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HRA

Severn Trent Sources SRO

Severn Trent Water

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Severn Trent Water Sources SRO

Habitat Regulations Assessment

Report for Severn Trent Water

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Executive Summary

Water companies in England and Wales are required to produce a Water Resources Management Plan (WRMP) every five years. The Plan sets out how the company intends to maintain the balance between supply and demand for water over the selected planning horizon (minimum 25 years) in order to ensure security of supply in each of the water resource zones making up its supply area.

Following submission of WRMPs in 2019, Ofwat through the Price Review 2019 (PR19) Final Determination, has identified the potential for companies to jointly deliver strategic regional water resources solutions to secure long-term resilience on behalf of customers while protecting the environment and benefiting wider society.

As part of the assessment of companies' PR19 business plans, Ofwat introduced proposals to support the delivery of Strategic Regional Water Resource Options (SROs) over the next 5 to 15 years with solutions considered to be 'construction ready' for the 2025-2030 period. Ofwat's Final Determination[1] in December 2019 set out a gated process for the co-ordination and development of a consistent set of SROs.

This gated process provides a mechanism for the industry, regulators, stakeholders and customers to input into the development and scheduling of these strategic solutions, through a combined set of statutory and regulatory processes. These include the National Framework, Drinking Water Safety Plans, Business Plans and WRMPs. The Strategic Regional working group (consisting of Affinity Water, Anglian Water, Severn Trent Water, Southern Water, South West Water, Thames Water, United Utilities and Wessex Water) published a joint company statement reiterating a commitment to continue working with the Regulators' Alliance for Progressing Infrastructure Development (RAPID), the Environment Agency (EA), Natural Resources Wales (NRW), Ofwat and the Drinking Water Inspectorate (DWI) to make all of the planning processes and statutory timetables a success.

The Severn Trent Water (STW) Sources has been identified as an SRO in the PR19 Final Determination, with funding provided to STW as an individual company. Although the STW Sources SRO is considered a company solution with no identified partner this has potential to benefit other companies and interact with joint solutions, therefore its delivery will benefit from development funding and RAPID facilitation.

The ACWG guidance states that the Habitat Regulation Assessment (HRA) for each SRO should be undertaken in accordance with available guidance for England and Wales and should be based on a precautionary approach as required under the HRA process. The requirement for a HRA is established through the Conservation of Habitats and Species Regulations 2017 (as amended), commonly referred to as the Habitats Regulations.

As the gate-1 submission does not form a statutory plan or project, STW has undertaken an assessment of the implications of the individual schemes within the STW Sources SRO by adopting the *principles* of the HRA process to help identify risks to feasibility and deliverability of the schemes as well as the additional monitoring and assessment work required to inform the formal HRA at gate-2. While an in-combination assessment has been undertaken of the individual schemes, the in-combination assessments with other SROs, non-SRO options and other plans and projects has not been undertaken, It is understood that such assessments will be will be undertaken as part of the relevant regional plan or WRMP24 assessment processes.

As such, the assessment has identified where there is a risk of Likely Significant Effects (LSE) as a result of each scheme and the STW Sources SRO and, where a risk is identified, whether adverse effects on site integrity are predicted.

The assessment concluded that LSE is not anticipated as a result of the construction or operation of any of the three assessed schemes associated with the STW Sources SRO, subject to the current information on scheme design and operation. As such, no further assessments have been undertaken.

[1] Ofwat (2019), PR19 Final Determinations, Strategic regional water resource solutions appendix

The conclusion on the risk of LSE will need to be reviewed and updated (where required) as more information becomes available during completion of the gate-2 assessments. Particularly with regards to any changes in the potential treatment processes of the final effluent prior to discharge into the River Severn for the Netheridge Wastewater Treatment Works (WwTW) schemes.

Table A: Summary of HRA Stage 1 Screening Assessment of the STW Sources SRO Schemes.

Scheme	Stage 1 Screening Assessment - risk of likely significant effect on European site(s) alone?	Stage 1 Screening Assessment - risk of likely significant effect on European site(s) In-combination with other schemes?
Mythe abstraction licence transfer (15 Ml/d)	No	No
Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d)	No	No
Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d)	No	No

1 Introduction

1.1 Background and purpose of report

Water companies in England and Wales are required to produce a Water Resources Management Plan (WRMP) every five years. The Plan sets out how the company intends to maintain the balance between supply and demand for water over the selected planning horizon (minimum 25 years) in order to ensure security of supply in each of the water resource zones making up its supply area.

Following submission of WRMPs in 2019, Ofwat through the Price Review 2019 (PR19) Final Determination, has identified the potential for companies to jointly deliver strategic regional water resources solutions to secure long-term resilience on behalf of customers while protecting the environment and benefiting wider society. As part of the assessment of companies' PR19 business plans, Ofwat introduced proposals to support the delivery of Strategic Regional Water Resource Options (SROs) over the next 5 to 15 years with solutions considered to be 'construction ready' for the 2025-2030 period. Ofwat's Final Determination[2] in December 2019 set out a gated process for the co-ordination and development of a consistent set of SROs.

This gated process provides a mechanism for the industry, regulators, stakeholders and customers to input into the development and scheduling of these strategic solutions, through a combined set of statutory and regulatory processes. These include the National Framework, Drinking Water Safety Plans, Business Plans and WRMPs. The strategic regional working group (consisting of Affinity Water, Anglian Water, Severn Trent Water, Southern Water, South West Water, Thames Water, United Utilities and Wessex Water) published a joint company statement reiterating a commitment to continue working with the Regulators' Alliance for Progressing Infrastructure Development (RAPID), the Environment Agency (EA), Natural Resources Wales (NRW), Ofwat and the Drinking Water Inspectorate (DWI) to make all of the planning processes and statutory timetables a success.

The Severn Trent Water (STW) Sources has been identified as an SRO in the PR19 Final Determination, with funding provided to STW as an individual company. Although the STW Sources SRO is considered a company solution with no identified partner this has potential to benefit other companies and interact with joint solutions, therefore its delivery will benefit from development funding and RAPID facilitation.

In October 2020, the group of Water Companies involved in developing SROs (known as the All Company Working Group - ACWG), published guidance[3] for environmental assessment methods for SROs which is aligned to the draft Water Resources Planning Guideline (WRPG): Working Version for Water Resource Management Plan 2024 (WRMP24) to increase the consistency of environmental assessment and the evaluation of impacts on environmental water quality in particular.

The ACWG guidance states that the Habitat Regulation Assessment (HRA) for each SRO should be undertaken in accordance with available guidance for England and Wales and should be based on a precautionary approach as required under the HRA process. The requirement for a Habitat Regulation Assessment (HRA) is established through the Conservation of Habitats and Species Regulations 2017 (as amended), commonly referred to as the Habitats Regulations. Under Regulations 63 and 105, 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.

[2] Ofwat (2019), PR19 Final Determinations, Strategic regional water resource solutions appendix
[3] Mott MacDonald Limited (2020). All Companies Working Group WRMP environmental assessment guidance and applicability with SROs. Published October 2020

As such, each SRO should meet the requirements of the Habitats Regulations before implementation.

The amended 2017 Habitats Regulations have created a national site network on land and at sea, including both the inshore and offshore marine areas, in the UK. The national site network includes:

- existing Special Areas of Conservation (SACs)[4] and Special Protected Areas (SPAs)[5]
- new SACs and SPAs designated under these Regulations

Designated Wetlands of International Importance (known as Ramsar sites) do not form part of the national site network. Many Ramsar sites overlap with SACs and SPAs, and may be designated for the same or different species and habitats. All Ramsar sites are protected in the same way as SACs and SPAs.

For ease of reference through this HRA report, these designations are collectively referred to as "European sites". As per Natural England (NE) guidance[6], any HRA should also consider any European Marine Protected Areas (MPAs) within England's inshore waters (out to 12 nautical miles) to support sites in achieving conservation objectives and to guide effective management. No MPAs of European importance or Marine Conservation Zones (MCZs) are associated with the study area and therefore, no further consideration is required to inform the Strategic Environmental Assessment (SEA).

This HRA report aims to establish whether schemes included in the STW Sources SRO are likely to have a significant effect on European sites, either alone or in-combination. 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 designated). 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.

1.2 Area under consideration

The area under consideration for the assessment reflects the spatial scope of the ST Sources SRO schemes which includes specific areas of the River Severn catchment area. This comprises the River Severn corridor, from the existing STW abstraction licence at its Mythe intake in the lower River Severn to the Severn Estuary.

1.3 Requirements for Habitat Regulations Assessments

As the gate-1 submission does not form a statutory plan or project[7], the *principles* of the HRA process have been applied to help identify *risks* to feasibility and deliverability of the schemes (alone and in-combination).

As such there is no competent authority undertaking the integrity test.

HRA Guidance for the appraisal of Plans[8], summarises the Habitats Regulations. Regulation 63 states that the Plan making authority (in this case Severn Trent Water) shall adopt, or otherwise give effect to, the Plan only after having ascertained that it will not adversely affect the integrity of a European site, subject to Regulation 64 or 105 of the Habitats Regulations.

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[4] SACs were 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.
[5] SPAs were 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).
[6] Help Note: Tips and advice on how to assess potential impacts of water company statutory plans on the marine environment1 – Focussing on Marine Conservation Zones (MCZ)
[7] Ofwat 3 April 2020 Strategic Regional Water Resource Solutions: Gate one assessment. Letter issued via email to Regulatory Directors of companies with strategic regional water resource solutions.

[8] Tyldesley, D. & Chapman, C. (2013) The Habitats Regulations Assessment Handbook, November 2020 edition UK: DTA Publications Limited.

Regulation 64 of the Habitats Regulations states:

64. — (1) If the competent authority is satisfied that, there being no alternative solutions, the plan or project must be carried out for imperative reasons of overriding public interest (which, subject to paragraph (2), may be of a social or economic nature), they may agree to the plan or project notwithstanding a negative assessment of the implications for the European site or the European offshore marine site (as the case may be).

(2) Where the site concerned hosts a priority natural habitat type or a priority species, the reasons referred to in paragraph (1) must be either —

(a) reasons relating to human health, public safety or beneficial consequences of primary importance to the environment; or

(b) (b) any other reasons which the competent authority, having due regard to the opinion of the Appropriate Authority, consider to be imperative reasons of overriding public interest.

Regulation 105 of the Habitats Regulations states:

105. — (1) Where a land use plan —

(a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects), and

(b) (b) is not directly connected with or necessary to the management of the site, the plan-making authority for that plan must, before the plan is given effect, make an appropriate assessment of the implications for the site in view of that site's conservation objectives.

(2) The plan-making authority must for the purposes of the assessment consult the appropriate nature conservation body and have regard to any representations made by that body within such reasonable time as the authority specify.

(3) They must also, if they consider it appropriate, take the opinion of the general public, and if they do so, they must take such steps for that purpose as they consider appropriate.

(4) In the light of the conclusions of the assessment, and subject to regulation 103 (considerations of overriding public interest), the plan-making authority or, in the case of a regional strategy, the Secretary of State must give effect to the land use plan only after having ascertained that it will not adversely affect the integrity of the European site or the European offshore marine site (as the case may be).

(5) A plan-making authority must provide such information as the appropriate authority may reasonably require for the purposes of the discharge of the obligations of the appropriate authority under this Chapter.

(6) This regulation does not apply in relation to a site which is —

(a) a European site by reason of regulation 8(1)(c), or

(b) a European offshore marine site by reason of regulation 15(c) of the 2007 Regulations (site protected in accordance with Article 5(4) of the Habitats Directive).

Best practice guidance[9] recommends that if there are no alternative solutions and if, in exceptional circumstances, it is proposed that a Plan be adopted despite the fact that it may adversely affect the integrity of a European site, the HRA will need to address and explain the Imperative Reasons of Overriding Public Interest (IROPI) which the Plan making authority considers to be sufficient to outweigh the potentially adverse effects on the European site(s). As noted above, the HRA process will be applied to help identify risks to feasibility and deliverability of each scheme. As such, it is expected that schemes that are likely to result in adverse effects on site integrity will either be amended or will not be taken forward for consideration in gate-2.

[9] Tyldesley, D. & Chapman, C. (2013). The Habitats Regulations Assessment Handbook, February 2021 edition UK: DTA Publications Limited..

1.4 Structure of the report

The report is divided into the following sections:

- Section 1: This introduction
- Section 2: Provides a background to the STW Sources SRO
- Section 3: Provides the methodology adopted for the HRA
- Section 4: Provides the results of the screening of the individual STW Sources schemes
- Section 5: Conclusions and Recommendations

2 Severn Trent Water Sources SRO

2.1 Introduction

The STW Sources SRO schemes are considered integral to a Severn to Thames Transfer (STT) System.

A STT conveying raw water from the lower River Severn into the upper or middle River Thames via an interconnector would increase the catchment area from which water resources can be drawn to the south-east of England. In addition to any flows that may be available to be abstracted under licence from the River Severn, a range of raw water Source Support Elements for the STT System are under consideration to provide additional resource.

The STT SRO comprises 2 principal aspects:

1. Severn to Thames Conveyance – Deerhurst to Culham pipeline or Cotswold canal conveyance, including piping to Culham – to convey the water from the River Severn to the River Thames; and
2. STT Source Support Elements, these comprise water resources that can be added, or not abstracted (redeployed), from the rivers Vyrnwy, Severn and Avon.

In order for some of the STT Source Support Elements to be able to deliver the water into the STT System, there is a requirement for these water supplies to be replaced with other water sources. The provision of this additional water is covered under separate SROs that provide the facilities to enable supporting flows for the STT. These SROs are: STW Sources SRO, STW Minworth SRO, UU Sources SRO and UU Vyrnwy Aqueduct SRO.

STW Sources SRO include three schemes:

1. Mythe abstraction licence transfer (15 Ml/d)

2A. Netheridge Wastewater Treatment Works (WwTW) discharge diversion, Deerhurst pipeline (35 Ml/d)

2B. Netheridge WwTW discharge diversion, Cotswold canals (35 Ml/d)

This HRA report considers the schemes associated with the STW Sources SRO only and separate assessments are being undertaken to inform the HRA of the other sources and the STT SRO. In-combination assessments of the various SROs that form the STT System is not subject to this report and will be considered in the relevant regional plans.

A more detailed description of each scheme is provided in the sections below.

2.2 Mythe abstraction licence transfer (15 Ml/d)

This scheme provides support to STT abstraction from the Severn catchment by redeploying 15 Ml/d of the existing STW abstraction licence at its Mythe intake in the lower River Severn. This infrequently used licensed volume would remain in the River Severn for abstraction downstream at Deerhurst or Gloucester Docks. The Mythe intake is located on the River Severn near Tewkesbury, 5km northeast of Deerhurst. STW has advised that no construction works would be required to redeploy the spare licence volume for abstraction by TW.

It is understood from STW that no specific additional resource to replace this current abstraction licence volume has been determined to date and would require consideration at gate-2.

2.3 Netheridge WwTW discharge diversion

2.3.1 Deerhurst Pipeline (35 Ml/d)

Currently treated discharge from the Netheridge WwTW is input to the upper Severn Estuary. It is proposed to divert a 35 Ml/d portion of this treated discharge to a new outfall on the freshwater River Severn to support STT abstraction from the River Severn at Deerhurst. The outfall location to the River Severn has been identified, during studies undertaken at gate-1, to be located just downstream of the proposed intake from the River Severn at Deerhurst. The discharge diversion from Netheridge WwTW would be pumped by a new pumping station, located at the WwTW via[redacted]

WwTW discharge transfer for STT support would not be continuous, only discharging to the freshwater river outfall according to an operating regime when support is required to enable abstraction from the River Severn. The discharge would be a flow replacement for river water abstracted locally upstream. The scheme will result in a relocation of discharge of up to 35 Ml/d.

2.3.2 Netheridge WwTW discharge diversion, Cotswold Canals (35 Ml/d)

Currently treated discharge from Netheridge WwTW is input to the upper Severn Estuary. It is proposed to divert a 35 Ml/d portion to a new outfall on the freshwater River Severn to support STT abstraction from the River Severn at Gloucester and Sharpness Canal. The discharge location is into the East Channel of the River Severn, just downstream of the proposed abstraction discharging to Gloucester & Sharpness Canal. The diversion from Netheridge WwTWs would be pumped by a new pumping station, located at the WwTWs[redacted]

WwTW discharge transfer for STT support would not be continuous, only discharging to the freshwater river outfall according to an operating regime when support is required to enable abstraction from the River Severn. The discharge would be a flow replacement for river water abstracted locally upstream. The scheme will result in a relocation of up to 35 Ml/d.

The locations of these three schemes are shown on **Figure 2.1**.

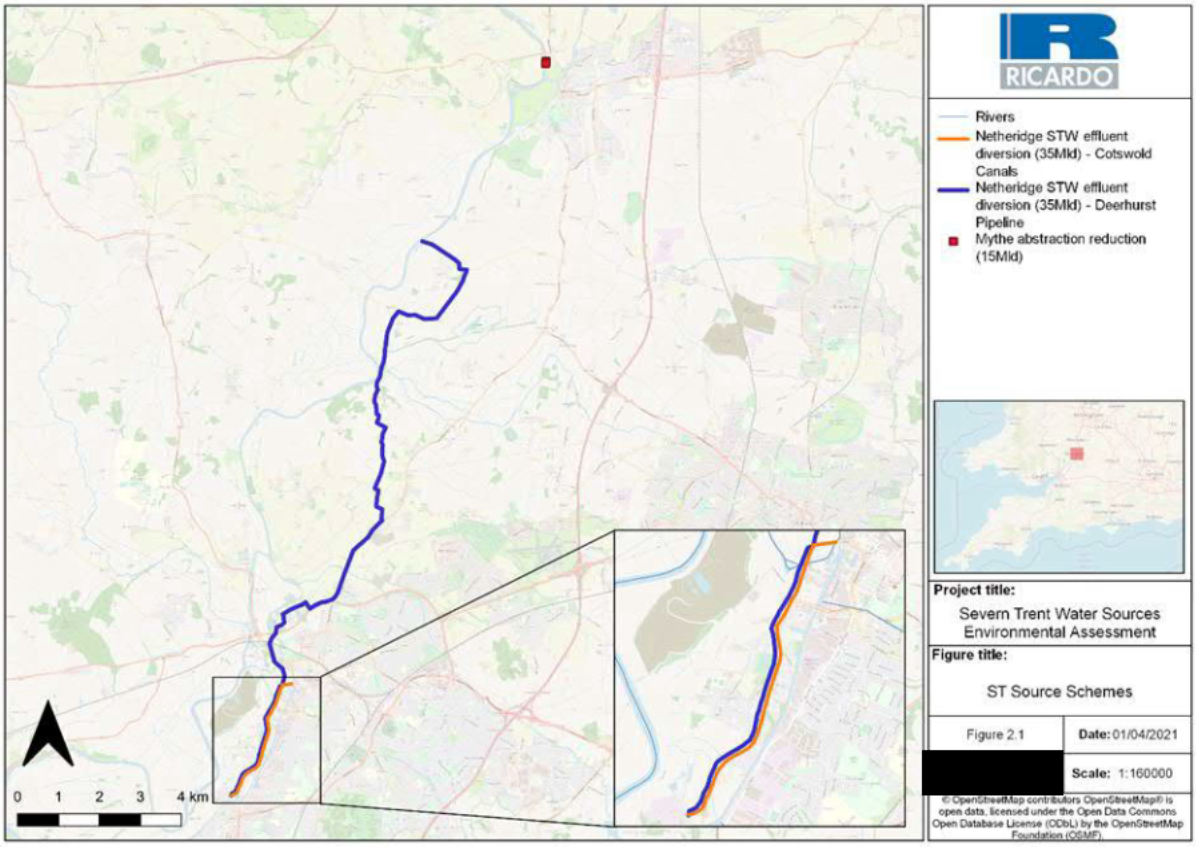

Figure 2.1: Location of STW Sources SRO Schemes

3 Methodology

3.1 Introduction

The ACWG guidelines indicate that a HRA should be undertaken in accordance with available guidance[10][11][12][13][14][15][16][17] and should be based on a precautionary approach as required under the Conservation of Habitats and Species Regulations 2017 (as amended).

The HRA required for gate-1 has been carried out in line with the ACWG current guidance for SRO Environmental Assessment. The requirements and outputs of the assessment are consistent with those in the WRSE Regional Plan Environmental Assessment Methodology Guidance, as well as the WRPG guidance for WRMP24.

The objective of this HRA is to establish whether any of the schemes for the STW Sources SRO is likely to have a significant effect on European sites (alone and in combination with each other when forming the STW Sources SRO).

In-combination assessments with other SROs, non-SRO options and other plans and projects in regional plans and WRMP24 will be undertaken as part of the relevant regional plan or WRMP24 assessment processes.

As the gate-1 submission does not form a statutory plan or project, the principles of the HRA process were applied to help identify *risks to feasibility* and deliverability of the schemes. A Stage 1 (screening) assessment was undertaken as part of the initial screening exercise for each of the schemes, and the *risk* of failing the integrity test was reviewed for each scheme, using the principles of the Stage 2 (Appropriate Assessment) assessment.

3.1.1 Stage 1 Screening

For gate-1, each scheme (either alone or in-combination) was considered to determine whether there were any risk of Likely Significant Effect (LSE) arising from construction or implementation activities and/or operation of the scheme on one or more European sites.

GIS data was used to map the locations and boundaries of European sites in relation to the three different schemes. Sites within 10km of construction and operation works and 500m of rivers transferring excess water were identified for screening of potential LSE. Where impact pathways were identified at greater distances (>10km) as a result of hydrological connectivity for example, designated sites were screened in as appropriate.

The attributes of the European sites, which contribute to and define their integrity, current conservation status and the specific sensitivities of the site were considered with reference to:

- Standard Data forms for SACs and SPAs and Information Sheets for Ramsar sites. An analysis of these information sources has enabled the identification of the site's qualifying features.
- Article 12 and 17 reporting,
- Site conservation objectives,
- Supplementary advice to the conservation objectives (SACO) where available
- Site Improvement Plans
- Core Management Plans (Wales), and

[10] Court of Justice for the European Union's ruling on People Over Wind and Sweetman ('Sweetman II') vs Coillte Teoranta, Case C-323/17.
[11] UK Government (2019). Guidance on the use of Habitats Regulations Assessment.
[12] UK Government (2019). Conservation of Habitats and Species Regulations (Amendment) (EU Exit).
[13] Natural England (2020). Guidance on how to use Natural England's Conservation Advice Packages in Environmental Assessments.
[14] Tyldesley, D. & Chapman, C. (2013). The Habitats Regulations Assessment Handbook, February 2021 edition UK: DTA Publications Limited.
[15] Environment Agency and Natural Resources Wales (2017). Water resources planning guideline – April 2017
[16] European Commission (2018). Managing Natura 2000 sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. European Union, 1-86.
[17] Defra (2012). The Habitats and Wild Birds Directives in England and its seas: Core guidance for developers, regulators & land/marine managers.

- the supporting Site of Special Scientific Interest's favourable condition tables where relevant and no SACOs applicable to the features were available.

Analysis of how potential impacts of each scheme could affect a European site was undertaken using this information.

The qualifying habitats and species of European sites are vulnerable to a wide range of impacts such as physical loss or damage of habitat, disturbance from noise, light, human presence, changes in hydrology (e.g. changes in water levels/flow, flooding), changes in water or air quality and biological disturbance (e.g. direct mortality, introduction of disease or non-native species). The assessment considered the construction and operational effects.

In determining the likelihood of significant effects on European sites, particular consideration was given to the possible source-receptor pathways through which effects may be transmitted from activities associated with each scheme, to features contributing to the integrity of the European sites (e.g. surface water catchments, air, etc.).

Where applicable, screening considered different types of impacts which can occur over different distances. The assumptions and distances used in the screening and a justification for their use are provided in **Table 3.1**.

Consideration was also given to the NE SSSI Impact Risk Zone (IRZ) datasets. The IRZs are reviewed regularly to ensure they reflect the current understanding of specific site sensitivities and potential risks posed to SSSIs. Where the notified features of a European site and SSSI are different, the SSSI IRZs have been set so that they reflect both. As such, these IRZs were used as part of a HRA to assist with determining whether there are likely to be significant effects from a particular development on the interest features of the European site.

Table 3.1: Potential impacts of scheme on European sites.

Broad categories of potential impacts on European sites, with examples	*Examples of operations responsible for impacts* (distance assumptions in italics)
Physical loss: • Removal (including offsite effects, e.g. foraging habitat, and removal of supporting habitat within boundary of a SPA) • Smothering	*Development of infrastructure associated with scheme, e.g. new or temporary pipelines, transport infrastructure, temporary weirs.* *Indirect effects from a reduction in flows e.g. drying out marginal habitat.* Physical loss is most likely to be significant where the boundary of the scheme extends within the boundary of the European site, or within an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).
Physical damage: • Sedimentation / silting • Prevention of natural processes including coastal and fluvial bank stabilisation, prevention of long-shore drift etc. • Habitat degradation • Erosion • Fragmentation • Severance/barrier effect • Edge effects	*Reduction in river flow leading to permanent and/or temporary loss of available habitat, sedimentation/siltation, fragmentation, etc.* Physical damage is likely to be significant where the boundary of the scheme extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated, or where natural processes link the scheme to the site, such as through hydrological connectivity downstream of a scheme, long shore drift along the coast, or the scheme impacts the linking habitat).
Non-physical disturbance: • Noise (incl. underwater)	*Noise from temporary construction or temporary pumping activities.*

Broad categories of potential impacts on European sites, with examples	*Examples of operations responsible for impacts* (distance assumptions in italics)
• Visual presence • Human presence • Light pollution • Vibration (incl. underwater).	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 bird species, it is concluded that noise impacts could be significant up to 1km from the boundary of the European site[18]. *Noise from vehicular traffic during operation of a scheme.* Noise from construction traffic is only likely to be significant where the transport route to and from the scheme is within 3-5km of the boundary of the European site. *Plant and personnel involved in in operation of the scheme.* These effects (noise, visual/human presence) are only likely to be significant where the boundary of the scheme extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated). *Schemes which might include artificial lighting, e.g. for security around a temporary pumping station.* Effects from light pollution are only likely to be significant where the boundary of the scheme is within 500m of the boundary of the European site. *Vibration from temporary construction* From a review of Environment Agency internal guidance on HRA and various websites/sources[19,20,21] it is considered that effects of vibration are more likely to be significant if development is within 500m of a European site.
Water table/availability: • Drying • Flooding / stormwater • Changes to surface water levels and flows including both increases and reductions. • Changes in groundwater levels and flows • Changes to coastal water movement	*Changes to water levels and flows due to increased water abstraction, reduced storage or reduced flow releases from reservoirs to river systems.* These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site.

[18] British Standards Institute (BSI) (2009) BS5228 - Noise and Vibration Control on Construction and Open Sites. BSI, London.
[19] Institute of Lighting Professionals (2011) Guidance Notes for the Reduction of Obtrusive Light GN01:2011
[20] 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.
[21] 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.

Broad categories of potential impacts on European sites, with examples	*Examples of operations responsible for impacts* (distance assumptions in italics)
Toxic contamination: • Water pollution • Soil contamination • Air Pollution	*Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems.* These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site. *Air emissions associated with plant and vehicular traffic during construction and operation of schemes.* The effect of dust is only likely to be significant where site is within or in proximity to the boundary of the European site[22,23]. 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. 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 affected[24].
Non-toxic contamination: • Nutrient enrichment (e.g. of soils and water) • Algal blooms • Changes in salinity • Changes in water chemistry (e.g. pH, calcium balance etc) • Changes in thermal regime • Changes in turbidity • Changes in sedimentation/silting	*Changes to water salinity, nutrient levels, turbidity, thermal regime due to increased water abstraction, storage, or reduced compensation flow releases to river systems.* These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European Site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site.
Biological disturbance: • Direct mortality • Changes to habitat availability • Out-competition by non-native species • Selective extraction of species • Introduction of disease • Rapid population fluctuations • Natural succession	*Potential for changes to habitat availability, for example reductions in wetted width of rivers leading to desiccation of macrophyte beds due to changes in abstraction or reduced compensation flow releases to river systems. In addition, via removal of vegetation (including hedgerows and trees) used by based as foraging, roosting and hibernation sites and birds as roosting and nesting sites.* *Creation of new pathway of non-native invasive species.* This effect is only likely to be significant where the scheme is situated within the European site or an upstream tributary of the European site (or affects

[22] Highways Agency (2003) Design Manual for Roads and Bridges (DMRB), Volume 11.
[23] Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction v1.1.
[24] 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 operations responsible for impacts* (distance assumptions in italics)
	groundwater levels supporting these sites or tributaries) *Entrapment during in-river or terrestrial construction works causing injury and/or mortality of mobile species* Likely to be a risk of entrapment, injury and/or mortality where the boundary of the option extends within or is directly adjacent to the boundary of a European site or within/adjacent to offsite functionally linked habitat. Mobile species could include fish, bats and European otters for example. *Potential for changes to habitat availability via removal of vegetation (including hedgerows and trees) to facilitate construction activities and potential entrapment, injury and/or mortality of breeding birds and roosting/hibernating bats.* This effect is dependent on the requirement to remove vegetation (if it cannot be avoided), ecological surveys to determine species presence and timing of removal based on species specific ecological considerations.

3.1.2 Stage 2 Appropriate Assessment

Where an LSE is identified for a scheme at the screening stage (noting the precautionary principle), the scheme will be subject to the *principles* of the Stage 2 Appropriate Assessment, noting again that the gate-1 submission does not form a statutory plan or project and as such there is no competent authority undertaking the integrity test.

Further assessment will, therefore, be undertaken to identify where it is predicted that the integrity test cannot be met, and to identify further surveys, assessment and mitigation requirements to provide greater certainty to any conclusions.

The Appropriate Assessment will consider the potentially damaging aspects of the schemes, both construction and operation, and the potential effects on the associated European site's qualifying features and achievement of the conservation objectives and characterised the impacts in terms of their likelihood, nature, scale, severity and duration.

The potential for adverse effects on the integrity of a European site depends on the scale and magnitude of the action and its predicted impacts, taking into account the distribution of the qualifying features across the site in relation to the predicted impact and the location, timing and duration of the proposed activity and the level of understanding of the effect, such as whether it has been recorded before and, based on current ecological knowledge, whether it can be expected to operate at the site in question.

Impacts

To determine adverse effect on site integrity, the following parameters will be used as appropriate to define the impact (i.e. mechanism by which effects are caused):

- Impact type - direct or indirect, positive or negative
- Magnitude of impact – the 'amount' or intensity of an impact. This may sometimes (but not always) be synonymous with 'extent' (see below) for certain impacts, such as habitat loss.
- Extent of impact – the area over which the impact will be felt.
- Duration of impact – how long it will occur. The guidelines suggest that ecological impact durations should be described in terms of ecological characteristics (e.g. species lifecycles/longevity) rather than human timeframes. The definitions of duration based on this approach and using professional judgement are detailed in **Table 3.2**.

- Timing of impact – when it will occur, taking note of seasonality.
- Frequency of impact – how often it will occur.
- Reversibility of impact – whether recovery or reinstatement is possible.

Table 3.2: Definitions of impact duration

Duration	Habitats	*Species*
Short-term	The typical regrowth period for many submerged macrophytes, grass and herb communities – as a rough guide, up to two years	*Impact is measurable up to one (breeding/wintering, migration, spawning etc.) season – as a rough guide, up to a year for fauna*
Medium-term	The typical regrowth period for many shrub and hedge communities, slower growing macrophytes and reedbeds – as a rough guide, two to eight years	*Impact is measurable up to one typical reproductive lifespan (in the wild). This varies depending on species, but generally anything from one year to 5 years as a rough guide for most fauna*
Long-term	A period lasting longer than the typical scrub/hedge regrowth period – as a rough guide, more than 8 years	*Impact is measurable over several (species) generations*
Permanent	An impact where no reasonable chance of recovery/restoration is evident within the foreseeable future	

These impacts then need to be considered in terms of the effects to the qualifying habitats and species.

Adverse Effect

Where required, the possible impacts associated with each scheme will be considered in the context of their effect on the qualifying features for the sites under consideration.

An Adverse Effect on the sites Integrity (AEoI) is likely to be one which undermines achievement of the sites conservation objectives and prevents the qualifying feature from progressing towards favourable conservation status.

Work has commenced to inform the potential risks to the receiving environment associated with the schemes. This includes a monitoring programme for the freshwater communities and initial modelling of the potential physical environmental impacts. This data will be used (where applicable) to inform the Appropriate Assessment for those schemes where LSEs were identified.

Any further data requirements, including the need for specific monitoring, will be identified in the Appropriate Assessment (if required) for consideration during gate-2 and gate-3. As such, the data that will be used in the more detailed assessments will be limited to that readily available. The scope of the monitoring programme is subject to a separate report[25].

3.1.3 Integrity Test

The integrity test is the conclusion of an Appropriate Assessment and requires the competent authority to ascertain whether the proposed scheme (either alone or in-combination with other plans or projects), will have no adverse effect on site integrity. The following definition of site integrity is provided by Defra: the integrity of the site is "*the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the level of populations of the species for which it was classified*"[26].

At gate-1, the potential for AEoI will be assessed against the conservation objectives as far as possible, and where it is predicted that the integrity test cannot be met, these will be identified for further consideration for the gate-2 assessments.

[25] Ricardo Energy & Environment (2020). Severn to Thames Transfer: Environmental Assessment Methodologies. Report prepared for United Utilities. 29 October 2020.
[26] Defra Circular 01/2005.

3.1.4 Mitigation measures and monitoring

The assessment considered measures that may be available to reduce the likelihood, magnitude, scale, and duration of the effect to a lower level, which can be applied at the Appropriate Assessment stage to inform the overall integrity test[27]. These measures will include both avoidance and reduction measures, with the former being the preferred option.

Where necessary, the report will also recommends additional survey work that will be required to inform the gate-2 HRA and any monitoring deemed necessary either for the purposes of validating the findings of the Appropriate Assessment (where required), or 'early warning' monitoring which would enable any actions to be stopped, paused, reduced in scale or altered should an unexpected adverse effect be recorded when the SRO is being implemented.

The need for further investigation of potential mitigation measures that will be required as part of the gate-2 process will be defined as part of the Appropriate Assessment (if required).

3.1.5 Limitations

Information provided by third parties, including publicly available information and databases, is considered correct at the time of submission. Due to the dynamic nature of the environment, conditions may change in the period between the preparation of this report, and the construction and operation of the proposed scheme.

The compilation of information to support an assessment has been undertaken in as detailed a way as possible, using all available open source data where they exist. However, the conclusions drawn from this is necessarily limited by the age, type, coverage and availability of data. Any uncertainties and the limitations of the assessment process are acknowledged and highlighted.

Recommendations for avoidance and mitigation measures to address the potential adverse effects on European Site integrity identified by this report are also based on the information available at the time of the assessment.

It is recognised that there are still a number of uncertainties and risks that need to be managed, with further iterations of the assessment required as more detailed engineering information and modelling work becomes available, prior to gate-2. The in-combination assessments with other SROs, non-SRO options and other plans and projects has not been undertaken. It is understood that such assessments will be undertaken as part of the relevant regional plan or WRMP24 assessment processes.

As such, the conclusion on the risk of LSE and predictions regarding adverse effects will need to be reviewed and updated (where required) as more information becomes available during completion of the gate-2 assessments. This includes consideration of any monitoring and modelling outputs made available between submission of this report and the end date if the gate-2 assessments and any changes in the applicability and/or availability of mitigation measures.

[27] The "People over Wind" or "Sweetman" judgment ruled that Article 6(3) of the Habitats Directive must be interpreted as meaning that mitigation measures should be assessed within the framework of an Appropriate Assessment and that it is not permissible to take account of mitigation measures at the screening stage.

4 HRA Screening of STW Sources SRO Schemes

4.1 Risk of Likely Significant Effects of STW Sources SRO

The STW Sources SRO is associated with a number of European and Internationally designated sites including SACs[28], SPAs[29] and Ramsar[30] sites as identified in **Table 4.1** below.

Table 4.1 European designated sites associated with the STW Sources SRO Schemes

European designated site	Associated Schemes	Screening Criteria
Bredon Hill SAC	Mythe abstraction licence transfer (15 Ml/d)	The SAC is located < 10km from the Mythe WTWs. As no construction activities will be required and the SAC is not hydrologically linked to the WTW, the European site has not been included for further assessment.
Cotswold Beechwoods SAC	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d) Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d)	The SAC is located <10km from the construction activities and has been for consideration of LSE as a result of construction activities.
Dixton Wood SAC	Mythe abstraction licence transfer (15 Ml/d)	The SAC is located <10km from the construction activities and has been for consideration of LSE as a result of construction activities.
Severn Estuary SAC	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d) Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d) Mythe abstraction licence transfer (15 Ml/d)	Although the European site is >10km from the construction activities, the site is hydrologically connected, and the associated reaches of the River Severn provides a migration route and off-site functional habitat for qualifying features of the site anadromous fish).
Severn Estuary SPA	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d) Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d) Mythe abstraction licence transfer (15 Ml/d)	Although the European site is >10km from the construction activities, the site the reaches of the River Severn provides off-site functional habitat for qualifying features of the site and water quality and hydrological impacts could effect supporting habitats.
Severn Estuary Ramsar	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d) Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d) Mythe abstraction licence transfer (15 Ml/d)	Although the European site is >10km from the construction activities, the site is hydrologically connected, and the associated reaches of the River Severn provides a migration route and off-site functional habitat for qualifying features of the site anadromous fish and water quality and hydrological impacts could effect supporting habitats.
Walmore Common SPA	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d) Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d)	The European site is located <10km from the proposed construction activities.
Walmore Common Ramsar	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d) Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d)	The European site is located <10km from the proposed construction activities.

As described in Section 3, this HRA has screened all of the schemes located within a 10km radius of any of the European sites in the study area and 500m of rivers transferring excess water. Sites that are hydrologically connected or which provide off-site functional habitat has also been considered. The SSSI IRZ has also been considered when selecting European Sites that require assessment. As

[28] Special Areas of Conservation (SACs) are strictly protected sites designated under the EC Habitats Directive. Article 3 of the Habitats Directive requires the establishment of a European network of important high-quality conservation sites that will make a significant contribution to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended). www.jncc.org.uk

[29] Special Protection Areas (SPAs) are strictly protected sites classified in accordance with Article 4 of the EC Directive on the conservation of wild birds (79/409/EEC), also known as the Birds Directive, which came into force in April 1979. They are classified for rare and vulnerable birds, listed in Annex I to the Birds Directive, and for regularly occurring migratory species. www.jncc.org.uk

[30] Ramsar sites are wetlands of international importance designated under the Ramsar Convention

indicated in Section 3.1.1, to further inform the likelihood of any impacts on European sites the NE SSSI IRZ datasets were also applied. The IRZs are reviewed regularly to ensure they reflect the current understanding of specific site sensitivities and potential risks posed to SSSIs. Where the notified features of a European site and SSSI are different, the SSSI IRZs have been set so that they reflect both. As such, these IRZs can be used as part of a HRA to assist with determining whether there are risks of likely to be significant effects from a particular development on the interest features of the European site.

The HRA screening assessments of identified European sites within 10km radius of the schemes for potential effects is provided in **Table 4.2.** Where uncertainty has been identified, this uncertainty indicates that a confident conclusion of no risk of LSE is not yet possible, in most cases due to the very early stage of option development (meaning specific design and location information may not be available to allow a full appraisal of the risk of likely effects). Where uncertainty remains, an Appropriate Assessment is required to either confirm a risk of LSE related to a scheme or to confirm that no risk LSE are expected.

No MPAs of European importance or MCZs are associated with the study area and therefore, no further consideration is required to inform the SEA.

Table 4.2: Screening assessments of identified European sites within 10km radius of the proposed STW Sources SRO Schemes for potential effects.

Designated site name:	**Cotswold Beechwoods (UK0013658)**		
Designation type: (SAC, SPA, Ramsar):	**SAC**		
Qualifying features:	9130 *Asperulo-Fagetum* Beech forests 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites)	**Water Dependency** Habitat and species not identified as water dependent, but it will be important to protect the rooting structure of the beech tree features[31].	
Current conservation status:	**9130 *Asperulo-Fagetum* Beech forests: Unfavourable recovering.** (range: favourable, area: unfavourable - inadequate, structure and function: unfavourable – bad, future prospects: unfavourable - bad). **6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites): Favourable.** (range: favourable, area: favourable, structure and function: unfavourable – bad, future prospects: unfavourable - bad).		
Conservation objectives:	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; • The extent and distribution of qualifying natural habitats • The structure and function (including typical species) of qualifying natural habitats, and • The supporting processes on which qualifying natural habitats rely		
SSSI Condition assessment:	Cotswold Commons and Beechwoods SSSI: 55.83% Unfavourable – recovering and 44.17% Favourable.		
Site Improvement Plan:	1. Invasive species – Threat – 9130 Beech forests - Reduce invasive sycamore especially in the canopy; Reduce squirrel damage to trees. 2. Deer – Threat – 9130 Beech forests - Reduce deer browsing pressure. 3. Disease – Threat – 9130 Beech forests - Produce a strategy to deal with potential ash dieback. 4. Public access/disturbance – Threat – 9130 Beech forests - Minimise impact of recreational use, especially mountain biking, horse riding and dog walking. 5. Changes in species distributions – Threat – 9130 Beech forests - Monitor the effects of drought on beech trees. 6. Air pollution: impact of atmospheric nitrogen deposition – Pressure – 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates – Control, reduce and ameliorate atmospheric nitrogen impacts.		
Potential Effects			
Scheme:		Risk of Likely Significant Effects Alone?	Risk of Likely Significant Effects In-combination with other schemes
Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d)	This scheme is located approximately 6.5 km north-west of Cotswold Beechwoods SAC. A SIP pressure of potential relevance during construction is the impact of air pollution and atmospheric nitrogen deposition. The empirical critical load for atmospheric nitrogen deposition of the beech forests is 10 – 20 kg N/ha/yr and for the semi natural dry grasslands is 15 – 25 kg N/ha/yr. Current trends (data collected in 2017) at the designated site suggest that nitrogen deposition for the beech forests is above the critical load by 9 kg N/ha/yr. However, due to the distance between the designated site and the proposed construction works, no additional nitrogen deposition at the designated site is anticipated. No impact pathways during the operation of this scheme have been identified as Cotswold Beechwoods SAC is not hydrologically connected downstream of the Netheridge discharge location. Beech forests are also not classified as water dependent species. Therefore, no LSE are anticipated on the qualifying features of the SAC.	**No**	**No**
Netheridge WwTW discharge diversion, Cotswold Canals (35 Ml/d)	This scheme is located approximately 6.5 km north-west of Cotswold Beechwoods SAC. A SIP pressure of potential relevance during construction is the impact of air pollution and atmospheric nitrogen deposition. The empirical critical load for atmospheric nitrogen deposition of the beech forests is 10 – 20 kg N/ha/yr and for the semi natural dry grasslands is 15 – 25 kg N/ha/yr. Current trends (data collected in 2017) at the designated site suggest that nitrogen deposition for the beech forests is above the critical load by 9 kg N/ha/yr. However, due to the distance between the designated site and the proposed construction works, no additional nitrogen deposition at the designated site is anticipated. No impact pathways during the operation of this scheme have been identified as Cotswold Beechwoods SAC is not hydrologically connected downstream of the Netheridge discharge location. Beech forests are also not classified as water dependent species. Therefore, no LSE are anticipated on the qualifying features of the SAC.	**No**	**No**

[31] UKTAG (2003). *Guidance on the Identification of Natura Protected Areas [Final]*. UK Technical Advisory Group on the Water Framework Directive. TAG Work Programme Task 4.a, 1 – 20.

Designated site name:	**Dixton Wood (UK0030135)**		
Designation type: (SAC, SPA, Ramsar):	**SAC**		
Qualifying features:	1079. *Limoniscus violaceus*; Violet click beetle	**Water Dependency**: Species not identified as water dependent[32].	
Current conservation status:	**1079 *Limoniscus violaceus*; Violet click beetle: Bad and deteriorating** (range: favourable, population: bad and deteriorating, habitat: inadequate and deteriorating, future prospects: bad).		
Conservation objectives:	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; • The extent and distribution of the habitats of qualifying species • The structure and function of the habitats of qualifying species • The supporting processes on which the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site		
SSSI Condition assessment:	Dixton Wood SSSI: 100% Unfavourable recovering		
Site Improvement Plan:	1. Changes in species distributions – Threat - 1079 Violet click beetle - Carry out survey and monitoring work to inform advice to landowner. 2. Forestry and woodland management – Pressure/Threat - 1079 Violet click beetle - Formulate and implement a wood mould continuity strategy for the Violet click beetle population. 3. Disease – Threat - 1079 Violet click beetle - Monitor for Chalara and take appropriate action.		
Potential Effects			
Scheme:		Risk of Likely Significant Effects Alone?	Risk of Likely Significant Effects In-combination with other schemes
Mythe abstraction licence transfer (15 Ml/d)	The scheme is located 8.6 km north-west of Dixton Wood SAC. None of the SIP threats and pressures for this SAC are considered relevant to an abstraction licence transfer at the Mythe intake. The proposed scheme will not require land take from within the SAC boundaries and as no construction activities are required, no LSE are anticipated. As the violet click beetle is not water dependent and Dixton Wood is not hydrologically connected downstream of the Mythe intake, LSE on the qualifying feature of the SAC is not anticipated.	**No**	**No**

[32] UKTAG (2003). *Guidance on the Identification of Natura Protected Areas [Final]*. UK Technical Advisory Group on the Water Framework Directive. TAG Work Programme Task 4.a, 1 – 20.

Designated site name:	**Severn Estuary SAC (UK0013030)**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) 1110 Sandbanks which are slightly covered by sea water all the time 1170 Reefs 1095 *Petromyzon marinus*; Sea lamprey 1099 *Lampetra fluviatilis;* River lamprey 1103 *Alosa fallax*; Twaite shad	**Water Dependency:** Habitat and species identified as water dependent**Error! Bookmark not defined.**: • 1130 Estuaries • 1140 Mudflats and sandflats not covered by seawater at low tide • 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • 1110 Sandbanks which are slightly covered by sea water all the time • 1170 Reefs • 1095 *Petromyzon marinus*; Sea lamprey • 1099 *Lampetra fluviatilis;* River lamprey • 1103 *Alosa fallax*; Twaite shad
Current conservation status:	**1130 Estuaries: Unfavourable – Bad** (range: favourable area: unknown, structure and function: unfavourable - bad, future prospects: unfavourable - bad). **1140 Mudflats and sandflats not covered by seawater at low tide: Unfavourable – Bad** (range: favourable, area: unknown, structure and function: unfavourable – bad, future prospects: unfavourable – bad). **1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*):** **1110 Sandbanks which are slightly covered by sea water all the time: Deteriorating** (range: favourable area: unfavourable - inadequate, structure and function: unfavourable - bad, future prospects: unfavourable - bad). **1170 Reefs: Unknown** (range: unknown, area: unknown, structure and function: unfavourable - inadequate, future prospects: unfavourable - inadequate). **1095 *Petromyzon marinus*; Sea lamprey: Unknown** (range: favourable, population: unknown, habitats for the species: unknown, future prospects: unknown). **1099 *Lampetra fluviatilis;* River lamprey: Favourable** (range: favourable, population: favourable, habitats for the species: unknown, future prospects: favourable). **1103 *Alosa fallax*; Twaite shad: Unfavourable – inadequate** (range: unfavourable - inadequate, population: unfavourable - inadequate, habitats for the species: unfavourable - inadequate, future prospects: unfavourable – inadequate).	
Conservation objectives:	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; • The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.	
SSSI Condition assessment:	Severn Estuary SSSI: 95.80% Favourable, 0.08% Unfavourable - recovering and 2.43% Unfavourable - no change. Bridgwater Bay SSSI: 88.42% Favourable, 11.28% Unfavourable – Recovering and 0.29% Unfavourable – No change. Upper Severn Estuary SSSI: 85.85% Favourable and 3.31% Unfavourable – Recovering.	
Site Improvement Plan:	1. Public access/disturbance – Pressure/Threat - 1130 Estuaries, 1170 Reefs, 1330 Atlantic salt meadows – Identify/reduce impacts of disturbance to birds and damage to habitats. 2. Physical modification – Threat - 1095 Sea lamprey, 1099 River lamprey and 1103 Twaite shad – Reduce, remove (where possible) and prevent barriers to migratory species. 3. Impacts of development – Pressure/Threat - 1130 Estuaries, 1170 Reefs, 1330 Atlantic salt meadows, 1140 Intertidal mudflats and sandflats, 1095 Sea lamprey, 1099 River lamprey and 1103 Twaite shad – Inform strategic planning decisions to minimise impact of development. 4. Coastal squeeze – Pressure/Threat - 1130 Estuaries, 1170 Reefs, 1330 Atlantic salt meadows, 1140 Intertidal mudflats and sandflats – Limit coastal squeeze, provide sustainable coastal defences, improve existing structures, deliver compensatory habitat. 5. Change in land management – Pressure/Threat - 1130 Estuaries, 1330 Atlantic salt meadows – Maintain appropriate levels and timing of grazing and management of intertidal saltmarsh habitat. 6. Changes in species distributions – Threat – 1095 Sea lamprey, 1099 River lamprey and 1103 Twaite shad – Understand/prepare for changes in species distribution (caused by climate change/other events). 7. Water pollution – Pressure/Threat - 1110 Subtidal sandbanks, 1130 Estuaries, 1170 Reefs, 1330 Atlantic salt meadows, 1140 Intertidal mudflats and sandflats, 1095 Sea lamprey, 1099 River lamprey and 1103 Twaite shad – Identify any existing issues and prevent/reduce decline in water and sediment quality (applying relevant measures to all relevant tributaries in England and Wales). 8. Air Pollution: impact of atmospheric nitrogen deposition – Pressure - 1130 Estuaries, 1330 Atlantic salt meadows, 1095 Sea lamprey, 1099 River lamprey, 1103 Twaite shad and waterbird assemblage – Develop a Site Nitrogen Action Plan. 9. Marine consents and permits minerals and waste – Pressure/Threat - 1110 Subtidal sandbanks, 1140 Intertidal mudflats and sandflats, 1170 Reefs, 1330 Atlantic salt meadows, 1095 Sea lamprey, 1099 River lamprey, 1103 Twaite shad – Ensure in-combination/cumulative impacts from aggregate extraction, maintenance dredging and disposal are fully considered. 10. Fisheries: recreational marine and estuarine – Pressure – 1095 Sea lamprey, 1099 River lamprey and 1103 Twaite shad, 1140 Intertidal mudflats and sandflats, 1170 Reefs and 1330 Atlantic salt meadows – Establish levels and location 11. Fisheries: commercial marine and estuarine – Threat - 1095 Sea lamprey, 1099 River lamprey and 1103 Twaite shad, 1140 Intertidal mudflats and sandflats, 1170 Reefs and 1330 Atlantic salt meadows - Identify any threats to site features and habitats from commercial fisheries activity and establish and ensure compliance with any necessary management measures. 12. Invasive species – Threat - 1130 Estuaries, 1170 Reefs, 1330 Atlantic salt meadows, 1140 Intertidal mudflats and sandflats – Assess the risks from and control the spread of invasive non-native species. 13. Marine litter – Pressure/Threat - 1130 Estuaries, 1170 Reefs, 1330 Atlantic salt meadows, 1140 Intertidal mudflats and sandflats, 1095 Sea lamprey, 1099 River lamprey and 1103 Twaite shad – Investigate sources of marine litter and implement actions for removal/shoreline clean up. 14. Marine pollution incidents – Threat - 1110 Subtidal sandbanks, 1130 Estuaries, 1170 Reefs, 1330 Atlantic salt meadows, 1140 Intertidal mudflats and sandflats, 1095 Sea lamprey, 1099 River lamprey and 1103 Twaite shad – Minimise impact from marine pollution incidents and clean up response.	
Potential Effects		
Scheme:		Risk of Likely Significant Effects Alone? / Risk of Likely Significant Effects In-combination with other schemes

Designated site name:	**Severn Estuary SAC (UK0013030)**		
Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d)	This scheme is located approximately 10.3 km north-east of the Severn Estuary SAC and is approximately 44.69 km north-east via hydrological connectivity. The most relevant SIP threats and pressures of this scheme during construction are (2) physical modification, (3) impacts of development, (6) changes in species distribution, (7) water pollution, (8) air pollution and (12) invasive species. The most relevant SIP threat of this scheme during operation is (2) physical modification. **River lamprey, sea lamprey, twaite shad, allis shad, Atlantic salmon, sea trout and European eel** Off-site functional habitat downstream of the proposed outfall could potentially be affected during construction works as a result of localised increases in suspended sediment (siltation and deposition), potential invasive and non-native species introduction/ spread from construction vehicles and unclean PPE, noise and vibration disturbance, entrapment and impingement and potential water pollution incidents. Due to the distance between the proposed works and the designated site via hydrological connectivity, temporary nature of constructing the outfall and relatively small footprint of the outfall on the river bank (250 m²), no LSE are anticipated on qualifying species of the SAC during construction. Potential impact pathways of this scheme during operation include exposure to localised changes in nutrient loading, turbidity, salinity regime and dissolved oxygen surrounding the outfall during migration upstream, as a result of a reduction in freshwater effluent released from Netheridge WwTW. Due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge in the freshwater River Severn, negligible amendments to water flow within the river reach during operation are anticipated. Furthermore, the treated effluent will be subject to further treatment prior to discharge into the River Severn and water quality impacts have been identified as negligible[33]. Therefore, no LSE are anticipated.	**No**	**No**
	Estuaries, mudflats and sandflats, Atlantic salt meadows, sandbanks and reefs The footprint of this scheme is outside of the boundary of the SAC. During proposed construction works for this scheme potential impact pathways include localised increases in suspended sediment (siltation and deposition), potential invasive and non-native species introduction/ spread from construction vehicles and unclean PPE, air pollution and potential water pollution incidents. Due to the distance between the proposed works and the designated site via hydrological connectivity and directly, and temporary nature of constructing the outfall, no LSE are anticipated on qualifying habitats of the SAC during construction. Localised changes in water flow may expose a larger area of intertidal mudflats (A2.3 – littoral mud) and cause fluctuations in nutrient loading, turbidity, salinity and oxygenation surrounding the outfall during operation. Due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge in the freshwater River Severn, negligible amendments to water flow within the river reach during operation are anticipated. Therefore, no LSE on qualifying habitat features of the SAC are anticipated.	**No**	**No**
Netheridge WwTW discharge diversion, Cotswold Canals (35 Ml/d)	This scheme is located approximately 10.3 km north-east of the Severn Estuary SAC and is approximately 44.69 km north-east via hydrological connectivity. The most relevant SIP threats and pressures of this scheme during construction are (2) physical modification, (3) impacts of development, (6) changes in species distribution, (7) water pollution, (8) air pollution and (12) invasive species. The most relevant SIP threat of this scheme during operation is (2) physical modification. **River lamprey, sea lamprey, twaite shad, allis shad, Atlantic salmon, sea trout and European eel** Off-site functional habitat downstream of the proposed outfall could potentially be affected during construction works as a result of localised increases in suspended sediment (siltation and deposition), potential invasive and non-native species introduction/ spread from construction vehicles and unclean PPE, noise and vibration disturbance, entrapment and impingement and potential water pollution incidents. Due to the distance between the proposed works and the designated site via hydrological connectivity, temporary nature of constructing the outfall and relatively small footprint of the outfall on the river bank (250 m²), no LSE are anticipated on qualifying fish features of the SAC during construction. Potential impact pathways of this scheme during operation include exposure to localised changes in nutrient loading, turbidity, salinity regime and dissolved oxygen surrounding the outfall during migration upstream, as a result of a reduction in freshwater effluent released from Netheridge WwTW. Due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge in the freshwater River Severn, negligible amendments to water flow within the river reach during operation are anticipated. Furthermore, the treated effluent will be subject to further treatment prior to discharge into the River Severn and water quality impacts have been identified as negligible. Therefore, no LSE are anticipated.	**No**	**No**
	Estuaries, mudflats and sandflats, Atlantic salt meadows, sandbanks and reefs The footprint of this scheme is outside of the boundary of the SAC. During proposed construction works for this scheme potential impact pathways include localised increases in suspended sediment (siltation and deposition), potential invasive and non-native species introduction/ spread from construction vehicles and unclean PPE, air pollution and potential water pollution incidents. Due to the distance between the proposed works and the designated site via hydrological connectivity and directly, and temporary nature of constructing the outfall, no LSE are anticipated on qualifying habitats of the SAC during construction. Localised changes in water flow may expose a larger area of intertidal mudflats (A2.3 – littoral mud) and cause fluctuations in nutrient loading, turbidity, salinity and oxygenation surrounding the outfall during operation. Due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge in the freshwater River Severn, negligible amendments to water flow during operation are anticipated. Therefore, no LSE on qualifying habitat features of the SAC are anticipated.	**No**	**No**
Mythe abstraction licence transfer (15 Ml/d)	The scheme is located approximately 29.2 km north-east of the Severn Estuary SAC and is approximately 49.6 km north-east via hydrological connectivity. The SIP threats and pressures of potential relevance to this scheme is (2) physical modification threat and (7) water pollution. The proposed scheme will not require land take from within the designated site however, the scheme is hydrologically linked to the designated site. No construction works are required and due to the distance from the designated site and the fact that no change in abstraction is proposed, no LSE are anticipated on any of the designated sites.	**No**	**No**

[33] Ricardo Energy & environment (2021). Severn to Thames Transfer SRO. Assessment Report: Appendix B3.2 Water Quality. Report for United Utilities on behalf of the Severn to Thames Transfer Programme. March 2021

Designated site name:	**Severn Estuary SPA (UK9015022)**	
Designation type: (SAC, SPA, Ramsar):	**SPA**	
Qualifying features:	Severn Estuary SPA 051 *Anas strepera;* Gadwall 394 *Anser albifrons albifrons;* Greater white-fronted geese 672 *Calidris alpina;* Dunlin 037 *Cygnus columbianus bewickii;* Bewick's swan 048 *Tadorna tadorna;* Common shelduck 162 *Tringa tetanus;* Common redshank WATR Internationally important assemblage of waterfowl (wildfowl and waders)	**Water Dependency:** Species identified as water dependent[34]. • 051 *Anas strepera;* Gadwall. • 394 *Anser albifrons albifrons;* Greater white-fronted geese. • 672 *Calidris alpina;* Dunlin. • 037 *Cygnus columbianus bewickii;* Bewick's swan. • 048 *Tadorna tadorna;* Common shelduck. • 162 *Tringa tetanus;* Common redshank. • WATR Internationally important assemblage of waterfowl (wildfowl and waders).
Current conservation status:	**051 *Anas strepera;* Gadwall:** (type: wintering, size: minimum 282; maximum 282 (0.9% of the population 5 year peak mean 1991/92 – 1995/96), unit: individuals, data quality: good, population: 2 – 15%, isolation: population not isolated within extended distribution range). **394 *Anser albifrons albifrons;* Greater white-fronted geese** (type: wintering, size: minimum 2664; maximum 2664 (0.4% of the population 5 year peak mean 1991/92 – 1995/96), unit: individuals, data quality: good, population: 15 - 100%, isolation: population not isolated, but on margins of area of distribution). **672 *Calidris alpina alpina;* Dunlin** (type: wintering, size: minimum 44624; maximum 44624 (3.3% of the population 5 year peak mean 1991/92 – 1995/96), unit: individuals, data quality: good, population: 2 - 15%, isolation: population not isolated within extended distribution range). **037 *Cygnus columbianus bewickii;* Bewick's swan** (type: wintering, size: minimum 280; maximum 280 (3.9% of the population 5 year peak mean 1991/92 – 1995/96), unit: individuals, data quality: good, population: 2 - 15%, isolation: population not isolated within extended distribution range). **048 *Tadorna tadorna;* Common shelduck** (type: wintering, size: minimum 3330; maximum 3330 (1.1% of the population 5 year peak mean 1991/92 – 1995/96), unit: individuals, data quality: good, population: 2 - 15%, isolation: population not isolated within extended distribution range). **162 *Tringa tetanus;* Common redshank** (type: wintering, size: minimum 2330; maximum 2330 (1.3% of the population 5 year peak mean 1991/92 – 1995/96), unit: individuals, data quality: good, population: 2 - 15%, isolation: population not isolated within extended distribution range). **WATR Waterfowl assemblage** (size: minimum 84317; maximum 84317. Unit: individuals; motivation: International conventions).	
Conservation objectives:	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring; • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.	
SSSI Condition assessment:	Severn Estuary SSSI: 95.80% Favourable, 0.08% Unfavourable - recovering and 2.43% Unfavourable - no change. Aust Cliff SSSI: 100% Favourable. Blue Anchor to Lilstock Coast SSSI: 100% Favourable. Bridgewater Bay SSSI: 88.42% Favourable, 11.28% Unfavourable – Recovering and 0.29% Unfavourable – no change. Clevedon Shore SSSI: 100% Favourable. Lydney Cliff SSSI: 100% Favourable. Middle Hope SSSI: 80.40% Favourable and 19.60% Unfavourable – Recovering. Portishead Pier to Black Nore SSSI: 100% Favourable. Purton Passage SSSI: 100% Favourable. Spring Cove Cliffs SSSI: 100% Favourable. Steep Holm SSSI: 100% Favourable. Upper Severn Estuary SSSI: 85.85% Favourable, 10.84% Unfavourable – Declining and 3.31% Unfavourable – Recovering.	
Site Improvement Plan:	1. Public access/disturbance – Pressure/Threat - 037(NB) Bewick's swan, 048(NB) Common shelduck, 051(NB) Gadwall, 149(NB) Dunlin, 162(NB) Common shelduck, 394(NB) Greater white-fronted goose and waterbird assemblage – Identify/reduce impacts of disturbance to birds and damage to habitats. 2. Impacts of development – Pressure/Threat - 037(NB) Bewick's swan, 048(NB) Common shelduck, 051(NB) Gadwall, 149(NB) Dunlin, 162(NB) Common shelduck, 394(NB) Greater white-fronted goose and waterbird assemblage - Inform strategic planning decisions to minimise impact of development. 3. Coastal squeeze – Pressure/Threat - 037(NB) Bewick's swan, 048(NB) Common shelduck, 051(NB) Gadwall, 149(NB) Dunlin, 162(NB) Common shelduck, 394(NB) Greater white-fronted goose and waterbird assemblage – Limit coastal squeeze, provide sustainable coastal defences, improve existing structures, deliver compensatory habitat. 4. Change in land management – Pressure/Threat - 037(NB) Bewick's swan, 048(NB) Common shelduck, 051(NB) Gadwall, 149(NB) Dunlin, 162(NB) Common shelduck, 394(NB) Greater white-fronted goose and waterbird assemblage – Maintain appropriate levels and timing of grazing and management of intertidal saltmarsh habitat. 5. Changes in species distributions – Threat – 037(NB) Bewick's swan, 048(NB) Common shelduck, 051(NB) Gadwall, 149(NB) Dunlin, 162(NB) Common shelduck, 394(NB) Greater white-fronted goose, waterbird assemblage - Understand/prepare for changes in species distribution (caused by climate change/other events). 6. Water pollution – Pressure/Threat - 037(NB) Bewick's swan, 048(NB) Common shelduck, 051(NB) Gadwall, 149(NB) Dunlin, 162(NB) Common shelduck, 394(NB) Greater white-fronted goose and waterbird assemblage – Identify any existing issues and prevent/reduce decline in water and sediment quality (applying relevant measures to all relevant tributaries in England and Wales). 7. Air Pollution: impact of atmospheric nitrogen deposition – Pressure - 051 Gadwall and waterbird assemblage – Develop a Site Nitrogen Action Plan. 8. Fisheries: recreational marine and estuarine – Pressure – 037(NB) Bewick's swan, 048(NB) Common shelduck, 051(NB) Gadwall, 149(NB) Dunlin, 162(NB) Common shelduck, 394(NB) Greater white-fronted goose and waterbird assemblage – Establish levels and location 9. Fisheries: commercial marine and estuarine – Threat - 037(NB) Bewick's swan, 048(NB) Common shelduck, 051(NB) Gadwall, 149(NB) Dunlin, 162(NB) Common shelduck, 394(NB) Greater white-fronted goose and waterbird assemblage - Identify any threats to site features and habitats from commercial fisheries activity and establish and ensure compliance with any necessary management measures. 10. Marine litter – Pressure/Threat - 037(NB) Bewick's swan, 048(NB) Common shelduck, 051(NB) Gadwall, 149(NB) Dunlin, 162(NB) Common shelduck, 394(NB) Greater white-fronted goose and waterbird assemblage – Investigate sources of marine litter and implement actions for removal/shoreline clean up. 11. Marine pollution incidents – Threat - 037(NB) Bewick's swan, 048(NB) Common shelduck, 051(NB) Gadwall, 149(NB) Dunlin, 162(NB) Common shelduck, 394(NB) Greater white-fronted goose and waterbird assemblage – Minimise impact from marine pollution incidents and clean up response.	

[34]UKTAG (2003). *Guidance on the Identification of Natura Protected Areas [Final].* UK Technical Advisory Group on the Water Framework Directive. TAG Work Programme Task 4.a, 1 – 20.

Designated site name:	**Severn Estuary SPA (UK9015022)**		
Potential Effects			
Scheme:		Risk of Likely Significant Effects Alone?	Risk of Likely Significant Effects In-combination with other schemes
Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d)	This scheme is located approximately 10.3 km north-east of the Severn Estuary SPA and is approximately 44.69 km north-east via hydrological connectivity. The SIP threats and pressures of potential relevance to this scheme during construction are (2) impacts of development, (5) changes in species distributions, (6) water pollution and (7) air pollution. The footprint of this scheme is outside of the boundary of the SPA. Due to the distance between the proposed construction works of the pipeline and outfall and designated site, no impacts from disturbance and therefore, species distribution are anticipated. In addition, the distance via hydrological connectivity is also sufficient to conclude no LSE from water pollution incidents or increased suspended sediment that could impact on supporting habitats of bird species associated with the SPA. The empirical critical load for atmospheric nitrogen deposition is 20 – 30 kg N/ha/yr for Atlantic saltmarsh and is currently not being exceeded within the designated site (in 2017, nitrogen deposition on short vegetation was 12 kg N/ha/yr. Considering that nitrogen deposition is below the critical load and also the distance between the proposed construction works and designated site, no LSE are anticipated. The most relevant SIP threat and pressure to this scheme during operation are (2) impacts of development and (5) changes in species distributions. No direct impact pathways on qualifying species have been identified for this scheme during operational works, due to the proposed timing of discharging treated effluent (outside of overwintering season) and distance from the designated site. In addition, due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge in the freshwater River Severn, negligible amendments to water flow within the river reach during operation are anticipated. Furthermore, the treated effluent will be subject to further treatment prior to discharge into the River Severn and water quality impacts have been identified as negligible. Therefore, no LSE are anticipated.	**No**	**No**
Netheridge WwTW discharge diversion, Cotswold canals (35 Ml/d)	This scheme is located approximately 10.3 km north-east of the Severn Estuary SPA and is approximately 44.69 km north-east via hydrological connectivity. The SIP threats and pressures of potential relevance to this scheme during construction are (2) impacts of development, (5) changes in species distributions, (6) water pollution and (7) air pollution. The footprint of this scheme is outside of the boundary of the SPA. Due to the distance between the proposed construction works of the pipeline and outfall and designated site, no impacts from disturbance and therefore, species distribution are anticipated. In addition, the distance via hydrological connectivity is also sufficient to conclude no LSE from water pollution incidents or increased suspended sediment that could impact on supporting habitats of bird species associated with the SPA. The empirical critical load for atmospheric nitrogen deposition is 20 – 30 kg N/ha/yr for Atlantic saltmarsh and is currently not being exceeded within the designated site (in 2017, nitrogen deposition on short vegetation was 12 kg N/ha/yr. Considering that nitrogen deposition is below the critical load and also the distance between the proposed construction works and designated site, no LSE are anticipated. The most relevant SIP threat and pressure to this scheme during operation are (2) impacts of development and (5) changes in species distributions. No direct impact pathways on qualifying species have been identified for this scheme during operational works, due to the proposed timing of discharging treated effluent (outside of overwintering season) and distance from the designated site. In addition, due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge by Gloucester Docks, negligible amendments to water flow within the river reach during operation are anticipated. Furthermore, the treated effluent will be subject to further treatment prior to discharge into the River Severn and water quality impacts have been identified as negligible. Therefore, no LSE are anticipated.	**No**	**No**
Mythe abstraction licence transfer (15 Ml/d)	The scheme is located approximately 29.2 km north-east of the Severn Estuary SPA and is approximately 49.6 km north-east via hydrological connectivity. The SIP threats and pressures of potential relevance to this scheme is (5) changes in species distribution and (6) water pollution. The proposed scheme will not require land take from within the designated site however, the scheme is hydrologically linked to the designated site. No construction works are required and no risk of likely significant effects on the SPA have been identified during operation due to the timing (outside of overwintering season) and distance from the designated site via hydrological connectivity. Therefore, no LSE are anticipated.	**No**	**No**

Designated site name:	**Severn Estuary Ramsar (UK11081)**	
Designation type: (SAC, SPA, Ramsar):	**Ramsar site**	
Qualifying features:	**Ramsar criterion 1** Due to immense tidal range (second-largest in world), this affects both the physical environment and biological communities. **Ramsar criterion 3** Due to unusual estuarine communities, reduced diversity and high productivity. **Ramsar criterion 4** This site is important for the run of migratory fish between sea and river via estuary. Species include Atlantic salmon (*Salmo salar*), sea trout (*S. trutta*), sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*), allis shad (*Alosa alosa*), twaite shad (*A. fallax*) and European eel (*Anguilla anguilla*). It is also of particular importance for migratory birds during spring and autumn. **Ramsar criterion 5** Assemblages of international importance: Species with peak counts in winter: 70919 waterfowl (5 year peak mean 1998/99-2002/2003). **Ramsar criterion 6** Species/populations occurring at levels of international importance. Qualifying species/populations (as identified at designation): *Calidris alpina;* Dunlin – Passage/Wintering *Anas strepera;* Gadwall – Wintering *Tringa tetanus;* Common redshank – Passage/Wintering *Tadorna tadorna;* Common shelduck – Wintering *Anser albifrons albifrons;* Greater white-fronted geese – Wintering *Charadrius hiaticula;* Ringed plover – Passage *Numenius phaeopus*; Whimbrel – Passage Waterbird assemblage – Wintering Estuary with immense tidal range Unusual estuarine communities Run of migratory fish Possible future consideration under criterion 6: lesser black-backed gull (*Larus fuscus graellsii*), Eurasion teal (*Anas crecca*) and Northern pintail (*Anas acuta*) **Ramsar criterion 8** The fish of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Atlantic salmon, sea trout, sea lamprey, river lamprey, allis shad, twaite shad and European eel use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary. The site is important as a feeding and nursery ground for many fish species particularly allis shad and twaite shad which feed on mysid shrimps in the salt wedge.	**Water Dependency:** The Ramsar Site and its qualifying criteria (by definition) are all water dependent.
Current conservation status:	N/A	
Conservation objectives:	Not available.	
SSSI Condition assessment:	Severn Estuary SSSI: 95.80% Favourable, 0.08% Unfavourable - recovering and 2.43% Unfavourable - no change. Aust Cliff SSSI: 100% Favourable. Blue Anchor to Lilstock Coast SSSI: 100% Favourable. Clevedon Shore SSSI: 100% Favourable. Lydney Cliff SSSI: 100% Favourable. Middle Hope SSSI: 80.40% Favourable and 19.60% Unfavourable – Recovering. Portishead Pier to Black Nore SSSI: 100% Favourable. Purton Passage SSSI: 100% Favourable. Spring Cove Cliffs SSSI: 100% Favourable. Steep Holm SSSI: 100% Favourable. Upper Severn Estuary SSSI: 85.85% Favourable, 10.84% Unfavourable – Declining and 3.31% Unfavourable – Recovering.	
Site Improvement Plan:	See threats and pressures listed in Severn Estuary SAC and SPA screening table.	
Potential Effects		
Scheme:		Risk of Likely Significant Effects Alone? / Risk of Likely Significant Effects In-combination with other schemes
Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d)	This scheme is located approximately 10.3km north-east of the Severn Estuary Ramsar site and is approximately 44.69km north-east via hydrological connectivity. **Ramsar Criterion 4 and 8** Off-site functional habitat downstream of the proposed outfall could potentially be affected during construction works as a result of localised increases in suspended sediment (siltation and deposition), potential invasive and non-native species introduction/ spread from construction vehicles and unclean PPE, noise and vibration disturbance, entrapment and impingement and potential water pollution incidents. Due to the distance between the proposed works and the designated site via hydrological connectivity, temporary nature of constructing the outfall and relatively small footprint of the outfall on the river bank (250 m²), no LSE are anticipated on qualifying species of the Ramsar site during construction. Potential impact pathways of this scheme during operation include exposure to localised changes in nutrient loading, turbidity, salinity regime and dissolved oxygen surrounding the outfall during migration upstream, as a result of a reduction in freshwater effluent released from Netheridge WwTW. Due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge in the freshwater River Severn, negligible amendments to water flow within the river reach during operation are anticipated. Furthermore, the treated effluent will be subject to further treatment prior to discharge into the River Severn and water quality impacts have been identified as negligible. Therefore, no LSE on Criterion 4 and 8 of the Ramsar site are anticipated.	**No** / **No**
	Ramsar Criterion 5 and 6 The footprint of this scheme is outside of the boundary of the Ramsar site. Due to the distance between the proposed construction works of the pipeline and outfall and designated site, no impacts from disturbance and therefore, species distribution are anticipated. In addition, the distance via hydrological connectivity is also sufficient to conclude no LSE from water pollution incidents or increased suspended sediment that could impact on supporting habitats of bird species associated with the Ramsar site. The empirical critical load for atmospheric nitrogen deposition is 20 – 30 kg N/ha/yr for Atlantic saltmarsh and is currently not being exceeded within the designated site (in 2017, nitrogen deposition on short vegetation was 12 kg N/ha/yr. Considering that nitrogen deposition is below the critical load and also the distance between the proposed construction works and designated site, no LSE are anticipated. The most relevant SIP threat and pressure to this scheme during operation are (2) impacts of development and (5) changes in species distributions. No direct impact pathways on qualifying species have been identified for this	**No** / **No**

Designated site name:	**Severn Estuary Ramsar (UK11081)**		
	scheme during operational works, due to the proposed timing of discharging treated effluent (outside of overwintering season) and distance from the designated site. In addition, due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge in the freshwater River Severn, negligible amendments to water flow within the river reach during operation are anticipated. Furthermore, the treated effluent will be subject to further treatment prior to discharge into the River Severn and water quality impacts have been identified as negligible. Therefore, no LSE on supporting habitat of the Ramsar site are anticipated.		
	Ramsar Criterion 1 and 3 The footprint of this scheme is outside of the boundary of the Ramsar site. During proposed construction works for this scheme potential impact pathways include localised increases in suspended sediment (siltation and deposition), potential invasive and non-native species introduction/ spread from construction vehicles and unclean PPE, air pollution and potential water pollution incidents. Due to the distance between the proposed works and the designated site via hydrological connectivity and directly, and temporary nature of constructing the outfall, no LSE are anticipated on qualifying habitats of the Ramsar site during construction. Localised changes in water flow may expose a larger area of intertidal mudflats (A2.3 – littoral mud) and cause fluctuations in nutrient loading, turbidity, salinity and oxygenation surrounding the outfall during operation. Due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge in the freshwater River Severn, negligible amendments to water flow within the river reach during operation are expected. Furthermore, the treated effluent will be subject to further treatment prior to discharge into the River Severn and water quality impacts have been identified as negligible. Therefore, no LSE anticipated on qualifying habitats of the Ramsar site.	**No**	**No**
Netheridge WwTW discharge diversion, Cotswold Canal (35 Ml/d)	This scheme is located approximately 10.3 km north-east of the Severn Estuary Ramsar site and is approximately 44.69 km north-east via hydrological connectivity. **Ramsar Criterion 4 and 8** Off-site functional habitat downstream of the proposed outfall could potentially be affected during construction works as a result of localised increases in suspended sediment (siltation and deposition), potential invasive and non-native species introduction/ spread from construction vehicles and unclean PPE, noise and vibration disturbance, entrapment and impingement and potential water pollution incidents. Due to the distance between the proposed works and the designated site via hydrological connectivity, temporary nature of constructing the outfall and relatively small footprint of the outfall on the river bank (250 m²), no LSE are anticipated on qualifying species of the Ramsar site during construction. Potential impact pathways of this scheme during operation include exposure to localised changes in nutrient loading, turbidity, salinity regime and dissolved oxygen surrounding the outfall during migration upstream, as a result of a reduction in freshwater effluent released from Netheridge WwTW. Due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge close to Gloucester Docks, negligible amendments to water flow within the river reach during operation are anticipated. Furthermore, the treated effluent will be subject to further treatment prior to discharge into the River Severn and water quality impacts have been identified as negligible. Therefore, no LSE on Criterion 4 and 8 of the Ramsar site are anticipated.	**No**	**No**
	Ramsar Criterion 5 and 6 The footprint of this scheme is outside of the boundary of the Ramsar site. Due to the distance between the proposed construction works of the pipeline and outfall and designated site, no impacts from disturbance and therefore, species distribution are anticipated. In addition, the distance via hydrological connectivity is also sufficient to conclude no LSE from water pollution incidents or increased suspended sediment that could impact on supporting habitats of bird species associated with the Ramsar site. The empirical critical load for atmospheric nitrogen deposition is 20 – 30 kg N/ha/yr for Atlantic saltmarsh and is currently not being exceeded within the designated site (in 2017, nitrogen deposition on short vegetation was 12 kg N/ha/yr. Considering that nitrogen deposition is below the critical load and also the distance between the proposed construction works and designated site, no LSE are anticipated. The most relevant SIP threat and pressure to this scheme during operation are (2) impacts of development and (5) changes in species distributions. No direct impact pathways on qualifying species have been identified for this scheme during operational works, due to the proposed timing of discharging treated effluent (outside of overwintering season) and distance from the designated site. In addition, due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge close to Gloucester Docks, negligible amendments to water flow within the river reach during operation are anticipated. Furthermore, the treated effluent will be subject to further treatment prior to discharge into the River Severn and water quality impacts have been identified as negligible. Therefore, no LSE on supporting habitat of the Ramsar site are anticipated.	**No**	**No**
	Ramsar Criterion 1 and 3 The footprint of this scheme is outside of the boundary of the Ramsar site. During proposed construction works for this scheme potential impact pathways include localised increases in suspended sediment (siltation and deposition), potential invasive and non-native species introduction/ spread from construction vehicles and unclean PPE, air pollution and potential water pollution incidents. Due to the distance between the proposed works and the designated site via hydrological connectivity and directly, and temporary nature of constructing the outfall, no LSE are anticipated on qualifying habitats of the Ramsar site during construction. Localised changes in water flow may expose a larger area of intertidal mudflats (A2.3 – littoral mud) and cause fluctuations in nutrient loading, turbidity, salinity and oxygenation surrounding the outfall during operation. Due to the large tidal range of the Severn Estuary and small volume of effluent proposed for diversion and discharge close to Gloucester Docks, negligible amendments to water flow within the river reach during operation are expected. Furthermore, the treated effluent will be subject to further treatment prior to discharge into the River Severn and water quality impacts have been identified as negligible. Therefore, no LSE anticipated on qualifying habitats of the Ramsar site.	**No**	**No**
	Ramsar Criterion 5 and 6 Significant air quality impacts during construction are not anticipated for this scheme due to the distance between the proposed works and the qualifying features. If construction works to rehabilitate the canals pounds and locks took place during the overwintering season there is a potential noise disturbance impact on bird assemblages particularly while utilising off-site functional habitat. No direct impact pathways have been identified for this scheme during operational works due to the proposed timing of abstraction (outside of overwintering season) and distance from the designated site and therefore, no LSE are anticipated.	**No**	**No**
Mythe abstraction licence transfer (15 Ml/d)	The scheme is located approximately 29.2 km north-east of the Severn Estuary Ramsar site and is approximately 49.6 km north-east via hydrological connectivity. The proposed scheme will not require land take from within the designated site however, the scheme is hydrologically linked to the designated site. No construction works are required and due to the distance from the designated site and the fact that no change no abstraction is proposed, no LSE are anticipated on any of the designated sites.	**No**	**No**

Designated site name:	**Walmore Common SPA (UK9007051)**		
Designation type: (SAC, SPA, Ramsar):	**SPA**		
Qualifying features:	A037 *Cygnus columbianus bewickii*, Bewick's swan	**Water Dependency** Species identified as water dependent[35]: • *Cygnus columbianus bewickii*, Bewick's swan.	
Current conservation status:	**A037 *Cygnus columbianus bewickii*, Bewick's swan: Unknown.** Type: Wintering. Size: minimum 104, maximum 104. Unit: Individuals. Data quality: Good. Population: <2%. Isolation: Population not-isolated within extended distribution range.		
Conservation objectives:	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; • The extent and distribution of habitats of qualifying species • The structure and function of the habitats of qualifying species • The supporting processes on which the habitats of qualifying species rely • The populations of qualifying species, and, The distribution of qualifying species within the site.		
SSSI Condition assessment:	Walmore Common SSSI: 100% Unfavourable – no change.		
Site Improvement Plan:	1. Hydrological changes – Threat – 037(NB) Bewick's swan - Water level management plan. 2. Changes in species distributions – Threat – 037(NB) Bewick's swan - Research into Bewick's swan distribution. 3. Change in land management – Threat – 037(NB) Bewick's swan - Improve habitat connectivity. 4. Offsite habitat availability/management – Pressure/Threat – 037(NB) Bewick's swan - Review designation boundaries to include critical grazing areas. 5. Public access/disturbance – Threat – 037(NB) Bewick's swan - Access strategy 6. Energy production – Threat – 037(NB) Bewick's swan - Appropriate ecological information available to inform development control.		
Potential Effects			
Scheme:		Risk of Likely Significant Effects Alone?	Risk of Likely Significant Effects In-combination with other schemes
Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d)	This scheme is located 6 km south-east of Walmore Common SPA. The SIP threats and pressures of potential relevance to this scheme are (1) hydrological changes, (2) changes in species distribution and (4) offsite habitat availability/management. Due to the distance between the designated site and the proposed works, no disturbance or air pollution impacts during construction are anticipated, that could cause changes in species distribution. As Bewick's swans overwinter at Walmore Common from October – March, hydrological changes in the Severn Estuary during operation of the scheme will not directly impact on the population. Negligible impacts on hydrological regime are anticipated within the Severn Estuary and therefore, no impacts on supporting saltmarsh habitat are expected. In conclusion, no LSE are anticipated.	**No**	**No**
Netheridge WwTW discharge diversion, Cotswold Canal (35 Ml/d)	This scheme is located 6 km south-east of Walmore Common SPA. The SIP threats and pressures of potential relevance to this scheme are (1) hydrological changes, (2) changes in species distribution and (4) offsite habitat availability/management. Due to the distance between the designated site and the proposed works, no disturbance or air pollution impacts during construction are anticipated, that could cause changes in species distribution. As Bewick's swans overwinter at Walmore Common from October – March, hydrological changes in the Severn Estuary during operation of the scheme will not directly impact on the population. Negligible impacts on hydrological regime are anticipated within the Severn Estuary and therefore, no impacts on supporting saltmarsh habitat are expected. In conclusion, no LSE are anticipated.	**No**	**No**

[35] UKTAG (2003). *Guidance on the Identification of Natura Protected Areas [Final]*. UK Technical Advisory Group on the Water Framework Directive. TAG Work Programme Task 4.a, 1 – 20.

Designated site name:	**Walmore Common Ramsar (UK11076)**		
Designation type: (SAC, SPA, Ramsar):	**Ramsar**		
Qualifying features:	**Ramsar Criterion 6** Species/populations occurring at levels of international importance. Qualifying species/populations (as identified at designation): *Cygnus columbianus bewickii*, Bewick's swan – Wintering, NW Europe 43 individuals, representing an average of 0.5% of the GB population (5 year peak mean 1998/9-2002/3).	**Water Dependency** Species identified as water dependent[36]: • *Cygnus columbianus bewickii*, Bewick's swan	
Current conservation status:	N/A		
Conservation objectives:	Information not available.		
SSSI Condition assessment:	Walmore Common SSSI: 100% Unfavourable – no change.		
Site Improvement Plan:	1. Hydrological changes – Threat – Bewick's swan - Water level management plan. 2. Changes in species distributions – Threat – Bewick's swan - Research into Bewick's swan distribution. 3. Change in land management – Threat – Bewick's swan - Improve habitat connectivity. 4. Offsite habitat availability/management – Pressure/Threat – Bewick's swan - Review designation boundaries to include critical grazing areas. 5. Public access/disturbance – Threat – Bewick's swan - Access strategy 6. Energy production – Threat – Bewick's swan - Appropriate ecological information available to inform development control.		
Potential Effects			
Scheme:		Risk of Likely Significant Effects Alone?	Risk of Likely Significant Effects In-combination with other schemes
Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d)	This scheme is located 6 km south-east of Walmore Common Ramsar site. Due to the distance between the designated site and the proposed works, no disturbance or air pollution impacts during construction are anticipated, that could cause changes in specie distribution. As Bewick's swans overwinter at Walmore Common from October – March, hydrological changes in the Severn Estuary during operation of the scheme will not directly impact on the population. Negligible impacts on hydrological regime are anticipated within the Severn Estuary and therefore, no impacts on supporting saltmarsh habitat are expected. In conclusion, no LSE are anticipated.	**No**	**No**
Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d)	This scheme is located 6 km south-east of Walmore Common Ramsar site. Due to the distance between the designated site and the proposed works, no disturbance or air pollution impacts during construction are anticipated, that could cause changes in specie distribution. As Bewick's swans overwinter at Walmore Common from October – March, hydrological changes in the Severn Estuary during operation of the scheme will not directly impact on the population. Negligible impacts on hydrological regime are anticipated within the Severn Estuary and therefore, no impacts on supporting saltmarsh habitat are expected. In conclusion, no LSE are anticipated.	**No**	**No**

[36] UKTAG (2003). *Guidance on the Identification of Natura Protected Areas [Final]*. UK Technical Advisory Group on the Water Framework Directive. TAG Work Programme Task 4.a, 1 – 20.

4.2 HRA Screening conclusions

A summary of the outcomes of the HRA screening process for the schemes is presented in **Table 4.3.**

Table 4.3: Summary of the outcomes of HRA Screening Assessment of the Schemes for STW Sources SRO.

European designated site	Schemes	Risk of Likely significant effect?
Cotswold Beechwoods SAC	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d) Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d)	No
Dixton Wood SAC	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d) Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d) Mythe abstraction licence transfer (15 Ml/d)	No
Severn Estuary SAC	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d)	No
	Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d)	No
	Mythe abstraction licence transfer (15 Ml/d)	No
Severn Estuary SPA	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d)	No
	Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d)	No
	Mythe abstraction licence transfer (15 Ml/d)	No
Severn Estuary Ramsar	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d)	No
	Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d)	No
	Mythe abstraction licence transfer (15 Ml/d)	No
Walmore Common SPA	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d) Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d)	No
Walmore Common Ramsar	Netheridge WwTW discharge diversion, Deerhurst pipeline (35 Ml/d) Netheridge WwTW discharge diversion, Cotswold canal (35 Ml/d)	No

The HRA screening has indicated that a risk of LSE has not been identified for any of the schemes associated with the STW Sources SRO, either alone or in-combination with other schemes in the SRO. As such, an Appropriate Assessment is not required.

5 Conclusions and Recommendations

The ACWG guidance states that the HRA for each SRO should be undertaken in accordance with available guidance for England and Wales and should be based on a precautionary approach as required under the HRA process. The requirement for a HRA is established through the Conservation of Habitats and Species Regulations 2017 (as amended), commonly referred to as the Habitats Regulations.

As the gate-1 submission does not form a statutory plan or project, STW has undertaken an assessment of the implications of the individual schemes of the STW Sources SRO by adopting the *principles* of the HRA process to help identify risks to feasibility and deliverability of the schemes.

As such, the assessment has identified where there is a risk of LSE to occur as a result of each scheme in the STW Sources SRO.

The assessment concluded that no LSE is anticipated as a result of the construction or operation of any of the schemes associated with the ST Sources SRO, subject to the current information on scheme design and operation. As such, no further assessments have been undertaken.

The conclusion on the risk of LSE will need to be reviewed and updated (where required) as more information becomes available during completion of the gate-2 assessments.

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