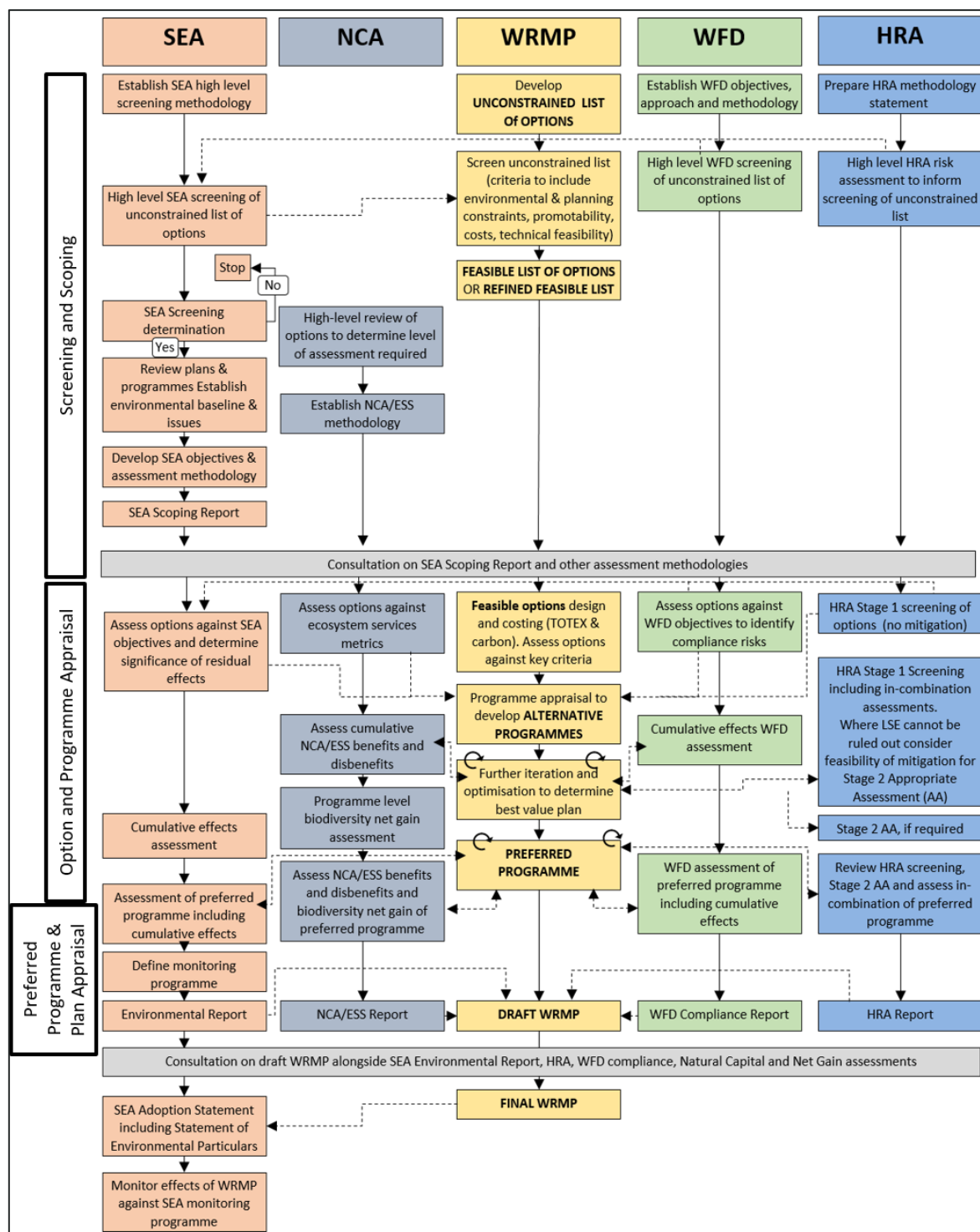
Further details about the South Staffs Water supply system are provided on the South Staffs Water website (<https://www.south-staffs-water.co.uk>).

Figure 3.1 South Staffs Water supply area and wider assessment area



In developing its WRMP24, South Staffs Water has examined the future forecast water supply/demand balance and determined how any deficit between forecast demand and reliable water supply availability should be addressed. In developing the plan, a large number of alternative options were identified and assessed to understand their costs, their benefits to the supply-demand balance, their effect on carbon emissions and their environmental and social effects (through the SEA process and associated HRA and WFD assessments). The options were subsequently compared through a comprehensive programme appraisal process to determine the 'best value' programme of options to maintain the supply-demand balance over the planning period. Decisions on the best value programme took account of a range of factors, such as the implications for water customer bills, the resilience to future risks and uncertainties, deliverability considerations and the environmental and social effects of the programme (both adverse and beneficial effects), as informed by the SEA. **Figure 3.2** below, summarises the overall approach to the evolution of the WRMP24: from the initial "unconstrained" list of options through to the consideration of alternative programmes and the development of the WRMP24.

Figure 3.2 Alignment of SEA, HRA, Water Framework Directive (WFD) and Natural Capital Assessments (NCA) to inform plan development



A total of 19 options were assessed as part of the feasible options list, all of which are located in the South Staffs Water Resource Zone (WRZ). The demand management options are shown in **Table 3.1** and the supply side options in **Table 3.2**.

Table 3.1 Feasible Options: Demand Management Options

Option	Activity
9% reduction in NHH demand by 2038	Fitting of Enhanced Meter Technology over AMP8 and AMP9 to all NHH
50% leakage reduction by 2050	Proactive trunk mains leakage reduction
	Advanced pressure optimisation
	Customer supply pipe repair or replacement (without smart networks)
	Distribution Mains/Comms pipe replacement
	Customer supply pipe repair or replacement (with smart networks)
	DMA MOT (with smart networks)
	DMA ALC plus (with smart networks)
	DMA MOT (without smart networks)
110 l/h/d by 2050	DMA ALC plus (without smart networks)
	Water labelling no minimum standards
	Household water efficiency programme (partnering approach, home visit)
	Housing associations - targeted programme
	Innovative tariffs
	Targeting properties for efficiency audits (without smart metering)
	Water neutrality (without smart metering)
	Community Water Efficiency Scheme (without smart metering)

Underpinning these options is the company's programme of universal metering it is proposing to undertake between 2025 and 2035, which will provide invaluable information to support changes to customer behaviour as well as aiding with the targeting and delivery of leakage reductions.

Table 3.2 Feasible Options: Supply Side Options

South Staffs Water Option ID	Option name
2.1.1.1	40 Ml/d capacity raw water abstraction from the Trent to Blithfield.
2.2.1.1	Increase storage at Blithfield - increase dam height by 1m.
2.2.2.1	Increase storage at Blithfield - increase dam height by 2m.
2.3.1	Chelmarsh Reservoir 15 Ml/d <2m raising.
2.3.2	Chelmarsh Reservoir 30 Ml/d up to 2m raising.
6.1.1	40 Ml/d capacity treatment works on the Trent, with 14 day storage.
6.1.3	70 Ml/d capacity treatment works on the Trent, with 14 day storage.
7.1.2.1	Third Party Option: Canal & River Trust, Birmingham Blithfield surplus.
7.1.5	Third Party Option: Canal & River Trust, Chasewater options.
7.5.1.1	UU Vyrnwy reservoir raw water release 15 Ml/d to River Severn to support South Staffs Water.
7.5.1.2	UU Vyrnwy reservoir raw water release 30 Ml/d to River Severn to support South Staffs Water.
7.5.1.3	UU Vyrnwy reservoir raw water release 45 Ml/d to River Severn to support South Staffs Water.
7.5.1.4	UU Vyrnwy reservoir raw water release 75 Ml/d to River Severn to support South Staffs Water.
8.1.1	Third Party Option: potable import.
8.1.5	Third Party Option: drill new groundwater source with licence trade.
8.3.1	Third Party Option: new raw water storage reservoir close to the River Trent.

4. HRA STAGE 1 SCREENING

4.1 EXISTING LICENCES

The WRMP24 sets out South Staff Water's long-term strategy for maintaining reliable and resilient water supplies to its customers. The strategy includes the use of existing water resources to meet demand as well as existing demand management measures to ensure sufficient supply under current baseline conditions.

The Environment Agency Review of Consents (RoC) process, undertaken in the early 2000s, considered South Staff Water's existing water source abstraction licences (at the abstraction licence limit) and the potential for adverse effects on European sites. Where adverse effects were identified, recommendations were made to change abstraction licences. Since the RoC process was completed, there have been changes to the baseline, conservation objectives and/or Supplementary Advice to Conservation Objectives, and site condition, which may require the original RoC conclusions to be revisited.

As part of the WRMP process, licences are identified between the water company and Environment Agency that are determined as valid for the planning period, or identified as requiring sustainability reductions. This informs the baseline, and provides an opportunity to flag any other licences considered to be at risk.

None of South Staff Water's existing licences have been identified as causing deterioration to the condition of a European site, and as such no further assessment work is required.

4.2 POTENTIAL LIKELY SIGNIFICANT EFFECTS OF WRMP24 FEASIBLE OPTIONS

The approach to HRA screening is described above in **Section 2** above. The South Staffs Water's supply area and the European sites within this area and in proximity are shown on **Figure 4.1**.

The HRA screening of demand management options for the WRMP24 is provided in **Section 4.2.1** and for potential water supply options in **Section 4.2.2**. Where uncertainty has been identified, this uncertainty indicates that a confident conclusion of no LSE is not yet possible. Where uncertainty remains, a Stage 2 HRA (AA) would be required to either confirm no adverse effect related to a scheme or to confirm an adverse effect and any appropriate mitigation measures. The WRMP24 does not include any options that were identified as 'uncertain' in respect of LSE on any European site.

4.2.1 Demand management options

The demand side options are summarised in **Table 3.1**, and essentially comprise the following generic option types:

- Physical amendments to the network:
 - District Metered Area (DMA) optimisation (reducing the size of DMAs through network interventions to improve the detection of smaller leaks);
 - Flow regulators (installation of flow restrictors and pressure reducing valves);
 - In-pipe repairs and lining technologies (typically non-invasive);
 - Mains rehabilitation/renewal/replacement (typically invasive);
 - Permanent network sensors (installation of acoustic loggers within assets);
 - Pressure management (reduces leakages);
 - Enhanced metering of households (smart meters);
 - Upgrade existing household meters to smart meters;

- Upstream tile optimisation (installation of larger meters 'upstream' in the supply network to improve monitoring of network losses).
- Water efficiency support:
 - Free water efficiency audits for households;
 - Free water efficiency devices (internal or external) for households;
 - Government intervention (water labelling, standards);
 - Non-household water efficiency programmes;
 - Rainwater harvesting and water reuse (new builds).

Of these, the 'water efficiency support' options cannot have significant effects due to the nature of the option (based on established guidance for similar policies and proposals in strategic planning documents that do not promote development³¹).

The remaining demand-side options are likely to require some form of physical intervention or amendment to the network. The works required for the vast majority of these options will be very minor (e.g. meter installation) with virtually no risk of significant effects on European sites. In some instances effect pathways might be conceivable (for example, a hypothetical leaking pipe might be located in or near a European site) but it is not possible to predict or identify specific locations where such measures might be applied and so effects on specific European sites cannot be identified.

Non-specific residual risks such as these can almost always be avoided with established scheme-level mitigation measures and it is very unlikely that significant or significant and adverse effects as the result of a particular demand-side measure would be unavoidable at the scheme level; however, these options are carried forward to the 'appropriate assessment' stage for procedural reasons and to avoid potential conflict with the 'People over Wind' case.

4.2.2 Supply-side options

A summary of the initial '**risk review**' of the **supply-side**³² **feasible options**, to assist South Staffs Water's selection of constrained options (i.e. 'HRA as a process') is provided in **Table 4.1**. Further screening details are provided in **Appendix C**.

Table 4.1 Screening 'risk review' of supply-side feasible options for impacts on European sites

Option No.	Option Name	HRA Outcome	Comments
2.1.1.1	40 MI/d capacity raw water abstraction from the Trent to Blithfield	LSEs identified	Works associated with Option 2.1.1 1 are considered to have a risk of likely significant effect on the Cannock Chase SAC. As such, a Stage 2 Appropriate Assessment will be required if this option is selected within the preferred programme.
2.2.1.1	Increase storage at Blithfield - increase dam height by 1m	LSEs identified	The use of the River Trent by qualifying features of the River Mease SAC (particularly spined loach) is uncertain. The River Blithe discharges into the River Trent, and therefore there is a risk of sedimentation and pollution incidents during construction. As such, a Stage 2 Appropriate
2.2.2.1	Increase storage at Blithfield - increase dam height by 2m	LSEs identified	

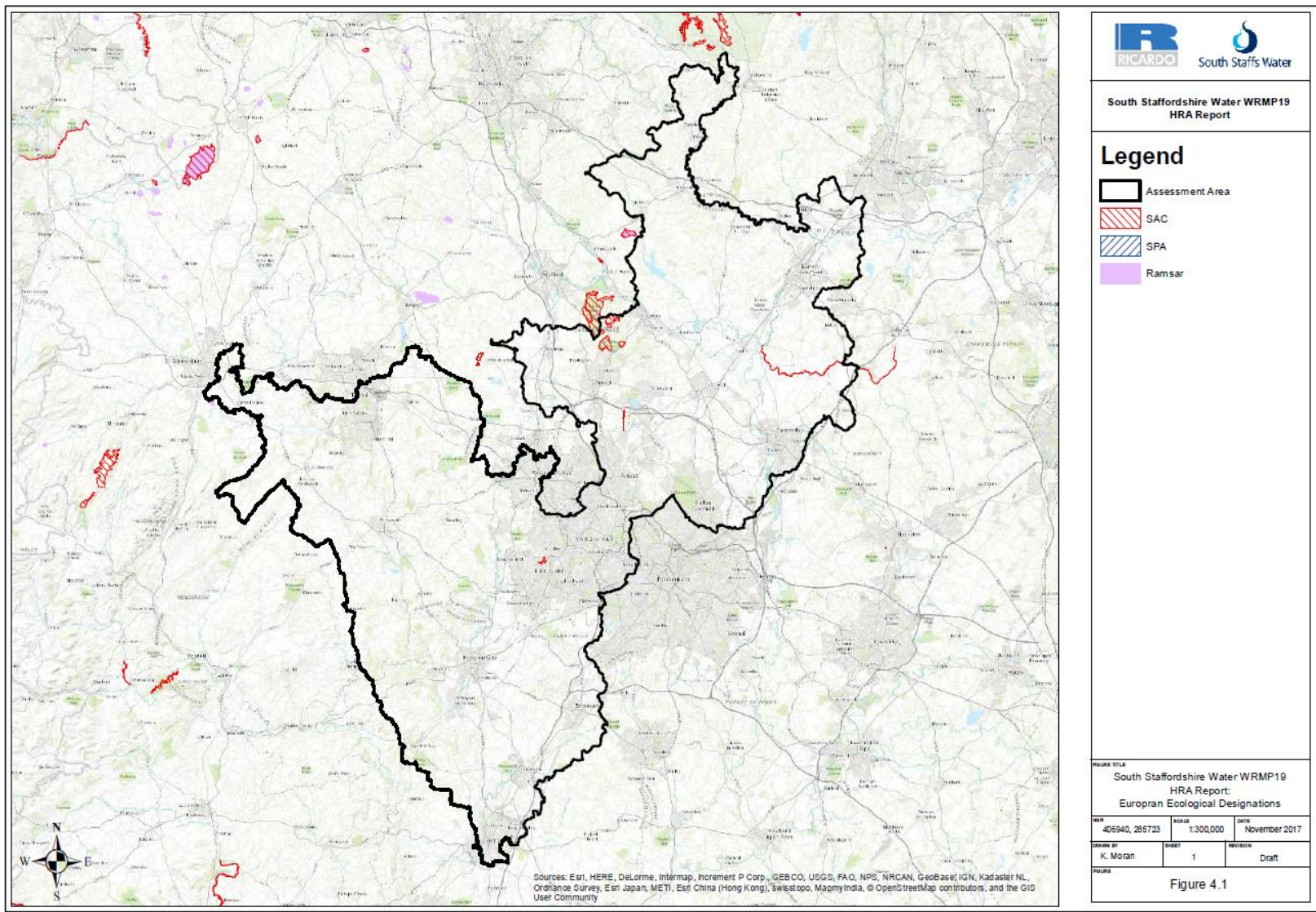
³¹ e.g. Tyldesley, D. & Chapman, C. (2021). The Habitats Regulations Assessment Handbook [online]. DTA Publications Limited. Available at: <https://www.dtapublications.co.uk/handbook/>.

³² Demand-side options designed to reduce treated water use (such as metering, provision of water butts or leakage reduction options) are not systematically reviewed at this stage as they are invariably generic and geographically unspecified activities or groups of actions that cannot negatively affect any European sites (or be meaningfully assessed at the strategy level). Since they will form part of the adopted WRMP they are formally subject to Regulation 63 as part of the final HRA, but this is typically a simple screening exercise or 'down-the-line' deferral, depending on the nature of the option.

Option No.	Option Name	HRA Outcome	Comments
			Assessment will be required to consider mitigation measures that would avoid adverse effects if this option is selected within the preferred programme.
2.3.1	Chelmarsh Reservoir 15 MI/d <2m raising	LSEs identified	Works associated with Option 2.3.1. are considered to have a risk of likely significant effect on the Severn Estuary SAC/SPA/Ramsar. As such, a Stage 2 Appropriate Assessment will be required to assess impacts from construction and operational activities if this option is selected within the preferred programme.
2.3.2	Chelmarsh Reservoir 30 MI/d up to 2m raising	LSEs identified	Works associated with Option 2.3.1. are considered to have a risk of likely significant effect on the Severn Estuary SAC/SPA/Ramsar. As such, a Stage 2 Appropriate Assessment will be required to assess impacts from construction and operational activities if this option is selected within the preferred programme.
6.1.1	40 MI/d capacity treatment works on the Trent, with 14 day storage	LSEs identified	Works associated with Option 6.1.1 are considered to have a risk of likely significant effect on the qualifying features of the River Mease SAC. As such, a Stage 2 Appropriate Assessment will be required if this option is selected within the preferred programme.
6.1.3	70 MI/d capacity treatment works on the Trent, with 14 day storage	LSEs identified	Works associated with Option 6.1.3 are considered to have a risk of likely significant effect on the River Mease SAC. As such, a Stage 2 Appropriate Assessment will be required if this option is selected within the preferred programme.
7.1.2.1	Canal & River Trust: Birmingham Blithfield surplus	LSEs identified	Works associated with Option 7.1.2.1 are considered to have likely significant effects on the River Mease SAC. As such, a Stage 2 Appropriate Assessment will be required if this option is selected within the preferred programme.
7.1.5	Canal & Rivers Trust: Chasewater surplus to Crane Brook	LSEs identified	Works associated with Option 7.1.5 are considered likely to have a risk of likely significant effect on Cannock Extension Canal SAC. As such, a Stage 2 Appropriate Assessment will be required to assess impacts if this option is selected within the preferred programme.
7.5.1.1	UU Vyrnwy reservoir raw water release 15 MI/d to River Severn to support South Staffs Water	LSEs identified	Works associated with Option 7.5.1.1 are considered to have likely significant effects on the Severn Estuary SAC/SPA/Ramsar. As such, a Stage 2 Appropriate Assessment will be required if this option is selected within the preferred programme.
7.5.1.2	UU Vyrnwy reservoir raw water release 30 MI/d to River Severn to support South Staffs Water	LSEs identified	Works associated with Option 7.5.1.2 are considered to have likely significant effects on the Severn Estuary SAC/SPA/Ramsar. As such, a Stage 2 Appropriate Assessment will be required if this option is selected within the preferred programme.
7.5.1.3	UU Vyrnwy reservoir raw water release 45 MI/d to River Severn to support South Staffs Water	LSEs identified	Works associated with Option 7.5.1.3 are considered to have likely significant effects on the Severn Estuary SAC/SPA/Ramsar. As such, a Stage 2 Appropriate Assessment will be required if this option is selected within the preferred programme.

Option No.	Option Name	HRA Outcome	Comments
7.5.1.4	UU Vyrnwy reservoir raw water release 75 Ml/d to River Severn to support South Staffs Water	LSEs identified	Works associated with Option 7.5.1.4 are considered to have likely significant effects on the Severn Estuary SAC/SPA/Ramsar. As such, a Stage 2 Appropriate Assessment will be required if this option is selected within the preferred programme.
8.1.1	Third Party Option: potable import	LSEs identified	Works associated with Option 8.1.1 are considered to have a risk of likely significant effect on the River Mease SAC. As such, a Stage 2 Appropriate Assessment will be required to assess impacts from construction activities if this option is selected within the preferred programme.
8.1.5	Third Party Option: drill new groundwater source with licence trade	LSEs identified	Works associated with Option 8.1.5 are considered to have a risk of likely significant effect on the River Mease SAC. As such, a Stage 2 Appropriate Assessment will be required to assess impacts from construction and operational activities if this option is selected within the preferred programme.
8.3.1	Third Party Option: new raw water storage reservoir close to the River Trent	LSEs identified	Works associated with Option 8.3.1 are considered to have a risk of LSE on the River Mease SAC. As such, a Stage 2 Appropriate Assessment will be required to assess impacts from construction and operational activities if this option is selected within the preferred programme.

Figure 4.1 European sites within the study area



4.3 HRA STAGE 1 SCREENING CONCLUSIONS FOR PREFERRED PROGRAMME OPTIONS

4.3.1 Demand side options

No further assessment has been carried out on the demand side options given the conclusions of the review undertaken during the feasible options stage, see **Section 4.2.1**.

4.3.2 Supply side options

The WRMP24 does not require any supply options during the planning period of 2025 to 2050 in order to meet the deficit. This is because the ambitious demand management programme provides the required level of savings. As such, no additional screening assessment or appropriate assessments are required.

4.4 HRA STAGE 1 SCREENING CONCLUSIONS FOR ADAPTIVE PATHWAY

The option of raising Blithfield dam by 2m was selected in an adaptive pathway if the demand management options are deemed to fall short of target (refer to overarching WRMP24 for further details). The HRA Stage 1 Screening for this option is provided in **Table 4.2**.

Table 4.2 Adaptive pathway: supply side options screening of 'Likely Significant Effects' (LSE)

Option No.	Name	Description	European site	Approximate distance from option	Screening Summary	LSE (construction)?	LSE (operation?)
2.2.2.1	Blithfield Reservoir - 2m raising	This option will aim to raise the Blithfield Reservoir full supply level by approximately 2m which would enlarge the actual storage volume by 6,550Ml. This option will include raising of the main embankment dam by 2m (reinforced concrete wall); raising of the draw off tower, footbridges, piers and bridges; raising of the stilling basin side walls and extension of the stilling basin approximately 12m downstream; raising of the road embankment and shifting of the road by 5m upstream; two new borrow pits. The option would not require a change to abstraction license.	West Midlands Mosses SAC	2.8km	There is no pathway for impact to this SAC from construction related issues such as noise and air quality (based on standard distance thresholds). There are also no pathways for impact during operation.	No LSEs anticipated	No LSEs anticipated
			Pasturefields Salt Marsh SAC	5.1km	There is no pathway for impact to this SAC from construction related issues such as noise and air quality (based on standard distance thresholds). The Blithfield Reservoir discharges to the River Blithe which connects to the River Trent downstream of Pasturefields Salt Marsh SACs, and therefore no hydrological pathway. There are also no pathways for impact during operation.	No LSEs anticipated	No LSEs anticipated
			Cannock Chase SAC	5.5km	There is no pathway for impact to this SAC from construction related issues such as noise and air quality (based on standard distance thresholds). The Blithfield Reservoir discharges to the River Blithe which connects to the River Trent downstream of the Cannock Chase SAC, and therefore no hydrological pathway.	No LSEs anticipated	No LSEs anticipated
			Midland Meres & Mosses Phase 1 Ramsar	2.8km	There is no pathway for impact to this SPA/Ramsar from construction related issues such as noise and air quality (based on standard distance thresholds).	No LSEs anticipated	No LSEs anticipated
			River Mease SAC	Downstream receptor (c.15km)/offsite functionally linked habitat	There is uncertainty as to the distribution of mobile species of the River Mease SAC (spined loach in particular) outside the designation (offsite functionally linked habitat) and therefore whether impacts (sedimentation, pollution incidents) could occur during construction of the raised embankment (hydrological connectivity via the River Blithe). A Stage 2 Appropriate Assessment will be required to consider the mitigation measures necessary to avoid an adverse effect to the River Mease SAC. Increasing the capacity of the reservoir may result in changes to hydrology within the River Blithe, a tributary of the River Trent through a change in spill regime. The use of the River Blithe and River Trent by the mobile species of the River Mease SAC is unknown. LSEs therefore cannot be ruled out due to uncertainty over the operational regime and how this may affect the extent of functionally linked habitat. Should this option be taken forward to the preferred options stage, scheme level investigations and Stage 2 Appropriate Assessment would need to be undertaken.	LSEs identified	LSEs identified
			Humber Estuary SAC, SPA and Ramsar	Downstream receptors (>150km)	The Humber Estuary is considered sufficiently distant at construction impacts will not result in an adverse effect, with the SACO stating that the River Trent does not support sea or river lamprey (Cromwell Weir impassable). Although hydrologically linked to the Humber Estuary SAC, qualifying features not known to be present on the River Trent. The SACO states the following: - Sea lamprey: Distribution of sea lamprey in the River Trent is unknown however it is thought that distribution of the species is severely limited by Cromwell weir, which is considered as impassable. - River lamprey: Distribution of river lamprey in the River Trent is severely limited by Cromwell weir, which is considered as impassable to river lamprey. The reduction in flow is not considered to adversely affect the Humber Estuary SAC estuaries feature (SACO target for freshwater input) alone (based on WFD impact assessment).	No LSEs anticipated	No LSEs anticipated alone, potential for in-combination with other plans and programmes.

5. STAGE 2 APPROPRIATE ASSESSMENT: RIVER MEASE SAC

5.1 INTRODUCTION

Option 2.2.2.1 has the potential to cause LSEs during construction and operation to the River Mease SAC due to impact pathways to offsite functionally linked habitat within the wider river network.

Theoretical pathways for effects exist through:

- potential construction-related impacts on off-site supporting habitat that will rely on project-level mitigation (and so cannot be 'screened out');
- reduced freshwater input to the wider river catchment, therefore causing potential deterioration of off-site supporting habitat, reduction in accessibility and reduction in prey.

5.2 EUROPEAN SITE SUMMARY

5.2.1 Site description

The boundary of the River Mease SAC (centred on OS grid reference SK 260 114) covers a total of 21.86 ha across Derbyshire, Leicestershire and Staffordshire. The site covers approximately 25km of the River Mease from the Coal Measures in north-west Leicestershire across rural / agricultural landscapes to the confluence with the River Trent at Croxall. The designation includes the upper reaches of the Gilwiskaw Brook which is a steep and fast-flowing section with little aquatic vegetation.

Marginal vegetation where present within the river is typically dominated by common club-rush *Schoenoplectus lacustris*, floating sweetgrass *Glyceria fluitans*, reed canary grass *Phalaris arundinacea*, branches bur-reed *Sparganium erectum*, greater pond sedge *Carex riparia* and bullrush *Typha latifolia*. Submerged aquatic vegetation is more varied on the lower reaches of the river and includes river water-crowfoot *Ranunculus fluitans*, common water-crowfoot, *Ranunculus aquatilis*, blunt-leaved pondweed *Potamogeton obtusifolius*, fennel pondweed *Potamogeton pectinatus*, arrowhead *Sagittaria sagittifolia*, and yellow water-lily *Nuphar lutea*. There is variable bankside tree cover which provide submerged tree root systems for in-channel cover of associated species.

5.2.2 Qualifying features screened into Stage 2 Appropriate Assessment: baseline

5.2.2.1 Spined Loach

Habitat preferences of spined loach include sandy substrate with patchy, dense macrophytes. This species has a specialised feeding mechanism which requires fine substrate. This species is vulnerable to predation due to its small size. Dense patches of macrophytes within areas of open sandy substrate provide refuge against predation³³.

Habitat suitable for spined loach is present within the middle, broad and lowland reaches of River Mease SAC. Here the substrate is sandy and provides important feeding spawning grounds. The associated aquatic vegetation, including tree roots, at the margins also provides important refuges for spined loach from predators.

NBN Atlas

Out of a total of 104 records within 10km of the relevant screened options and River Mease SAC, 29 records for spined loach are for the period 2010 to 2019. These records are associated with Rivers Trent, Mease, Blithe, Penk and an un-named tributary of the River Mease.

5.2.2.2 Bullhead

The bullhead is the only freshwater cottid species found in the UK, and is adapted to benthic habitats. This species predominantly occurs in stony streams and rivers where the flow is moderate, water is cool, and oxygen-rich. The bullhead spawn from February to June, and are territorial and tied to their nest. Shade and cover are important for this species which actively hides from light. The bulk of their diet is benthic invertebrates, particularly crustaceans. Their habitat requirements are variable depending on the life stage.

³³ English Nature. (1998) *The habitat and management requirements of spined loach* Cobitis taenia. No. 244 – English Nature Research Reports.

Coarse substrates are essential for breeding, with shallow stony riffles used by young fish. Sheltered areas with woody debris and leaf litter are preferred by adult fish. The upper pH tolerance levels of 9.0 and lower limit of oxygen concentration of 40% is associated with bullhead. Water depth is not critical to this species, but high temperatures and/or low dissolved oxygen are likely to be fatal in shallow waters³⁴.

The head of the River Mease SAC is fast-flowing and provides valuable bullhead habitat, with clean and coarse gravels. There is additional bullhead habitat in the lower reaches where the substrate is finer but there is woody debris, providing suitable breeding habitat.

NBN Atlas

Out of a total of 801 records within 10km of the relevant screened options and River Mease SAC, 118 records for bullhead are for the period 2010 to 2019. These records are associated with Rivers Trent, Mease, Penk, Blithe, Dove and Tame, as well as a tributary of the River Trent towards Milwich.

5.2.2.3 White-clawed crayfish

The white-clawed crayfish (WCC; *Austropotamobius pallipes*) is the only native species of freshwater crayfish in Britain, and is the largest freshwater crustacean³⁵. WCC populations in the UK are fragmented and have rapidly declined since the 1970s. Specific areas with WCC cited as the primary reason for SAC site selection occurring mainly in the north and west of England³⁶. Populations are known within South Wales, Suffolk, East Midlands, Dorset, Somerset, Gloucestershire, Exmoor and the North York Moors³⁷.

WCC can live for more than 10 years³⁸. Breeding occurs in the autumn and early winter when the water temperature drops below 10°C for an extended period. The breeding time may vary with latitude and altitude. Females over winter with a clutch of eggs. Hatched eggs release from the female and become independent in June (south of England) and August (north of England). Migration into deeper water may occur in the winter. WCC have been known to burrow into riverbanks, particularly in the winter months³⁸. WCC occur in areas with hard, mineral-rich waters on calcareous and rapidly weathering rocks. It is found in both still and running water and is typically associated with watercourses of 0.75 m to 1.25 m, but has also been found in shallow streams (as low as 5 cm), and in deeper slow-flowing rivers (2.5 m). Water chemistry figures suitable for white-clawed crayfish include calcium at 5 mg/l, and pH between 6.5-9.0³⁸.

Barriers to crayfish movement can include major weirs, dams or waterfalls; a length of highly modified channel lacking suitable refuges; fast-flowing flume or culvert; dried-up section of a channel; or poor water quality within a reach. It is worth noting that barriers for white-clawed crayfish may not necessarily be barriers for signal crayfish *Pacifastacus leniusculus* as this species can walk over land and are less vulnerable to desiccation³⁵.

The River Mease SSSI/SAC Restoration Plan Technical Report (2012) noted that WCC appeared to be absent from the majority of the watercourse, with the exception of a population close to the Trent confluence. A dominant population of non-native American signal crayfish were also recorded in this location³⁹.

NBN Atlas

Out of a total of 599 records within 10km of the relevant screened options and River Mease SAC, six records for WCC are for the period 2010 to 2019. These records are associated with Rising Brook south of Rugeley Town, and Shropshire Brook near Upper Longdon.

5.2.2.4 Otter

Otters are very territorial, highly mobile and are known to use 20km or more of river habitat⁴⁰ as male have been known to have a home range encompassing up to 50km of river⁴¹. They are usually active at dusk and during the night, although they are known to be active during the daytime. Otters mainly eat fish, although

³⁴ Tomlinson, M. L., & Perrow, M. R. (2003). *Ecology of the Bullhead*. Conserving Natura 2000 Rivers Ecology Series No. 4 English Nature, Peterborough.

³⁵ Peay, S. (2002). *Guidance on Habitat for White-clawed Crayfish and its Restoration*. English Nature and the Environment Agency.

³⁶ JNCC. (2022). 1092 White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes* [White-clawed \(or Atlantic stream\) crayfish \(Austropotamobius pallipes\) - Special Areas of Conservation \(jncc.gov.uk\)](https://www.jncc.gov.uk/sites/default/files/1092%20White-clawed%20(or%20Atlantic%20stream)%20crayfish%20Austropotamobius%20pallipes%20-%20Special%20Areas%20of%20Conservation%20(jncc.gov.uk).pdf) Accessed in August 2022.

³⁷ Buglife. (2015). *Crayfish Identification, Distribution and Legislation*. Environment Agency.

³⁸ Holdich, D. (2003). *Ecology of the White-clawed Crayfish*. Conserving Natura 2000 Rivers. Ecology Series No. 1. English Nature.

³⁹ Jacobs (March 2012) *River Mease SSSI/SAC Restoration Plan Technical Report*. For Natural England and the Environment Agency.

⁴⁰ The Mammal Society. Species factsheet: the otter (*Lutra lutra*). https://www.mammal.org.uk/wp-content/uploads/2016/08/otter_complete.pdf - accessed November 2021.

⁴¹ Chanin P., 2003. *Ecology of the European Otter*. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.

crustaceans, frogs, voles and aquatic birds may also be a food resource⁴². In addition to rivers, otters are encountered on small streams, ditches, ponds, lakes, canals and marshes and can also be found in coastal areas and estuaries. An otter's resting site is known as a holt, which may be in a tree root system, a hole in a bank or under a pile of rocks. Drains and caves have also been recorded as otter holts. They also rest above ground in vegetation, creating flattened areas known as couches⁴². Resting sites are described as any site that an otter uses to stop when not engaged in foraging or commuting.

Breeding can occur at any time of year with one to four pups being born; the pups remain dependent on their mother for one year⁴². Females use a breeding site within their home range that is undisturbed, away from flooding and close to a good food supply⁴³. A distinction is made between the breeding site and the natal den. Identifying the location of natal den appears to be extremely difficult and may be some distance from major rivers⁴².

Otter populations declined rapidly in the 1960s due to the pollution of watercourses by pesticides. A ban on certain pesticides has resulted in an increase in otter numbers and they are now widely distributed across England, but still rare and uncommon in some areas of the UK⁴².

There is no specific details on the locations of the River Mease SAC associated with otter.

NBN Atlas

Out of a total of 821 records within 10km of the relevant screened options and River Mease SAC, 149 records for otter are for the period 2010 to 2019. These records are associated with Rivers Trent, Mease, Sow, Blithe and Dove.

5.2.3 Condition, threats, and pressures

The River Mease SAC is legally underpinned by one Site of Special Scientific Interest (SSSI); River Mease SSSI. This SSSI is designated due to the presence of spined loach and bullhead. There are four SSSI units associated with the site; all of which are classified as 'river and streams' and have been assessed to be in 'unfavourable – no change' condition. Unit 1 covers the River Trent to Harlston Bridge (5.85 Ha), Unit 2 Harlston Bridge to Netherseal (9.50 Ha), Unit 3 Netherseal to Snareston (5.44 Ha) and Unit 4 Snareston to Packington (2.24 Ha). All units have information on failing targets due to: 1) point source and diffused pollution; 2) physical modifications including over dredging, weirs or other impoundments, non-native species lack of river bank vegetation, lack of macrophyte species density and composition; and 3) over abstraction⁴⁴.

5.2.3.1 Spined loach

The following are pressures / threats with the outlined measures required to improve the condition of the feature which are listed within the River Mease SAC Site Improvement Plan⁴⁵ specifically associated with spined loach:

- Water pollution – reduce levels of nutrients by controlling point and diffuse pollution sources.
- Inappropriate weirs, dams and other structures – implement the river restoration plan.
- Invasive species – manage and reduce the impact of invasive species.
- Siltation – work with land managers to reduce siltation levels.
- Water abstraction – improve the understanding of the ecological implications of the current water inputs and abstractions.

The SACO for the site⁴⁶, produced by Natural England to identify attributes and targets to achieve Favourable Conservation Status includes:

⁴² Chanin P., 2003. *Ecology of the European Otter*. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.

⁴³ Liles G., 2003. *Otter Breeding Sites. Conservation and Management*. Conserving Natura 2000 Rivers Conservation Techniques Series No. 5. English Nature, Peterborough.

⁴⁴ Natural England's Designated Site View – River Mease SSSI. [Designated Sites View \(naturalengland.org.uk\)](https://designatedsitesview.naturalengland.org.uk/). Accessed on 25 August 2022.

⁴⁵ Natural England. (2014). *Site Improvement Plan River Mease*. Improvement Programme for England's Natura 2000 Sites. Planning for the Future.

⁴⁶ Natural England (2018). *European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features*. River Mease Special Area of Conservation (SAC). Natura 2000 database, 1 – 33.

- **Structure and function (including its typical species): Supporting off-site habitat** - Restore any supporting riverine habitats present beyond the site boundary upon which the feature of the site depends.

Additional conservation issues which may compromise the ability of a site to support spined loach include: nutrient loading and loss of macrophytes; loading of fine anoxic sediments; and the presence of large stocks of coarse fish.

5.2.3.2 *Bullhead*

The pressures / threats and outlined measures required to improve the condition of the feature which are listed within the River Mease SAC Site Improvement Plan⁴⁷ specifically associated with bullhead are the same as for spined loach (detailed in **Section 5.2.3.1** above).

The attributes and targets from the SACO for the site identified the same for bullhead as for spined loach.

Vertical drops of >18 to 20 cm are sufficient to prevent upstream movement of adult bullheads. They will therefore prevent re-colonisation of upper reaches affected by lethal pollution episodes or drought, and will lead to constraints on genetic interactions that may have adverse consequences.

Potential threats to UK populations of bullhead include: deposition of fine sediments in disturbed catchments, fragmentation of populations, channel management (i.e., channelisation, dredging, removal of riparian trees), and fisheries management (i.e., stocking of trout and introduced crayfish species)⁴⁸.

The SACO for the site⁴⁹, produced by Natural England to identify attributes and targets to achieve Favourable Conservation Status includes:

- **Structure and function (including its typical species): Supporting off-site habitat** - Restore any supporting riverine habitats present beyond the site boundary upon which the feature of the site depends.

5.2.3.3 *White-clawed crayfish*

The pressures / threats and outlined measures required to improve the condition of the feature which are listed within the River Mease SAC Site Improvement Plan⁴⁷ specifically associated with WCC are the same as listed for spined loach (detailed in **Section 5.2.3.1** above).

The SACO for the site, produced by Natural England to identify attributes and targets to achieve Favourable Conservation Status includes the same supporting off-site habitat attribute as stated for spined loach and bullhead.

WCC are particularly vulnerable to increased ammonia levels, reduced oxygen levels, turbidity increases, and siltation increases⁵⁰. WCC are vulnerable to high flows in watercourses, and can be washed away from favourable habitats, stranded or crushed⁵¹. Populations of WCC are under threat due to crayfish plague, competition from alien crayfish, loss /reduction of habitat and reduction of water quality and pollution incidents. Barriers (mentioned in **Section 5.2.3.3** above) may also be a threat to WCC movement and population isolation / connectivity.

Vertical drops are sufficient to prevent upstream movement of adult WCC, including low weirs. These will prevent colonisation of upper reaches affected by lethal pollution episodes or drought, and more generally will also lead to constraints on life cycle movements and genetic interactions throughout the river⁵².

⁴⁷ Natural England. (2014). *Site Improvement Plan River Mease*. Improvement Programme for England's Natura 2000 Sites. Planning for the Future.

⁴⁸ Tomlinson, M. L., & Perrow, M. R. (2003). *Ecology of the Bullhead*. Conserving Natura 2000 Rivers Ecology Series No. 4 English Nature, Peterborough.

⁴⁹ Natural England (2018). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features. River Mease Special Area of Conservation (SAC). Natura 2000 database, 1 – 33.

⁵⁰ Holdich, D. (2003). *Ecology of the White-clawed Crayfish*. Conserving Natura 2000 Rivers. Ecology Series No. 1. English Nature.

⁵¹ Peay, S. (2002). *Guidance on Habitat for White-clawed Crayfish and its Restoration*. English Nature and the Environment Agency.

⁵² Natural England (2018). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features. River Mease Special Area of Conservation (SAC). Natura 2000 database, 1 – 33.

5.2.3.4 Otter

The pressures / threats and outlined measures required to improve the condition of the feature which are listed within the River Mease SAC Site Improvement Plan⁵³ specifically associated with otter are the same as listed for spined loach (detailed in **Section 5.2.3.1** above).

The SACO for the site, produced by Natural England to identify attributes and targets to achieve Favourable Conservation Status does not include a specific attribute or target relating to off-site supporting habitat. The SACO states that the most significant determinant of otter usage of a habitat is likely to be the abundance of prey, therefore the construction and operational impacts of the South Staffs Water draft WRMP24 options will be considered with regards to potential changes to prey availability in the wider catchment.

The threats associated with otter can vary throughout the UK. Road casualties are amongst the biggest concern, with disease and acidification of waters (particularly in Wales and Scotland) also noted⁵⁴.

5.3 ASSESSMENT OF EFFECTS

An assessment of effects against the relevant SACO attributes and targets is provided as follows:

- Table 5.1 - spined loach and bullhead.
- Table 5.2 - white-clawed crayfish.
- Table 5.3 - otter.

⁵³ Natural England. (2014). *Site Improvement Plan River Mease*. Improvement Programme for England's Natura 2000 Sites. Planning for the Future.

⁵⁴ Chanin P., 2003. *Ecology of the European Otter*. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.

Table 5.1 Information to inform an assessment of adverse effects on River Mease SAC: spined loach and bullhead

Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
CONSTRUCTION				
Supporting habitat: structure/function: Integrity of off-site habitats	Restore any supporting riverine habitats present beyond the site boundary upon which the [qualifying feature] of the site depends.	<p><i>Option 2.2.2.1</i></p> <p>The precise scope of the construction requirements for each option (including location, timing, materials, extent, duration, etc.) cannot be precisely defined at this point.</p> <p>There is potential off-site supporting habitat loss due to the upgrades to the reservoir embankment which will encroach on the existing extent of the River Blithe (approximately 15 km upstream of the River Mease SAC boundary). There are records of spined loach and bullhead within the River Blithe. The likelihood of these populations being connected to those of the River Mease SAC are considered to be low. The APEM survey cited in the SACO states “...APEM found that young of the year were generally concentrated in the higher reaches of the Mease, suggesting that the Gilwiskaw Brook may be important habitat for spawning and juvenile fish, but overall young of the year were poorly distributed across the SAC”.</p> <p>Literature for both species suggests that the bottom-dwelling habit, ‘nesting’/burrowing and territorial behaviours, and poor swimming ability limits the distances over which the species will range^{55,56}, and therefore confines the population extent.</p> <p>The qualifying features may also be expose to site-derived pollutants (principally oils and other contaminants) and sediment entering the tributaries of/and River Trent, hence affecting potential off-site supporting habitats. An increase in fine sediments has potential to negatively affect the habitat suitability for spined loach and bullhead. The aquatic communities within the River Mease are highly sensitive to sedimentation and are typically associated with habitats dominated by fast flows and coarse sediments. Additional fine sediments could settle on macrophyte beds and coarse substrates downstream of the River Blithe changing habitat suitability or smothering the plants, which could result in a reduction in the availability of suitable refuge areas for spined loach and bullhead.</p> <p>It is not possible to quantify the likely effects without details of the construction (including intended approaches and time of year). However, there are numerous established measures that can be employed to reliably avoid impact pathways being realised.</p>	<ul style="list-style-type: none">▪ Avoidance of suitable habitat to support spined loach or bullhead within the footprint of the works.▪ Develop a precautionary working methodology (PWM) with regards to spined loach and bullhead which minimises the footprint of the proposed works within habitats which are suitable for the species.▪ A suitably qualified and experienced Environment Clerk of Work (EnvCoW) would be appointed by the Contractor to oversee the implementation of mitigation and monitoring of the water environment.▪ Adhere to relevant Environment Agency Pollution Prevention Guidance Notes for works in proximity to water.	No adverse effects on conservation objectives/ site integrity
Supporting habitat: structure/function: Vegetation composition: invasive non-native species	Ensure any non-native species categorised as 'high-impact' in the UK are either rare or absent but if present are causing minimal damage to the [qualifying feature]	<p>Construction activities have the potential to cause or facilitate the spread of invasive non-native species. Invasive plant species can colonise new areas of land from seeds contained in the parent plant or the soil, or from fragments of living root or stem. Such reproductive materials can be inadvertently transferred to enabling works areas from outside of the scheme boundary if they adhere to vehicles, machinery, tools or clothing. they can also be inadvertently transferred in waste. Although there are no works proposed within the SAC boundary, seeds and plant fragments could be transported through the wider River Trent catchment and potential off-site supporting habitats.</p> <p>Once present, invasive species can spread rapidly and out-compete the native vegetation that characterises the notable non-designated habitat. Habitat loss and fragmentation can also encourage the colonisation of invasive species by providing a pathway of suitable environmental conditions for invasive species to move closer to areas currently free from these species, this could affect the conservation status of the qualifying habitat.</p> <p>Standard best practice mitigation measures are considered to be available to prevent the introduction of aquatic or riparian invasive species to the SAC or supporting habitats. Taking into account the proposed mitigation no adverse effects on site integrity are anticipated due to invasive species.</p>	<ul style="list-style-type: none">▪ Where any INNS are identified as a risk of being introduced, spread within, or moved off site, ensure mitigation measures are considered at the early planning stage, and ensure enough time is given to implement them.▪ Consider phasing construction to allow time to deal with the presence and/or risk of spread of INNS.▪ Ensure INNS and locations (mapped) are incorporated within all relevant site method statements, including the site Ecological Protection Plan and Species Protection Plans, where appropriate.	No adverse effect on conservation objectives/ site integrity
OPERATION				
Supporting habitat: structure/function: Integrity of off-site habitats	Restore any supporting riverine habitats present beyond the site boundary upon which the [qualifying feature] of the site depends.	<p>The construction of Option 2.2.2.1 will involve raising the main embankment of the dam by 2m; raising the draw off tower, footbridges, piers and bridges; raising the stilling basin side walls and extension of the stilling basin; raising the road embankment and shifting the road by 2.5m upstream and installation of two new borrow pits.</p> <p>The option has the potential to impact the level regime in Blithfield Reservoir. The option would increase the capacity of the reservoir meaning that it would likely take longer to refill after the water level is drawn down through the summer.</p>	Water resource modelling should be carried out to determine how the change in the inflows and capacity of the reservoir would impact the spill regime into the River Blithe, and this information used to update the Stage 2 Appropriate Assessment in WRMP29 and confirm any compensation releases will be unaffected and flow changes in the River Trent will be negligible.	No adverse effects on conservation objectives/ site integrity

⁵⁵ CullingMAandCôté IM. (2006) Genetics and ecology of spined loach in England: implications for conservation management Science Report: SC000026/SR. Report for the Environment Agency,

⁵⁶ TomlinsonML&PerrowMR (2003). Ecology of the Bullhead. Conserving Natura 2000 Rivers Ecology Series No. 4. English Nature, Peterborough.

Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
		<p>Water is conveyed from Blithfield Reservoir to the River Blithe (GB1040280464910), a tributary to the River Trent, both by compensation flow release (of 24Ml/d year round) and by spill over the spillway of the reservoir. At the outflow of Blithfield Reservoir the catchment area is 120.55km² which increases to 167.34km² by the time the River Blithe meets the River Trent. The River Trent downstream of the River Blithe confluence has a catchment area of 1200km², indicating that the River Blithe at the reservoir outflow makes up 10% of the catchment of the River Trent at this point.</p> <p>The operation of Option 2.2.2.1 would not impact the low flows in the River Blithe as these are protected by the compensation flow requirements from the reservoir. However, the duration that flows are at the compensation flow for, may change due to a change in level regime possibly altering the duration/timing of spill events. The relatively small increase in dam size and the increase in inflow to the reservoir likely means that there will be little net change in the level regime so it is unlikely that these spill events will be significantly altered. There is low confidence in this assessment. Water resource modelling should be carried out to determine how the change in the inflows and capacity of the reservoir would impact the spill regime into the River Blithe, and this information used to update the Stage 2 Appropriate Assessment in WRMP29.</p> <p>Though there is low confidence on the potential impact on the River Blithe, there is high confidence that there will be only a minor/negligible impact on the flow regime of the River Trent with the significant increase in catchment size indicating that the flow regime in the River Trent is dominated by the wider catchment and not spill from Blithfield Reservoir.</p>		

Table 5.2 Information to inform an assessment of adverse effects on River Mease SAC: white-clawed crayfish

Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
CONSTRUCTION				
Supporting habitat: structure/function: Supporting off-site habitat	Restore the quality of any supporting habitat present beyond the site boundary upon which the white-clawed crayfish population of the site depend	<p>There is potential off-site supporting habitat loss due to the upgrades to the reservoir embankment which will encroach on the existing extent of the River Blithe (approximately 15 km upstream of the River Mease SAC boundary). There are records of white-clawed crayfish within the River Blithe. It is unknown whether supporting habitats for white-clawed crayfish are present within the footprint of the proposed reservoir impacts to the River Blithe. At the time of writing this report, the construction methodology for the works in this area is unclear.</p> <p>As above in Table 5.1 regarding site-derived pollution and sediments.</p>	<ul style="list-style-type: none">▪ Avoidance of suitable habitat to support white-clawed crayfish within the footprint of the works.▪ Develop a PWM with regards to white-clawed crayfish which minimises the footprint of the proposed works within habitats which are suitable for the species.▪ A suitably qualified and experienced EnvCoW would be appointed by the Contractor to oversee the implementation of mitigation and monitoring of the water environment.	No adverse effects on conservation objectives/ site integrity
Population (of the feature): Population health	<p>Restore the absence of non-native crayfish species from within the SAC and the catchment surrounding the site</p> <p>Restore the absence of individuals within the site infected with crayfish plague or porcelain disease</p> <p>Ensure human activities within or around the SAC do not pose a significant risk of plague transfer to the crayfish population</p>	<p>Construction activities and operational monitoring activities have potential to cause or facilitate the spread of invasive non-native species, including non-native crayfish. There are recent (past decade) records of signal crayfish <i>Pacifastacus leniusculus</i> on River Trent, upstream on the River Mease⁵⁷. Although there are no works proposed within the SAC boundary, it is possible that non-native crayfish species, crayfish plague or porcelain disease are brought into the working area and transferred to the SAC downstream or other off-site supporting habitats downstream.</p> <p>Once present, invasive species can spread rapidly and out-compete the native vegetation that characterises the notable non-designated habitat. Habitat loss and fragmentation can also encourage the colonisation of invasive species by providing a pathway of suitable environmental conditions for invasive species to move closer to areas currently free from these species, this could affect the conservation status of the qualifying habitat.</p> <p>The embedded mitigation in the CCoP are considered sufficient to prevent the introduction invasive species or disease to the SAC or supporting habitats. Taking into account the proposed mitigation no adverse effects on site integrity are anticipated due to invasive species.</p>	<ul style="list-style-type: none">▪ Where any INNS are identified as a risk of being introduced, spread within, or moved off site, ensure mitigation measures are considered at the early planning stage, and ensure enough time is given to implement them.▪ Consider phasing construction to allow time to deal with the presence and/or risk of spread of INNS.▪ Ensure INNS and locations (mapped) are incorporated within all relevant site method statements, including the site Ecological Protection Plan and Species Protection Plans, where appropriate.	No adverse effects on conservation objectives/ site integrity
OPERATION				
Supporting habitat: structure/function: Integrity of off-site habitats	Restore any supporting riverine habitats present beyond the site boundary upon which the [qualifying feature] of the site depends.	As above in Table 5.1 regarding flow impacts and mitigation.		No adverse effects on conservation objectives/ site integrity

⁵⁷ NBN Atlas. <https://nbnatlas.org/> Accessed September 2022.

Table 5.3 Information to inform an assessment of adverse effects on River Mease SAC: otter

Attribute	Target	Potential Effect	Mitigation	Effect on site integrity?
CONSTRUCTION				
Supporting processes (on which the feature and/or its supporting habitat relies): Connectivity within and to the site	Ensure there are no significant artificial barriers to the safe passage and movement of otters into, within and away from the SAC	There is potential off-site supporting habitat loss due to the upgrades to the reservoir embankment which will encroach on the existing extent of the River Blithe (approximately 15 km upstream of the River Mease SAC boundary). There are records of otter within the River Blithe. Habitats suitable for use by otter, including woodland and mature trees, are present within the proximity of the proposed crossing locations along the River Trent. It is unknown whether otters are present within suitable supporting habitats within the footprint of the proposed reservoir impacts to the River Blithe. At the time of writing this report, the construction methodology for the works in this area is unclear.	<ul style="list-style-type: none">Avoidance of suitable habitat to support otter within the footprint of the worksDevelop a PWM with regards to otter which minimises the footprint of the proposed works within habitats which are suitable for the speciesA suitably qualified and experienced EnvCoW would be appointed by the Contractor to oversee the implementation of mitigation and monitoring of the water environment	No adverse effects on conservation objectives/ site integrity
OPERATION				
Supporting habitat: structure/function: Water quality/quantity	Restore river water quality and quantity to a standard which provides the necessary conditions to support otter	As above in Table 5.1 regarding operation impacts and mitigation.		No adverse effects on conservation objectives/ site integrity

6. STRATEGIC IN-COMBINATION ASSESSMENT

6.1 BETWEEN-OPTION 'IN-COMBINATION' EFFECTS

The effects of the WRMP24 options operating 'in-combination' have been explored through the screening. As the preferred programme contains demand management options only, there are no in-combination effects anticipated. Similarly, as there is only one supply side option identified in the adaptive pathway, there are no in-combination effects.

6.2 IN-COMBINATION EFFECTS WITH OTHER SOUTH STAFFS WATER PLANS

6.2.1 Drought Plan

South Staffs Water published its Draft Final Drought Plan in August 2022. The drought plan describes how South Staffs Water will 'continue, during a period of drought to discharge our duties to supply adequate quantities of wholesome water, with as little recourse as possible to drought orders or drought permits'.

The Drought Plan provides a comprehensive statement of the actions that South Staffs Water will consider implementing during drought conditions in order to protect essential water supplies for customers and to minimise environmental impact. The Drought Plan includes a range of drought management actions (linked to drought triggers), that can be broadly categorised as:

- Demand-side actions (such as enhanced communications and extra promotion of water efficiency and demand management; leakage reduction, enhanced pressure management, appeals for restraint, temporary use bans, implementing restrictions, ordinary drought orders-non essential use bans);
- Supply side actions (such as reviewing planned outage and ensuring existing sources are fully operational, conserving Blithfield Reservoir, Operating River Blithe pump back and using Brindley Bank, Reviewing the potential for bulk supplies and transfers with Severn Trent Water);
- Drought permits and orders; and
- Extreme drought measures.

The potential drought permit/order sites are summarised in **Table 6.1**.

Table 6.1 Draft Final Drought Plan 2022- Potential sites for Drought Permit/ Order Sites

Potential South Staffs Water site	Environment Agency area	Option Type
River Blithe and River Trent pumpback	West Midlands Area	Drought permit
River Severn at the River Severn Works	West Midlands Area	Drought order

The WRMP24 preferred programme does not have any supply side options, and the demand management options will not affect European sites, therefore there will be no in-combination effects with the drought order. Should the adaptive pathway be adopted, the first year of use of Option 2.2.2.1 would not be until 2036. Further water resources modelling of the option will be required ahead of WRMP29 and this would address any in-combination effects with the Drought Plan 2025.

6.3 BETWEEN-COMPANY IN-COMBINATION EFFECTS

6.3.1 WRMPs and Drought Plans

The WRMP24 preferred programme does not have any supply side options, and the demand management options will not affect European sites, therefore there will be no in-combination effects with the other WRMPs.

Should the adaptive pathway be adopted, Option 2.2.2.1 could potentially alter the flows within the River Blithe, and therefore flows in the wider River Trent catchment. Based on the assessment work completed to date, the effect from the option alone is anticipated to be minor/negligible within the River Trent catchment as the

flow regime is dominated by the wider catchment and not spill from Blithfield Reservoir. Therefore in-combination effects with the Severn Thames WRMP24 are considered unlikely. This will however be confirmed through the proposed water resources modelling ahead of WRMP29.

6.4 IN-COMBINATION EFFECTS WITH OTHER PLANS AND PROGRAMMES

6.4.1 Effects with other strategic plans and water resource demand

The WRMP explicitly accounts for growth forecasts when calculating future water demand (and hence areas with potential deficits). This means that 'in-combination' water-resource effects with growth promoted by other plans or projects are considered and accounted for during the WRMP development process and its deficit calculations.

Potential 'in-combination' effects in respect of water-resource demands due to other plans or projects are therefore unlikely since these demands are explicitly modelled when determining deficit zones and hence developing Feasible Options. As a result (in respect of water resources) the WRMP is not likely to make non-significant effects in other plans significant (indeed, other plans are arguably the 'source' of any potential effects in respect of water demand, with the WRMP having to manage potential effects that are not generated by the WRMP itself).

Obviously local plans are not all consistent with regard to planned growth and this arguably introduces some uncertainty. However, with regard to water resources and planning uncertainty it is important to note the following:

The WRMP safeguards against uncertainty in option yield and timing through 'Target Headroom'; this is an allowance provided in the planning process (i.e. designed-in spare capacity) that ensures that any supply-demand deficit will still be met if there is an underperforming demand management measure or growth exceeds predicted levels. It is therefore extremely unlikely that additional demand or a poorly-performing option would 'suddenly' result in a deficit that might affect a European site; and (in any case);

The WRMP is revised on a five-yearly cycle, which allows any changes in demand forecasts (e.g. as new plans come forward) to be accounted for, and for timely intervention should a measure not be performing as expected. Delivery is also formally reviewed on an annual basis.

It is therefore considered that the WRMP options will not have significant 'in-combination' effects with local plans in respect of water resources.

6.4.2 Effects with major projects

Known major projects that are likely to increase demand have been taken into account during the development of South Staffs Water's WRMP24 and determination of future deficits.

Reference has been made to the Planning Inspectorates National Infrastructure Projects (NSIP) database⁵⁸ which includes major projects, subject to the requirements of the Planning Act 2008. It includes projects:

- where the developer has advised the Planning Inspectorate in writing that they intend to submit an application in the future;
- where an application has already been made to the Planning Inspectorate and is undergoing the development consent process;
- where a Development Consent Order (DCO) application has been determined.

There is one NSIP within a similar area to Option 6.13; Oaklands Farm Solar Project⁵⁹. The solar farm would be directly east of the proposed storage reservoirs. As such there may be elements of the construction programme which may overlap. However, given the solar farm's greater distance from the River Trent, it is considered that the Construction Environmental Management Plans will adequately mitigate adverse effects.

This exercise did not identify any other major projects likely to adversely affect the integrity of any sites in-combination with the WRMP.

⁵⁸ <https://infrastructure.planninginspectorate.gov.uk/projects/>

⁵⁹ [Oaklands Solar Farm](#) | [About the Project](#) | [BayWa r.e. \(baywa-re.co.uk\)](#)

7. HRA CONCLUSIONS

7.1 OVERVIEW

South Staffs Water has identified a preferred programme consisting of demand management options only, with one supply-side option identified in the adaptive pathway (see **Section 7.3**).

Water company WRMPs are subject to the provisions of the *Conservation of Habitats and Species Regulations 2017*. South Staffs Water has a statutory duty to prepare a WRMP and is therefore the Competent Authority for the HRA of that plan. This HRA report accompanies the WRMP24 that has been published for consultation, and summarises the current assessment of South Staffs Water's preferred plan of options against the requirements of the Habitats Regulations. It also documents the iterative HRA process that has been applied through the development of the WRMP24.

For each option (or group of options, as appropriate), the assessment comprises:

- a 'screening' of European sites within the study area to identify those sites and features where there will self-evidently be 'no effect', 'no likely significant effects', or positive effects due to the option⁶⁰, and those where significant effects are likely or uncertain; and
- an 'appropriate assessment' of any European sites where significant effects cannot be excluded (this may include 'down-the-line' deferral of some options in accordance with established HRA practice, where appropriate).

The conservation objectives are taken into account at the screening and appropriate assessment stages as necessary.

7.2 PREFERRED PROGRAMME: STAGE 1 SCREENING

With regard to **demand-side measures**, the only realistic mechanism for a negative effect would be through any construction required (for example, the leakage reduction programme may require repair of a pipe in or near an SAC), but this cannot be meaningfully assessed at the strategic level since information on the location of specific intervention requirements (e.g. leaks; households requesting meters) is not available without specific investigations, which would form part of the option package, and there is consequently no information on the scale (etc.) of any construction required. Therefore, from an HRA perspective, the options are 'screened in' (as an effect pathway is conceivable) but as a meaningful appropriate assessment is not possible, the assessment is necessarily deferred to the project level.

An initial screening review was completed for the **supply-side options**, however as there are none within the preferred programme, the assessment of these was not progressed further.

In-combination effects are considered highly unlikely given the discrete nature of any intrusive works required for the demand-side measures, however this will need to be confirmed at the project level HRA.

7.3 ALTERNATIVE PLAN: STAGE 2 APPROPRIATE ASSESSMENT

The option of raising Blithfield dam by 2m (Option 2.2.2.1) is selected in an adaptive pathway if the demand management options are deemed to fall short of target (refer to overarching WRMP24 for further details).. A Stage 2 Appropriate Assessment has been completed for the River Mease SAC, as the River Blithe has hydrological connectivity to the River Mease via the River Trent. The potential change in spill regime has been considered with regards a change in flows in offsite functionally linked habitat within the River Trent. It is anticipated that there will be minor/negligible changes in the spill regime and that this will not affect flows in the River Trent, as flows are dominated by the wider catchment rather than the River Blithe. However, ahead of WRMP29, water resources modelling will be undertaken to confirm any changes to the spill regime, and requirements to change compensation flows/spills to ensure no adverse effect downstream. In-combination effects are also considered unlikely, given the negligible change to flows estimated in the wider catchment.

⁶⁰ Note, for options with 'no effects' or positive effects there is no possibility of 'in-combination' effects.

APPENDICES

APPENDIX A EFFECT PATHWAY ASSUMPTIONS

Table 2.1 within the main report (from UKWIR 2021) and the following paragraphs outline some of the general assumptions that are typically (and reliably) applied to plan-level assessments where effect pathways are imaginable but not quantifiable at the plan level. These are applied cautiously, recognising that there is always a risk of atypical scenarios, but have been proved to be generally robust across a wide range of scenarios.

In addition:

WATER RESOURCE SENSITIVE FEATURES

The Environment Agency has previously published advice on qualifying species and habitats that it considers to be water-resource dependent (National Environment Agency guidance: Habitats Directive Stage 2 Review: Water Resources Authorisations – Practical Advice for Agency Water Resources Staff). This is not reproduced here, but as a general rule most species are not considered water resource dependent with the exception of wildfowl and waders associated with estuarine and wetland sites. Wide-ranging marine / marine dependent species associated with marine sites that are not directly connected to the hydrological zone of influence are not typically considered to be both sensitive and exposed to the effects of the options (except in certain relatively unique circumstances, such as some desalination schemes).

ESTUARINE BIRDS AND FRESHWATER FLOWS

Several studies have suggested that the number and densities of wintering waterbirds around estuarine freshwater channels are consistently greater than across associated mudflats, and that several bird species show significant preferences for freshwater flow areas over mudflats (e.g. Ravenscroft et al. (1997), Ravenscroft (1998, 1999), Ravenscroft & Beardall (2002) & Ravenscroft & Emes (2004)), although other studies have indicated that deeply incised channels associated with large volume inflows are less attractive to birds (Ravenscroft & Beardall, 2002).

There are a number of possible mechanisms for this. Correlations between freshwater flow and particle size (e.g. Ravenscroft & Emes (2004)), and substrate particle size distribution and invertebrate distribution have been recognised (e.g. Goss-Custard et al. (1991), Colwell and Landrum (1993), Yates et al. (1993)). Freshwater flow, salinity and invertebrate distribution have also been correlated (Kelly (2001)).

These physical relationships between invertebrate distributions and freshwater flows are important since there are numerous studies detailing relationships between overwintering waterbirds and the densities or distributions of their invertebrate prey (e.g. Goss-Custard et al. (1991), Colwell (1993), Colwell and Landrum (1993), Yates et al. (1993), Dierschke et al. (1999), Ravenscroft et al. (2002, 2004). Associations between bird densities and particle size (Granadeiro et al. 2004) have also been recognised.

Possible relationships between birds and freshwater flows were investigated in detail through a series of studies in The Swale SPA/Ramsar and the Medway Estuary and Marshes SPA/Ramsar (RPS 2004a, 2004b, 2004c, 2005a; Humphryes & Kellett 2003). These studies found few consistent patterns, however; for example:

- Whilst the general relationship of birds and creek corridors (rather than channels) was usually replicated between watercourses and embayments, the species assemblage was variable between creeks and years, suggesting that creek-specific variables may be less important for determining the community composition than environmental or community processes operating in the wider estuary or beyond. Most species (67%) displayed no, or a negative, association with creeks (70% when feeding behaviour only was considered).
- Latitudinal relationships between creeks and invertebrates were inconsistent, with only a slight tendency for invertebrate biomass to be higher within the creek corridor than the channel or surrounding mudflats.
- Significant decreases in invertebrate abundance and biomass down longitudinal gradients (potentially related to greater exposure to tidal processes) were recorded, although bird numbers showed the opposite (i.e. greater numbers towards the sea), perhaps reflecting greater foraging accessibility due to interstitial water, or less disturbance.

Furthermore, no significant differences in the usage of creeks by birds were recorded between freshwater creeks and those that were predominantly saline.

A broad consensus position appears to be that it is not freshwater flow volumes per se that are critical to the bird / intertidal channel relationship, rather the presence of some flows within channels to maintain morphology, and that bird distributions are often influenced instead by estuary-wide factors (e.g. changes in disturbance levels, reductions in bird populations altering estuary usage, proximity of roost sites), local factors (e.g. the role of creek morphology or substrate penetrability) and small-scale interactions (e.g. inter and intra-specific bird relationships, or prey availability associated with behavioural or physiological responses to intertidal exposure).

BAT SPECIES AND FUNCTIONAL LAND

Bat species associated with UK SACs are not considered 'water resource sensitive' and so (in the absence of substantial habitat changes caused by operational aspects (e.g. draining of a wetland or replacement of extensive foraging habitat with a reservoir; or introduction of light etc. sources that may disrupt commuting or seasonal movements), their exposure to the outcomes of the WRMP will be limited to incidental effects from construction. In most instances potential effects will not be specifically identifiable or quantifiable (as the locations of works are not necessarily defined, and field surveys would not typically be undertaken at plan level).

UK bat species do not typically travel substantial distances (i.e. tens of kilometres) when foraging and the Bat Conservation Trust has therefore identified Core Sustenance Zones (CSZs) – defined as “*the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the roost*” – for UK bat species; the CSZs for all UK species have a radius of 4km or less, with the exception of the CSZ for barbastelle (6km). This can be cautiously applied to bat SACs, although it is recognised that many roosts used by SAC bat populations will not be within the boundaries of the SAC. In general, therefore, unavoidable adverse effects would not be expected unless significant permanent land-take within those zones is likely; virtually all other potential effects are avoidable with normal good practice in planning and design, and with established mitigation measures that are known to be effective – although these inevitably cannot be defined above the project level.

BIRDS AND CONSTRUCTION NOISE / VISUAL DISTURBANCE

The **exposure** of any birds using the reservoir to **noise and visual disturbance** associated with the development will depend on several factors, including:

- the sound power level of the machinery;
- the principal habitats and locations used by the birds species (and hence the distance from the source of any disturbance);
- attenuating factors (such as screening by topography, buildings or vegetation);
- the seasonal timing of the works;
- background noise levels in this area⁶¹.

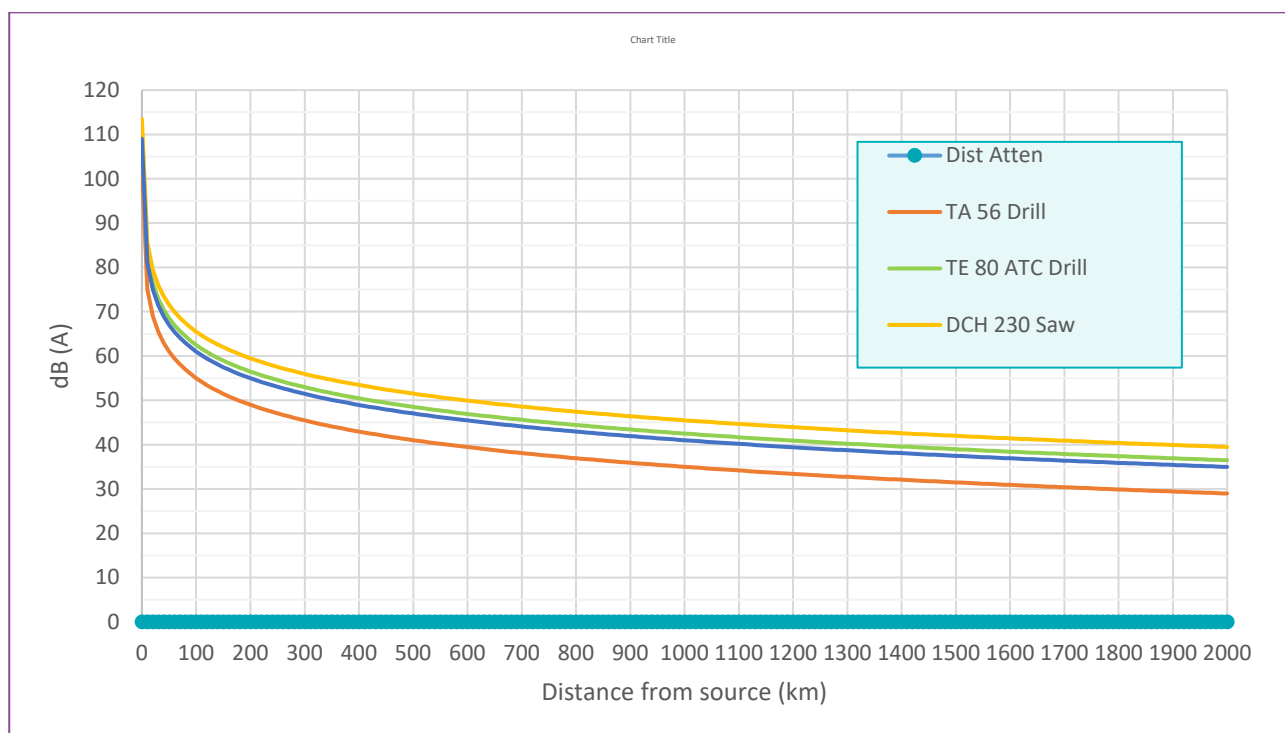
The sensitivity of the interest features will depend on their behavioural characteristics, their general tolerance / habituation to existing or new activities at a site, and the extent to which avoidance behaviours are achievable. This may also vary during the year (for example, most bird species will be more sensitive when nesting as avoidance behaviours are more constrained).

With regard to noise, a typical long-reach excavator has sound power level of ~109 dB(A); drills and saws have sound power level between 103 dB(A) and 114 dB(A). Without any barriers, the noise level of the loudest equipment used would attenuate to around 55dB(A) within 300m, and to 50 dB(A)⁶² within 600m due to distance alone (see **Figure A.1**).

⁶¹ Noise levels do not operate additively, so the dB levels in an area are not the sum of the component sources.

⁶² As a guide, 60dB(A) is approximately equivalent to a conversation; 50dB(A) is approximately equivalent to the level associated with a quiet suburb or light traffic (which is unlikely to be reached except at night in this area).

Figure A.1 Approximate attenuation of equipment noise with no barriers



With regard to visual disturbance, sensitivity may be broadly correlated with size, with larger species typically having greater 'flush distances' (the distances at which birds typically move when approached by people). Laursen et al. (2005) determined that the mean flush distance for shelduck was 225 m; 319 m for brent geese; but only 70 m for dunlin (a much smaller species).

Cutts et al. (2009)⁶³ provide a useful review of available data on bird disturbance. It makes particular reference to noise and disturbance investigations studies undertaken during sea defence works, which included piling works. These studies identified disturbance levels for various activities associated with construction, based on observations of bird responses.

The study also records the following observations from other construction schemes on the Humber:

- Piling activity on the landward side of the sea wall at Pyewipe (southern shore), associated with construction of a pumping station, had no disturbance effect on birds in January, February and March; the numbers and distributions of birds were similar during periods with and without piling. Disturbance only occurred when construction was moved to the seaward-side of the sea wall in April.
- Six years of bird monitoring associated with the construction of the Humber International Terminal (HIT) concluded that most disturbance only caused birds to move over a small area, and that the HIT development did not have a significant effect on usage of the area by birds.

The work has been consolidated as part of the TIDE toolbox, a result of the INTERREG IVB-Project "Tidal River Development" TIDE, which aims at the integrated management of estuaries by providing information on estuarine functioning, but also provides resources to support estuarine managers by providing experience, recommendations and tools for use in their work. The waterbird disturbance and mitigation toolkit is available at: [TIDE toolbox - TIDE tools \(tide-toolbox.eu\)](https://tide-toolbox.eu)

In general, therefore, effects from noise and visual disturbance during construction typically have a limited range and duration, are reversible, and do not result in long-term adjustments in bird behaviours (such that they might constitute an adverse effect).

⁶³ Cutts N., Phelps A. & Burdon D. (2009) *Construction and waterfowl: defining sensitivity, response, impacts and guidance*. Report to Humber INCA by the Institute of Estuarine and Coastal Studies, University of Hull

APPENDIX B STANDARD MITIGATION AND AVOIDANCE MEASURES

OVERVIEW

The 'avoidance measures' that may be applied to the options are detailed below, and are grouped as follows:

- General Measures (established construction best-practice, etc.) which will be applied to all options;
- Option-specific Measures (established and reliable measures identified to avoid specific potential effects on European sites, such as in relation to mobile species from the sites).

These measures will be applied unless project-level HRAs or project-specific environmental studies demonstrate that they are not required (i.e. the anticipated effect will not occur), not appropriate, or that alternative or additional measures are necessary or more appropriate.

Note that these measures are not exhaustive or exclusive and must be reviewed at the project stage, taking into account any changes in best-practice as well as scheme-specific survey information or studies.

GENERAL MEASURES AND PRINCIPLES

Scheme Design and Planning

All options will be subject to project-level environmental assessment as they are brought forward, which will include assessments of their potential to affect European sites during their construction or operation. These assessments will consider or identify (inter alia):

- opportunities for avoiding potential effects on European sites through design (e.g. alternative pipeline routes; micro siting; etc);
- construction measures that need to be incorporated into scheme design and/or planning to avoid or mitigate potential effects - for example, ensuring that sufficient working area is available for pollution prevention measures to be installed, such as sediment traps;
- operational designs required to ensure no adverse effects occur (e.g. screening, additional treatment, etc.) – although note that these measures can only be identified through detailed investigation schemes and agreed through the project-level HRA process.

Pollution Prevention

The habitats of European sites are most likely to be affected indirectly, through site-derived pollutants, rather than through direct encroachment. There is a substantial body of general construction good-practice which is likely to be applicable to all of the proposed options and can be relied on (at this level) to prevent significant or adverse effects on a European site occurring as a result of construction site-derived pollutants. The following guidance documents detail the industry best-practices in construction that are likely to be relevant to the proposed schemes:

- Environment Agency Pollution Prevention Guidance Notes⁶⁴, including:
 - PPG1: General guide to the prevention of pollution (May 2001);
 - PPG5: Works and maintenance in or near water (October 2007);
 - PPG6: Pollution prevention guidance for working at construction and demolition sites (April 2010);
 - PPG21: Pollution incident response planning (March 2009);
 - PPG22: Dealing with spillages on highways (June 2002);

⁶⁴ Note, the Environment Agency Pollution Prevention Guidance Notes have been withdrawn by the Government, although the principles within them are sound and form a reasonable basis for pollution prevention measures.

- Environment Agency (2001) Preventing pollution from major pipelines [online]. Available at www.environment-agency.gov.uk/static/documents/Business/pipes.pdf. [Accessed 1 March 2011];
- Venables R. et al. (2000) Environmental Handbook for Building and Civil Engineering Projects. 2nd Edition. Construction Industry Research and Information Association (CIRIA), London.

The best-practice procedures and measures detailed in these documents will be followed for all construction works derived from the WRMP as a minimum standard, unless scheme-specific investigations identify additional measures and/or more appropriate non-standard approaches for dealing with potential site-derived pollutants.

GENERAL MEASURES FOR SPECIES

Most species-specific avoidance or mitigation measures can only be determined at the scheme level, following scheme-specific surveys, and 'best-practice' mitigation for a species will vary according to a range of factors that cannot be determined at the strategic (DP) level. In addition, some general 'best-practice' measures may not be relevant or appropriate to the interest features of the European sites concerned (for example, clearing vegetation over winter is usually advocated to avoid impacts on nesting birds; however, this is unlikely to be necessary to avoid effects on some SPA species (such as overwintering estuarine birds) and the winter removal of vegetation might actually have a negative effect on these species through disturbance). However, the following general measures will be followed to minimise the potential for impacts on species that are European site interest features unless project level environmental studies or HRA indicate that they are not required or not appropriate, or that alternative or additional measures are more appropriate/necessary:

- Scheme design will aim to minimise the environmental effects by 'designing to avoid' potential habitat features that may be used by species that are European site interest features when outside the site boundary (e.g. linear features such as hedges or stream corridors; large areas of scrub or woodland; mature trees; etc.) through scheme-specific routing studies.
- The works programme and requirements for each option will be determined at the earliest opportunity to allow investigation schemes, surveys and mitigation to be appropriately scheduled and to provide sufficient time for consultations with NRW/NE.
- Night-time working, or working around dusk/dawn, should be avoided to reduce the likelihood of negative effects on nocturnal species.
- Any lighting required (either temporary or permanent) will be designed with an ecologist to ensure that potential 'displacement' effects on nocturnal animals, particularly SAC bat species, are avoided.
- All compounds/pipe stores etc. will be sited, fenced or otherwise arranged to prevent vulnerable SAC species (notably otters) from accessing them.
- All materials will be stored away from commuting routes/foraging areas that may be used by species that are European site interest features.
- All excavations will have ramps or battered ends to prevent species becoming trapped.
- Pipe-caps must be installed overnight to prevent species entering and becoming trapped in any laid pipe-work.

APPENDIX C HRA STAGE 1 SCREENING

SSW Option ID	Name	Description	European Sites	Approximate distance (km)	Construction Commentary	Construction LSE?	Operational Commentary	Operation LSE?	In-combination assessment required?
2.1.1.1	New 40 MI/d surface water abstraction from the River Trent and transfer to Blithfield Reservoir.	<p>The proposed option is to provide a new 40MI/d surface water abstraction on the River Trent, including: a new river intake, a new intake pumping station and a 3.8km of new 900mm diameter main between River Trent and Blithfield reservoir. The abstraction on the River Trent would be restricted for much of the summer by the Trent flow restrictions</p> <p>The exact location of the new river intake will need to be determined through further investigation and third-party consultation; however, for the purpose of this option assessment a notional location to the north-west of Rugeley has been selected. Permanent land take would be required for the river intake and associated plant/building.</p> <p>The option involves: a new river intake works and intake pumping, 380kW pump (760kW pumping station), 3.8km of new 900mm dia main between River Trent and Blithfield reservoir and a new outfall into Blithfield reservoir. An overall delivery period of 5 years is proposed.</p>	<p>Cannock Chase SAC Pasturefields Salt Marsh SAC West Midlands Mosses SAC Midland Meres and Mosses – Phase 1 and 2 Ramsar River Mease SAC</p> <p>Humber Estuary SAC, SPA and Ramsar</p>	<p>2.5km 5.7km 5.4km 5.4km</p> <p>Downstream receptor (c.20km) Downstream receptor (>150km)</p>	<p>There is no pathway for impact to any terrestrial site; Cannock Chase SAC is designated for European dry heaths and Northern Atlantic wet heaths and is not reliant on the River Trent for water supply despite its proximity. No LSEs identified within Pasturefields Salt Marsh SAC, West Midlands Mosses SAC and Midland Meres and Mosses – Phase 1 and 2 Ramsar; all three sites are located upstream of the works and are not considered to be exposed to water quality impacts and are sufficiently distanced such that noise and air quality impacts during construction are not considered to be an issue (based on standard distance thresholds).</p> <p>The Humber Estuary is considered sufficiently distant at construction impacts will not result in an adverse effect, with the SACO stating that the River Trent does not support sea or river lamprey (Cromwell Weir impassable). There is uncertainty as to the distribution of mobile species of the River Mease SAC (spined loach in particular) and therefore whether impacts could occur during construction of the new abstraction. A Stage 2 Appropriate Assessment will be required to consider the mitigation measures necessary to avoid an adverse effect to the River Mease SAC.</p>	LSEs identified	<p>A new 40MI/d abstraction is required on the River Trent to fill Blithfield Reservoir. The proposed abstraction point is c.8km upstream of the River Mease SAC confluence with the River Trent. The distribution of functionally linked habitat within the River Trent and it's use by the mobile species of the River Mease SAC (bullhead, spined loach and WCC) is unknown. Similarly, a long-term change in flow could alter prey availability for otter within the wider catchment. LSEs cannot be ruled out due uncertainty over the operational regime and how this may affect fish species, and the extent of functionally linked habitat to be affected. Should this option be taken forward to the preferred options stage, scheme level investigations and Stage 2 Appropriate Assessment would need to be undertaken.</p> <p>Although hydrologically linked to the Humber Estuary SAC, qualifying features not known to be present on the River Trent. The SACO states the following: - Sea lamprey: <i>Distribution of sea lamprey in the River Trent is unknown however it is thought that distribution of the species is severely limited by Cromwell weir, which is considered as impassable.</i> - River lamprey: <i>Distribution of river lamprey in the River Trent is severely limited by Cromwell weir, which is considered as impassable to river lamprey.</i> The reduction in flow is not considered to adversely affect the Humber Estuary SAC estuaries feature (SACO target for freshwater input) alone (based on WFD impact assessment).</p>	LSEs identified (uncertain)	<p>Yes - multiple abstractions affecting flow within River Trent and use of this as functional habitat by qualifying features of River Mease SAC.</p> <p>? - abstractions affecting freshwater input to the Humber Estuary (freshwater input is an attribute/target in the SACO for the estuaries feature)</p>
2.2.1.1	Blithfield Reservoir - 1m raising	<p>This option will aim to raise the Blithfield Reservoir full supply level by approximately 1m which would enlarge the actual storage volume by 3,180MI. This option will include raising of the main embankment dam by 1m (reinforced concrete wall); raising of the draw off tower, footbridges, piers and bridges; raising of the stilling basin side walls and extension of the stilling basin approximately 3m downstream; raising of the road embankment and shifting of the road by 2.5m upstream; two new borrow pits. The option would not require a change to abstraction license.</p>	<p>West Midlands Mosses SAC Pasturefields Salt Marsh Cannock Chase SAC Midland Meres & Mosses Phase 1 Ramsar River Mease SAC Humber Estuary SAC, SPA and Ramsar</p>	<p>2.8km 5.1km 5.5km 2.8km Downstream receptor (c.15km) Downstream receptors (>150km)</p>	<p>There is no pathway for impact to any terrestrial sites from construction related issues such as noise and air quality (based on standard distance thresholds). The Blithfield Reservoir discharges to the River Blithe which connects to the River Trent downstream of the Cannock Chase SAC and Pasturefields Salt Marsh SACs.</p> <p>The Humber Estuary is considered sufficiently distant at construction impacts will not result in an adverse effect, with the SACO stating that the River Trent does not support sea or river lamprey (Cromwell Weir impassable).</p> <p>There is uncertainty as to the distribution of mobile species of the River Mease SAC (spined loach in particular) and therefore whether impacts (sedimentation, pollution incidents) could occur during construction of the raised embankment (hydrological connectivity via the River Blithe). A Stage 2 Appropriate Assessment will be required to consider the mitigation measures necessary to avoid an adverse effect to the River Mease SAC.</p>	LSEs identified	<p>Increasing the capacity of the reservoir may result in changes to hydrology within the River Blithe, a tributary of the River Trent through a change in spill regime. The use of the River Blithe and River Trent by the mobile species of the River Mease SAC is unknown. LSEs therefore cannot be ruled out due to uncertainty over the operational regime and how this may affect the extent of functionally linked habitat. Should this option be taken forward to the preferred options stage, scheme level investigations and Stage 2 Appropriate Assessment would need to be undertaken.</p> <p>Although hydrologically linked to the Humber Estuary SAC, qualifying features not known to be present on the River Trent. The SACO states the following: - Sea lamprey: <i>Distribution of sea lamprey in the River Trent is unknown however it is thought that distribution of the species is severely limited by Cromwell weir, which is considered as impassable.</i> - River lamprey: <i>Distribution of river lamprey in the River Trent is severely limited by Cromwell weir, which is considered as impassable to river lamprey.</i> The reduction in flow is not considered to adversely affect the Humber Estuary SAC estuaries feature (SACO target for freshwater input) alone (based on WFD impact assessment).</p>	LSEs identified (uncertain)	<p>Yes - multiple abstractions affecting flow within River Trent and use of this as functional habitat by qualifying features of River Mease SAC.</p> <p>? - abstractions affecting freshwater input to the Humber Estuary (freshwater input is an attribute/target in the SACO for the estuaries feature)</p>

SSW Option ID	Name	Description	European Sites	Approximate distance (km)	Construction Commentary	Construction LSE?	Operational Commentary	Operation LSE?	In-combination assessment required?
2.2.2.1	Blithfield Reservoir - 2m raising	This option will aim to raise the Blithfield Reservoir full supply level by approximately 2m which would enlarge the actual storage volume by 6,600MI. This option will include raising of the main embankment dam by 2m (reinforced concrete wall); raising of the draw off tower, footbridges, piers and bridges; raising of the stilling basin side walls and extension of the stilling basin approximately 3m downstream; raising of the road embankment and shifting of the road by 2.5m upstream; two new borrow pits. The option would not require a change to abstraction license.	West Midlands Mosses SAC Pasturefields Salt Marsh SAC Cannock Chase SAC Midland Meres & Mosses Phase 1 Ramsar River Mease SAC Humber Estuary SAC, SPA and Ramsar	2.8km	There is no pathway for impact to any terrestrial sites from construction related issues such as noise and air quality (based on standard distance thresholds). The Blithfield Reservoir discharges to the River Blithe which connects to the River Trent downstream of the Cannock Chase SAC and Pasturefields Salt Marsh SACs. The Humber Estuary is considered sufficiently distant at construction impacts will not result in an adverse effect, with the SACO stating that the River Trent does not support sea or river lamprey (Cromwell Weir impassable). There is uncertainty as to the distribution of mobile species of the River Mease SAC (spined loach in particular) and therefore whether impacts (sedimentation, pollution incidents) could occur during construction of the raised embankment (hydrological connectivity via the River Blithe). A Stage 2 Appropriate Assessment will be required to consider the mitigation measures necessary to avoid an adverse effect to the River Mease SAC.	LSEs identified	Increasing the capacity of the reservoir may result in changes to hydrology within the River Blithe, a tributary of the River Trent through a change in spill regime. The use of the River Blithe and River Trent by the mobile species of the River Mease SAC is unknown. LSEs therefore cannot be ruled out due to uncertainty over the operational regime and how this may affect the extent of functionally linked habitat. Should this option be taken forward to the preferred options stage, scheme level investigations and Stage 2 Appropriate Assessment would need to be undertaken. Although hydrologically linked to the Humber Estuary SAC, qualifying features not known to be present on the River Trent. The SACO states the following: - Sea lamprey: <i>Distribution of sea lamprey in the River Trent is unknown however it is thought that distribution of the species is severely limited by Cromwell weir, which is considered as impassable.</i> - River lamprey: <i>Distribution of river lamprey in the River Trent is severely limited by Cromwell weir, which is considered as impassable to river lamprey.</i> The reduction in flow is not considered to adversely affect the Humber Estuary SAC estuaries feature (SACO target for freshwater input) alone (based on WFD impact assessment).	LSEs identified (uncertain)	Yes - multiple abstractions affecting flow within River Trent and use of this as functional habitat by qualifying features of River Mease SAC. ? - abstractions affecting freshwater input to the Humber Estuary (freshwater input is an attribute/target in the SACO for the estuaries feature)
				5.1km 5.5km 2.8km Downstream receptor (c.15km) Downstream receptors (>150km)					
2.3.1	Chelmarsh reservoir 15MI/d	This option will aim to raise the Chelmarsh reservoir supply by approximately 1m which would require to enlarge the existing storage volume of 3,063MI to provide an additional 420MI storage. Therefore this option will require raising the main embankment dam by 1m (reinforced concrete wall); raising of the overflow and inlet towers, footbridges and piers; extension of the culvert and stilling basing approximately 3m downstream; raising of the subsidiary dams on the downstream slope; shifting the road bout 2.5m downstream; two new borrow pits.	Severn Estuary SAC, SPA and Ramsar	Downstream receptor (>100km) There are no SACs, SPAs or Ramsar sites located within 10km of the proposal area.	Construction works may have an impact upon migratory species associated with Severn Estuary SAC/Ramsar (sea lamprey and twaite shad SAC qualifying features) through damage to functionally linked habitat, pollution incidents, sedimentation processes. The reservoir is hydrologically linked to the River Severn by a small watercourse. A Stage 2 Appropriate Assessment will be required to consider the mitigation measures (standard and best practice for construction) necessary to avoid an adverse effect to the Severn Estuary SAC and Ramsar, which would be mitigated through best practice measures. No functionally linked habitat for the SPA qualifying features has been identified at this distance from the estuary, and therefore no LSEs to the SPA are anticipated.	LSEs identified	Increasing the capacity of the reservoir may result in changes to hydrology within the tributary of the River Severn through reduction of water flow, water level and therefore further assessment would be required to understand the impact of these changes and if impacts are considered adverse upon the River Severn and migratory species (sea lamprey and twaite shad SAC qualifying features; salmon, sea trout, eel Ramsar qualifying features). If a release of water from the Lake Vyrnwy reservoir was required to support the scheme, impacts to the Severn Estuary EMS migratory fish life stages, and use of habitat within the upper River Vyrnwy, would need to be considered through a Stage 2 Appropriate Assessment.	LSEs identified	Yes – multiple abstractions on River Severn and potential change to freshwater input to estuary
2.3.2	Chelmarsh Reservoir 30MI/d	This option will aim to raise the Chelmarsh reservoir supply by approximately 2m which would require to enlarge the existing storage volume of 3,063MI to provide an additional 890MI storage. Therefore this option will require raising the main embankment dam by 2m earthwork to the crest and downstream slope); raising of the overflow and inlet towers, footbridges and piers; extension of the culvert and stilling basing approximately 10m downstream; raising of the subsidiary dams on the downstream slope; shifting the road bout 5m downstream; two new borrow pits.	Severn Estuary SAC, SPA and Ramsar	Downstream receptor (>100km) There are no SACs, SPAs or Ramsar sites located within 10km of the proposal area.	Construction works may have an impact upon migratory species associated with Severn Estuary SAC/Ramsar (sea lamprey and twaite shad SAC qualifying features) through damage to functionally linked habitat, pollution incidents, sedimentation processes. The reservoir is hydrologically linked to the River Severn by a small watercourse. A Stage 2 Appropriate Assessment will be required to consider the mitigation measures (standard and best practice for construction) necessary to avoid an adverse effect to the Severn Estuary SAC and Ramsar, which would be mitigated through best practice measures. No functionally linked habitat for the SPA qualifying features has been identified at this distance from the estuary, and therefore no LSEs to the SPA are anticipated.	LSEs identified	Increasing the capacity of the reservoir may result in changes to hydrology within the tributary of the River Severn through reduction of water flow, water level and therefore further assessment would be required to understand the impact of these changes and if impacts are considered adverse upon the River Severn and migratory species (sea lamprey and twaite shad SAC qualifying features; salmon, sea trout, eel Ramsar qualifying features). If a release of water from the Lake Vyrnwy reservoir was required to support the scheme, impacts to the Severn Estuary EMS migratory fish life stages, and use of habitat within the upper River Vyrnwy, would need to be considered through a Stage 2 Appropriate Assessment.	LSEs identified	Yes - multiple abstractions affecting flow within the River Severn and use of this as functional habitat by migratory species of the SAC and Ramsar. Abstractions affecting freshwater input to the Severn Estuary (freshwater input is an attribute/target in the SACO for the estuaries feature)

SSW Option ID	Name	Description	European Sites	Approximate distance (km)	Construction Commentary	Construction LSE?	Operational Commentary	Operation LSE?	In-combination assessment required?
6.1.1	Trent 40 MI/d - new sw intake with 14 day bankside storage and treatment works	This option seeks to make use of the available water in the River Trent by installing a new 40MI/d capacity treatment works adjacent to the River Trent between Rugeley and Yoxall. Therefore the option would require a new river abstraction on the River Trent, a new 0.1km pipeline, a new bankside storage reservoir (to provide 6 months storage), a new water treatment works (10ha) and new pipeline between the new treatment works and existing distribution grid (one pipeline of 4.7km to Burton on Trent, and one of 5km to Seedy Mill). An overall delivery period of 10 years would be necessary.	Cannock Chase SAC River Mease SAC Humber Estuary SAC/SPA and Ramsar	7.7km 5.8km Downstream receptor (>150km)	<p>Due to the distance between the option and Cannock Chase SAC (7.7km) and the lack of hydrological connectivity (Cannock Chase SAC is located upstream of the option along the River Trent; River Mease SAC is a downstream tributary of the River Trent), construction works are not anticipated to result in impacts through dust, air pollution, noise, pollution incidents. Construction works may have impact to River Mease SAC qualifying features through impact to supporting habitat for qualifying features in particular spined loach and otters. The reservoir location, and potential pipeline crossings of the River Trent and Trent and Mersey Canal, all could result in sedimentation and pollution incidents during construction. The use of the River Trent by the qualifying features of the River Mease SAC is uncertain. A Stage 2 Appropriate Assessment will be required.</p> <p>Due to the distance between the Humber Estuary SAC/Ramsar and the option, construction works is not anticipated to have an adverse effect upon the features of the SAC/Ramsar. While distribution of sea lamprey in the River Trent is unknown (Supplementary advice), the Cromwell weir is considerable impassable and therefore the distribution of sea lamprey and river lamprey is considered very limited within the River Trent. Therefore, the option is not considered to have an adverse impact upon the SAC/Ramsar features (migratory fish species).</p>	LSEs identified	Operation activities will require abstraction of 40MI/d on the River Trent which may have impact on hydrology and hydromorphology of the SACs connected to the River Trent. Therefore, the option may have an impact on habitats and species associated with River Mease SAC and Humber Estuary SAC/SPA/Ramsar. Due to the distance and the location upstream of Cannock Chase SAC, no LSE are anticipated. Without further understanding of the impact to water level, flow, velocity and hydromorphology, LSE cannot be ruled out and therefore further assessment would be required for River Mease SAC and Humber Estuary SAC/SPA/Ramsar.	LSEs identified	Yes - hydrological and geomorphological impact to River Trent.
6.1.3	Trent 70 MI/d - new sw intake with 14-day bankside storage and treatment works	This option seeks to make use of the available water in the River Trent by installing a new 70MI/d capacity treatment works adjacent to the River Trent between Alrewas and Burton. Therefore the option would require a new river abstraction on the River Trent, two new bankside storage reservoirs (to provide 6 months storage) and each of them would require a 0.1km pipeline between the river intake and the bankside storage, a new inlet, a new outlet and a new pipeline (1.7km and 0.8km) between the bankside storage and WTW. This option would also require a new water treatment works (10ha), new pipelines between the new treatment works and existing distribution grid (one pipeline of 0.5km to Burton on Trent, and one of 11.8km to Seedy Mill). An overall delivery period of 10 years would be necessary.	River Mease SAC Humber Estuary SAC/SPA and Ramsar	3.1km Downstream receptor (>150km)	<p>The River Mease SAC is located approximately 3.1km upstream of the option. There is uncertainty as to the distribution of mobile species of the River Mease SAC (spined loach in particular) within the River Trent, and therefore whether impacts (sedimentation, pollution incidents) could occur during construction. A Stage 2 Appropriate Assessment will be required to consider the mitigation measures necessary to avoid an adverse effect to the River Mease SAC.</p> <p>The Humber Estuary is considered sufficiently distant at construction impacts will not result in an adverse effect, with the SACO stating that the River Trent does not support sea or river lamprey (Cromwell Weir impassable).</p>	LSEs identified	<p>Operation activities will require abstraction of 70MI/d on the River Trent which may have impact on hydrology and hydromorphology of functionally linked habitat used by the mobile species of the River Mease SAC.</p> <p>Although hydrologically linked to the Humber Estuary SAC, qualifying features not known to be present on the River Trent. The SACO states the following: - Sea lamprey: <i>Distribution of sea lamprey in the River Trent is unknown however it is thought that distribution of the species is severely limited by Cromwell weir, which is considered as impassable.</i> - River lamprey: <i>Distribution of river lamprey in the River Trent is severely limited by Cromwell weir, which is considered as impassable to river lamprey.</i> The reduction in flow is not considered to adversely affect the Humber Estuary SAC estuaries feature (SACO target for freshwater input) alone (based on WFD impact assessment).</p>	LSEs identified	<p>Yes - multiple abstractions affecting flow within River Trent and use of this as functional habitat by qualifying features of River Mease SAC.</p> <p>? - abstractions affecting freshwater input to the Humber Estuary (freshwater input is an attribute/target in the SACO for the estuaries feature)</p>
7.1.2.1	Canal & Rivers Trust (CRT): Birmingham to Blithfield or Central Works via canal network.	This option seeks to make surplus water in the Birmingham Canal Network available for water supply purposes. This option would aim to transfer the water to the River Trent and Mersey Canal where water would be abstracted by SST and used to supplement flows into Blithfield Reservoir. This option also includes upgrades to the canal network to facilitate the transfer of water, the upgrade of the pumping station, the lock bypasses, a new abstraction point, and a new 6.2km pipeline between the abstraction point and Blithfield Reservoir. An overall delivery period of 10 years would be necessary.	<p>Pasturefields Salt Marsh SAC Cannock Chase SAC West Midlands Mosses SAC Midland Meres & Mosses Phase 1 Ramsar River Mease SAC</p> <p>Humber Estuary SAC, SPA and Ramsar</p>	<p>1.7km 1.9km 3.5km 3.5km</p> <p>Downstream receptor (c.20km) Downstream receptor (>150km)</p>	<p>Due to the distance between the option and Cannock Chase SAC, West Midlands Mosses SAC, Midland Meres & Mosses Phase 1 Ramsar and the lack of hydrological connectivity, no LSE are anticipated from construction of this option. Pastures Salt Marsh SAC is hydrologically connected to the River Trent, however is upstream of the new pipeline which would cross the River Trent. Therefore no LSEs are anticipated.</p> <p>The River Mease SAC is located approximately 20km downstream of the option. There is uncertainty as to the distribution of mobile species of the River Mease SAC (spined loach in particular) within the River Trent, and therefore whether impacts (sedimentation, pollution incidents) could occur during construction. It is assumed that a trenchless technique would be used for the river crossing, however a Stage 2 Appropriate Assessment will be</p>	LSEs identified	<p>Operational activities may result in the introduction of non-native species to the River Trent through water transfer. This could have an adverse effect on mobile species of the River Mease SAC which could be using functionally linked habitat within the River Trent. A Stage 2 Appropriate Assessment will be required to ensure suitable mitigation measures for INNS can be achieved to avoid an adverse effect.</p> <p>Due to the lack of hydrological connectivity between the abstraction point located on the Birmingham Canal Network and Pasturefields Salt Marsh SAC and West Midlands Mosses SAC, no LSE during operation are anticipated on these two SACs. There is no pathway for impact on the Cannock Chase SAC or Midland Meres and Mosses Ramsar.</p> <p>The redistribution of water in the network is</p>	LSEs identified	<p>Yes - multiple abstractions affecting flow within River Trent and use of this as functional habitat by qualifying features of River Mease SAC.</p> <p>? - abstractions affecting freshwater input to the Humber Estuary (freshwater input is an attribute/target in the SACO for</p>

SSW Option ID	Name	Description	European Sites	Approximate distance (km)	Construction Commentary	Construction LSE?	Operational Commentary	Operation LSE?	In-combination assessment required?
					<p>required to consider the mitigation measures necessary to avoid an adverse effect to the River Mease</p> <p>The Humber Estuary is considered sufficiently distant at construction impacts will not result in an adverse effect, with the SACO stating that the River Trent does not support sea or river lamprey (Cromwell Weir impassable).</p>		considered unlikely to result in an adverse effect on the Humber Estuary SAC, SPA and Ramsar.		the estuaries feature)
7.1.5	Canal & Rivers Trust (CRT): Chasewater surplus to Crane Brook	This option is to provide surplus from Chasewater Reservoir, via the Wryley & Essington Canal and Cranes Brook, to SSW. Surplus would then be discharged to Cranes Brook. The reservoir outflow would be released via automated structure. Detailed hydrological modelling has not been undertaken to determine the surplus, but it is likely to be in the region of 2-5 MI/d. New assets would include a 1km pipeline (450mm diameter) between the Chasewater outlet and Crane Brook, two inlet arrangements, new borehole at Pipehill with new borehole pumps/headworks/building, a 0.9m pipeline (450mm diameter) to connect the borehole to the existing Pipehill treatment plant, and a new pumping station at the new borehole.	Cannock Extension Canal SAC Cannock Chase SAC	2.2km 7.5km	<p>No LSEs identified due to the distance between the option and the Cannock Chase SAC, the lack of hydrological connectivity and the lack of terrestrial connectivity (major road infrastructures create physical barriers).</p> <p>Cannock Extension Canal is a terminal branch of the Wryley & Essington Canal, however given the numerous locks and direction of flow, it is considered unlikely that construction related impacts (e.g. sedimentation and pollution incidents) would give rise to an adverse effect.</p>	No LSEs identified	<p>No LSEs identified due to the lack of hydrological connectivity between the option and the Cannock Chase SAC.</p> <p>Surplus water release within Wryley & Essington Canal may have an impact upon the hydrology of the canal however this is not considered significant due to the existing water level management required to allow water transport. Therefore, no LSE are anticipated from operational activities on Cannock Chase SAC and Cannock Extension Canal SAC.</p>	No LSEs identified	
7.5.1.1	UU - 15 MI/d raw water (UU Vyrnwy reservoir raw water release 15 MI/d to River Severn to support SSW)	This option assumes that UU release raw water (15MI/d) release into the River Severn, making it available for sustainable abstraction downstream by SST which would be treated at Hampton Loade WTW. It is assumed that are no capital work associated with this option and that the option will use existing assets (any asset improvement will be considered by UU). Abstraction will be carried out at the existing Hampton Loade WTW with potential storage in Chelmarsh Reservoir. The option is linked to all options involving the existing or a rebuilt Hampton Loade WTW. An overall delivery period of 5 years.	Severn Estuary SAC/Ramsar/SPA	Downstream receptor (>100km) There are no SACs, SPAs or Ramsar sites located within 10km of the proposal area.	The option does not required construction works therefore no LSE identified.	No LSEs identified	<p>Operational activities will include the release of raw water to the River Vyrnwy, a tributary of the River Severn, from UU (Vyrnwy Reservoir) which has the potential to result in the introduction of non-native species, change in flows, water level and geomorphology processes. However, water to be released would be available for abstraction downstream by SST, at Hampton Loade WTW.</p> <p>There are uncertainties with regards to impacts of water transfer between UU and River Severn. This may have negative impact upon the migratory qualifying features of the Severn Estuary SAC, including sea lamprey and twaite shad and supporting habitats, introduction of non-native species, and the hydrology of the estuary.</p> <p>The use of the River Vyrnwy, and volume of water to be released into the watercourse, needs to be considered with regards impacts to supporting habitats for the freshwater life stages of the migratory fish of the Severn Estuary SAC and Ramsar. Changes in flow and water quality in the River Severn will also need to be considered alone and in-combination with other abstractions. LSEs identified and therefore a Stage 2 Appropriate Assessment will be required if this option is progressed.</p>	LSEs identified	<p>Yes - multiple discharges and abstractions affecting flow within the River Severn and use of this as functional habitat by migratory species of the SAC and Ramsar.</p> <p>Abstractions affecting freshwater input to the Severn Estuary (freshwater input is an attribute/target in the SACO for the estuaries feature)</p>

SSW Option ID	Name	Description	European Sites	Approximate distance (km)	Construction Commentary	Construction LSE?	Operational Commentary	Operation LSE?	In-combination assessment required?
7.5.1.2	UU - 30 MI/d raw water transfer to Hampton Loade via River Severn (UU Vyrnwy reservoir raw water release 30 MI/d to River Severn to support SSW)	This option assumes that UU release raw water (30MI/d) release into the River Severn, making it available for sustainable abstraction downstream by SST which would be treated at Hampton Loade WTW. It is assumed that are no capital work associated with this option and that the option will use existing assets (any asset improvement will be considered by UU). Abstraction will be carried out at the existing Hampton Loade WTW with potential storage in Chelmarsh Reservoir. The option is linked to all options involving the existing or a rebuilt Hampton Loade WTW. An overall delivery period of 5 years.	Severn Estuary SAC/Ramsar/SPA	Downstream receptor (>100km) There are no SACs, SPAs or Ramsar sites located within 10km of the proposal area.	The option does not required construction works therefore no LSE identified.	No LSEs identified	Operational activities will include the release of raw water to the River Vyrnwy, a tributary of the River Severn, from UU (Vyrnwy Reservoir) which has the potential to result in the introduction of non-native species, change in flows, water level and geomorphology processes. However, water to be released would be available for abstraction downstream by SST, at Hampton Loade WTW. There are uncertainties with regards to impacts of water transfer between UU and River Severn. This may have negative impact upon the migratory qualifying features of the Severn Estuary SAC and Ramsar, including sea lamprey and twaite shad and supporting habitats, introduction of non-native species, and the hydrology of the estuary. The use of the River Vyrnwy, and volume of water to be released into the watercourse, needs to be considered with regards impacts to supporting habitats for the freshwater life stages of the migratory fish of the Severn Estuary SAC and Ramsar. Changes in flow and water quality in the River Severn will also need to be considered alone and in-combination with other abstractions. LSEs identified and therefore a Stage 2 Appropriate Assessment will be required if this option is progressed.	LSEs identified	Yes - multiple abstractions affecting flow within the River Severn and use of this as functional habitat by migratory species of the SAC and Ramsar. Abstractions affecting freshwater input to the Severn Estuary (freshwater input is an attribute/target in the SACO for the estuaries feature)
7.5.1.3	UU River Severn - 45 MI /d (UU Vyrnwy reservoir raw water release 45 MI/d to River Severn to support SSW)	This option assumes that UU release raw water (45MI/d) release into the River Severn, making it available for sustainable abstraction downstream by SST which would be treated at Hampton Loade WTW. It is assumed that are no capital work associated with this option and that the option will use existing assets (any asset improvement will be considered by UU). Abstraction will be carried out at the existing Hampton Loade WTW with potential storage in Chelmarsh Reservoir. The option is linked to all options involving the existing or a rebuilt Hampton Loade WTW. An overall delivery period of 5 years.	Severn Estuary SAC/Ramsar/SPA	Downstream receptor (>100km) There are no SACs, SPAs or Ramsar sites located within 10km of the proposal area.	The option does not required construction works therefore no LSE identified.	No LSEs identified	Operational activities will include the release of raw water to the River Vyrnwy, a tributary of the River Severn, from UU (Vyrnwy Reservoir) which has the potential to result in the introduction of non-native species, change in flows, water level and geomorphology processes. However, water to be released would be available for abstraction downstream by SST, at Hampton Loade WTW. There are uncertainties with regards to impacts of water transfer between UU and River Severn. This may have negative impact upon the migratory qualifying features of the Severn Estuary SAC, including sea lamprey and twaite shad and supporting habitats, introduction of non-native species, and the hydrology of the estuary. The use of the River Vyrnwy, and volume of water to be released into the watercourse, needs to be considered with regards impacts to supporting habitats for the freshwater life stages of the migratory fish of the Severn Estuary SAC and Ramsar. Changes in flow and water quality in the River Severn will also need to be considered alone and in-combination with other abstractions. LSEs identified and therefore a Stage 2 Appropriate Assessment will be required if this option is progressed.	LSEs identified	Yes - multiple discharges and abstractions affecting flow within the River Severn and use of this as functional habitat by migratory species of the SAC and Ramsar. Abstractions affecting freshwater input to the Severn Estuary (freshwater input is an attribute/target in the SACO for the estuaries feature)

SSW Option ID	Name	Description	European Sites	Approximate distance (km)	Construction Commentary	Construction LSE?	Operational Commentary	Operation LSE?	In-combination assessment required?
7.5.1.4	UU - 75 MI/d raw water transfer to Hampton Loade via River Severn (UU Vyrnwy reservoir raw water release 75 MI/d to River Severn to support SSW)	This option assumes that UU release raw water (75MI/d) release into the River Severn, making it available for sustainable abstraction downstream by SST which would be treated at Hampton Loade WTW. It is assumed that are no capital work associated with this option and that the option will use existing assets (any asset improvement will be considered by UU). Abstraction will be carried out at the existing Hampton Loade WTW with potential storage in Chelmarsh Reservoir. The option is linked to all options involving the existing or a rebuilt Hampton Loade WTW. An overall delivery period of 5 years.	Severn Estuary SAC/Ramsar/SPA	Downstream receptor (>100km) There are no SACs, SPAs or Ramsar sites located within 10km of the proposal area.	The option does not required construction works therefore no LSE identified.	No LSEs identified	<p>Operational activities will include the release of raw water to the River Vyrnwy, a tributary of the River Severn, from UU (Vyrnwy Reservoir) which has the potential to result in the introduction of non-native species, change in flows, water level and geomorphology processes. However, water to be released would be available for abstraction downstream by SST, at Hampton Loade WTW.</p> <p>There are uncertainties with regards to impacts of water transfer between UU and River Severn. This may have negative impact upon the migratory qualifying features of the Severn Estuary SAC, including sea lamprey and twaite shad and supporting habitats, introduction of non-native species, and the hydrology of the estuary.</p> <p>The use of the River Vyrnwy, and volume of water to be released into the watercourse, needs to be considered with regards impacts to supporting habitats for the freshwater life stages of the migratory fish of the Severn Estuary SAC and Ramsar. Changes in flow and water quality in the River Severn will also need to be considered alone and in-combination with other abstractions. LSEs identified and therefore a Stage 2 Appropriate Assessment will be required if this option is progressed.</p>	LSEs identified. Significant risk of an adverse effect with this volume of water based on STT work.	Y - multiple discharges and abstractions affecting flow within the River Severn and use of this as functional habitat by migratory species of the SAC and Ramsar. Abstractions affecting freshwater input to the Severn Estuary (freshwater input is an attribute/target in the SACO for the estuaries feature)
8.1.1	Third party portable import in Burton-upon-Trent	Option to link in to Company X existing treatment plant infrastructure (depending on available capacity) to receive potable water directly via a pipeline into SSW existing supply network. The concept is to utilise third-party boreholes and a new potable import in the Burton-upon-Trent area. Raw water will be pumped from Company X's sources to either Chilcote WTW or Seedy Mill WTW for treatment before feeding into the SSW network. Potential potable water available from existing Company X's licensed borehole infrastructure is 50m3/hr (1200m3/d). Historically, low volumes did not make this cost beneficial. SSW would either supply Company X with water at no charge or pay Company X for potable water received at same cost as mains water.	River Mease SAC Humber Estuary SAC, SPA and Ramsar	0km (pipeline crosses SAC) Downstream receptor (>200km)	<p>Construction works would be required to build new assets including a new pipeline which would require crossing the River Mease SAC, as well as a tributaries including Seal Brook and Pessall Brook, the River Trent, and several unnamed watercourses.</p> <p>LSEs have been identified for River Mease SAC due to the proximity of the proposed pipeline, and the potential for direct impacts to qualifying habitats and species. There is also the potential for LSE on functionally liked habitat (hydrologically connected watercourses and direct loss of terrestrial habitats suitable for otter).</p>	LSEs identified	The operation of the option utilises an existing abstraction, with no proposed changes to the licence. On the basis that the licence is still valid following the Environment Agency's Review of Consents process (c.2005) no LSEs have been identified alone.	No LSEs identified	
8.1.5	New Burton-upon-Trent GW source with licence trade	The option would utilise third-party (Company X) abstraction licence(s) allowing for a new groundwater source in the Burton-upon-Trent area. The option will include purchasing land to drill a new borehole and a new pipeline to transfer raw water to existing Chilcote WTW to be treated.	River Mease SAC Humber Estuary SAC/SPA and Ramsar	0km (pipeline crosses SAC) Downstream receptor (>200km)	<p>Construction works would be required to build new assets including a new pipeline which would require crossing the River Mease SAC, as well as a tributaries including Hooborough Brook and the River Trent.</p> <p>LSEs have been identified for River Mease SAC due to the proximity of the proposed pipeline, and the potential for direct impacts to qualifying habitats and species. There is also the potential for LSE on functionally liked habitat (hydrologically connected watercourses and direct loss of terrestrial habitats suitable for otter).</p> <p>The Humber Estuary is considered sufficiently distant at construction impacts will not result in an adverse effect, with the SACO stating that the River Trent does not support sea or river lamprey (Cromwell Weir impassable).</p>	LSEs identified	<p>Operation impacts will include increased abstraction at the proposed new borehole location. The proposed new boreholes are located on the same low productivity aquifer, sandstone, as the River Mease SAC. The underlying sandstone is permeable and therefore a reduction in groundwater may influence the flow levels in the watercourses nearby which includes the River Trent, which is potentially functionally linked habitat for the River Mease SAC.</p> <p>Further assessment and consideration of operational flow impacts are therefore required through a Stage 2 Appropriate Assessment.</p> <p>Although hydrologically linked to the Humber Estuary SAC, qualifying features not known to be present on the River Trent. The SACO states the following: - Sea lamprey: <i>Distribution of sea lamprey in the River Trent is unknown however it is thought that distribution of the species is severely limited by Cromwell weir, which is considered as impassable.</i> - River lamprey: <i>Distribution of river lamprey in the River Trent is severely limited by Cromwell weir,</i></p>	LSEs identified	Yes - construction and operational impacts to River Mease SAC ? - Abstractions affecting freshwater input to the Humber Estuary (freshwater input is an attribute/target in the SACO for the estuaries feature)

SSW Option ID	Name	Description	European Sites	Approximate distance (km)	Construction Commentary	Construction LSE?	Operational Commentary	Operation LSE?	In-combination assessment required?
8.3.1	Burton-upon-Trent raw water reservoir - Site A						<i>which is considered as impassable to river lamprey.</i> The reduction in localised flow is not considered to adversely affect the Humber Estuary SAC estuaries feature (SACO target for freshwater input) alone.		
		The construction of new raw water storage reservoir close to the River Trent in the Burton-upon-Trent area. Third-party abstraction licence(s) to be utilised to fill it. Assuming an average water storage depth of 2m, this would provide a storage volume of approximately 0.5 Mm3.	River Mease SAC Humber Estuary SAC/SPA and Ramsar	0 km (unknown pipeline route but potentially crosses the River Mease SAC) 8 km (from reservoir footprint) Downstream receptor (>200km)	Construction works would be required to build new reservoir, and pipelines. The reservoir is located on potentially functionally linked habitat for otter associated with the River Mease SAC. The pipeline route may cross the River Mease SAC and LSE have therefore been identified for this SAC due to the potential proximity of the pipeline route, and the potential for direct and indirect impacts to qualifying habitats and species. There is also the potential for LSE on functionally liked habitat (hydrologically connected watercourses and direct loss of habitats suitable for qualifying species). The Humber Estuary is considered sufficiently distant at construction impacts will not result in an adverse effect, with the SACO stating that the River Trent does not support sea or river lamprey (Cromwell Weir impassable).	LSEs identified	Operation of the option will look to utilise 'spare third-party licences', with no new boreholes proposed which could be within proximity of the River Mease SAC, or be located within the same aquifer. On the basis that the licence is still valid following the Environment Agency's Review of Consents process (c.2005) no LSEs have been identified alone. Although hydrologically linked to the Humber Estuary SAC, qualifying features not known to be present on the River Trent. The SACO states the following: - Sea lamprey: <i>Distribution of sea lamprey in the River Trent is unknown however it is thought that distribution of the species is severely limited by Cromwell weir, which is considered as impassable.</i> - River lamprey: <i>Distribution of river lamprey in the River Trent is severely limited by Cromwell weir, which is considered as impassable to river lamprey.</i> The reduction in localised flow is not considered to adversely affect the Humber Estuary SAC estuaries feature (SACO target for freshwater input) alone.	No LSEs identified	Yes - abstractions affecting freshwater input to the Humber Estuary (freshwater input is an attribute/target in the SACO for the estuaries feature)



T: +44 (0) 1235 75 3000

E: enquiry@ricardo.com

W: ee.ricardo.com