Thames Water

Final Water Resources Management Plan 2019

Technical Appendices

Appendix C: Habitats Regulations Assessment

Ricardo Energy & Environment

Final Water Resources Management Plan 2019 Appendix C: Habitats Regulations Assessment – April 2020

Habitats Regulations Assessment

Report for Thames Water

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Thames Water Utilities Ltd

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Contact:

Ben Stansfield
Ricardo Energy & Environment
Bright Building, Manchester Science Park,
Manchester. M15 6GZ. United Kingdom.

t: +44 (0)1235 753 430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Ken Lipscomb, Miriam Westbrook, John Sanders

Approved By:

Ben Stansfield

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Non-Technical Summary

A Habitats Regulations Assessment (HRA) has been undertaken of Thames Water's Water Resources Management Plan 2019 (WRMP19) in parallel with Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessments to ensure an integrated approach to environmental assessment and to ensure its overall compliance with international and national environmental legislation. The HRA has been updated since the draft WRMP19 report to take account of:

a) The April 2018 Court of Justice of the European Union (CJEU) "People Over Wind" judgement[1] that ruled that mitigation measures should not be considered as part of the HRA screening assessment

b) Changes to the preferred strategies and reasonable alternative programmes for each of Thames Water's Water Resources Zones as set out in the WRMP19

The HRA screening assessment of the WRMP19 has concluded that of the 33 options included within the preferred programme, 26 options are not likely to have any significant effect on any European site. A Stage 2 Appropriate Assessment was required for seven options where it had not been possible at the screening stage to conclude no likely significant effects in order to determine whether these would adversely affect the integrity of a European site(s) after the consideration of mitigation measures. These Stage 2 Appropriate Assessments have determined that, with the application of mitigation measures as set out in each assessment, none of the options are likely to have any adverse effect on site integrity or the ability of the site to achieve its conservation objectives.

With the inclusion of the mitigation measures, Thames Water's WRMP19 has been assessed to have no adverse effects on the integrity of any European site, either alone or in-combination with other plans or projects.

In developing the preferred programme, Thames Water carried out HRA screening and, where applicable Appropriate Assessment, of six short-listed reasonable alternative programmes to help inform decision-making:

- Favouring intergenerational equity;
    - (Min_IGEQ)[2]
- Favouring resilience and cost equally;
    - (Multi-obj_RES)
- Favouring customer preference for the frequency of restrictions and cost equally;
    - (Multi-obj_FP)
- Favouring resilience with a programme cost restriction of 120% of least cost ;
    - (NearO_RES)
- Favouring customer preference for type of options with a programme cost restriction of 120% of least cost;
    - (NearO_TP)[3]; and

1 Case C-323/17 People Over Wind and Sweetman. Ruling of CJEU

2 Min_IGEQ = (Minimum Intergenerational Equity) An optimisation run that uses a 1% discount rate instead of 3.5% in order to decrease the incentive to defer spend to the future. Note that lower IGEQ values represent better performance in the modelling outputs.

3 NearO_TP = (Near optimal type preference) An optimisation run that meets customer preferences for option type, constrained to within 120% of the Least Cost

- the least cost programme (Phased_LC)

HRA screening indicated that all the reasonable alternative programmes considered included some options that would require Stage 2 Appropriate Assessment if that programme were to be selected instead of the WRMP19 preferred programme.

HRA will still need to be carried out (at the individual project level) as and when each of the schemes included in the preferred programme is brought forward by Thames Water for promotion and applications are made for planning permission and environmental permits. At that stage, the HRA will need to be revisited to take account of any changes to scheme design, construction and operational arrangements, as well as the final package of mitigation measures. In-combination effects will also need to be re-assessed to take account of prevailing, updated, information on other projects, programmes and plans.

1 Introduction

1.1 Background and purpose of report

1.1.1 Requirement for Habitats Regulations Assessment

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.

A water company must ensure its WRMP meets the requirements of the EU Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, hereby referred to as the 'Habitats Directive'), as transposed into national legislation by the Conservation of Habitats and Species Regulations 2017. The Habitats Regulations 2017 require that a Habitats Regulations Assessment (HRA) is carried out. Under these Regulations any plan or project which falls within a potential zone of influence of a European site must be subject to an HRA. European sites include Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). The Government also expects potential SPAs (pSPAs), candidate SACs (cSACs), and any confirmed HRA compensatory habitat and Ramsar (an international rather than European designation) sites to be considered in the same way. If the plan or project 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, it must be subject to an Appropriate Assessment to determine the implications for the site in view of its conservation objectives.

Both the *'Strategic Environmental Assessment and Habitat Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans'*[4] and '*Water Resources Planning Guideline'*[5] recommend that all WRMPs should be subject to the first stage of HRA, i.e. screening, for likely significant effects (LSE).

The responsibility for undertaking the Habitats Regulations Assessment lies with Thames Water as the Plan-making authority. The Plan-making authority 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.

This report documents the HRA of the Thames Water Utilities Ltd (Thames Water) WRMP19. The report sets out the findings of the HRA screening of options and preferred programme, both individually and in-combination, for each of Thames Water's Water Resources Zones.

This updated HRA Report takes account of the April 2018 CJEU "People Over Wind" judgement6 that ruled that mitigation measures should not be considered as part of the HRA screening assessment. It also takes account of comments made on the draft WRMP19 HRA Report during the public consultation on the draft plan.

1.2 Consultation

Natural England and the Environment Agency, along with other stakeholders, were consulted on the proposed HRA methodology in summer 2016 and feedback on the methodology was used to finalise the assessment approach. Additionally, a series of consultation meetings were held with the Environment Agency and Natural England during 2016 and 2017 to discuss the development of Thames Water's draft WRMP19 and the options being considered, including identified potential risks to European sites either from proposed construction and/or operational activities. Regular stakeholder meetings were held over the period 2015 to 2017 which provided the opportunity to discuss emerging

[4] UKWIR (2012) Strategic Environmental Assessment and Habitats Regulations Assessments - Guidance for Water Resources Management Plans and Drought Plans (WR/02/A).
[5] EA, Ofwat, Defra and the Welsh Government (2018) Water resources planning guideline: Interim Update. July 2018.
[6] Case C-323/17 People Over Wind and Sweetman. Ruling of CJEU

findings from the HRA process with a wide range of stakeholders and regulatory bodies. Further details of consultation activities and outcomes can be found within the WRMP.

During the summer of 2017, draft HRA Stage 1 screening assessments were shared with Natural England and the Environment Agency for informal consultation; the feedback on the draft assessments informed the final screening assessments presented in the draft WRMP19 HRA report. A summary of the draft HRA screening consultation comments and responses is presented in Appendix B.

In addition to the overall draft WRMP19 HRA assessments, Thames Water also held a series of regulatory consultation meetings between 2015 and 2017 on specific potential options, including HRA issues. Meetings were additionally held on the Severn to Thames Transfer option involving Natural England and Environment Agency, on the Vyrnwy river regulation support option with Environment Agency and Natural Resources Wales and the Teddington Direct River Abstraction option with Environment Agency and Natural England (amongst others). Comments and feedback from the regulatory bodies on the HRA issues for each of these options were used to inform the assessments presented in the HRA report accompanying the draft WRMP19.

Following publication of the draft WRMP19 for consultation in early 2018, various comments have been received by Thames Water on the draft WRMP19 HRA conclusions. These are set out in the Statement of Response published on the Thames Water website alongside Thames Water's response and a summary of the consequent changes made to this HRA Report. Thames Water's response to the HRA comments and the updated information presented in this report has been informed by further dialogue with Natural England, the Environment Agency, and with other interested stakeholders as required, during spring and summer 2018.

1.3 Changes since the draft WRMP19 HRA report

Thames Water published the draft WRMP for public consultation in February 2018. The public consultation ran from 9 February to 29 April.

Work has continued to further develop the water resource options identified in the draft WRMP19 in parallel with the public consultation. As a result, some of the options on the Constrained List of options have been updated: to incorporate new information received; to take account of the output of ongoing investigations; or in response to consultee comments. In addition, where new options have been identified, they have been assessed for inclusion in this WRMP19 HRA Report. Furthermore, options which have been withdrawn by third parties, or have proved to be unsustainable on the basis of new information received or in response to consultee comments, have been removed from this updated HRA Report.

A summary of the changes to the water resource options since the publication of the draft WRMP19 in February 2018 is presented in the WRMP19 Strategic Environmental Assessment (SEA) Environmental Report.

1.4 Structure of the report

The remainder of this report is divided into the following sections:

Section 2: Thames Water's WRMP 2019
Section 3: Methodology
Section 4: HRA findings for potential new resource options, option elements and preferred programme
Section 5: Potential in-combination effects with other plans and projects
Section 6: HRA findings for alternative programmes
Section 7: Conclusions

2 Thames Water's WRMP 2019

2.1 Thames Water's supply system

The Thames Water supply area extends from Cirencester in the west to Dartford in the east and from Banbury in the north to Guildford in the south and covers over 5,000 square miles. Every day, Thames Water supplies around 2,600 million litres of water to around 10 million people and 215,000 businesses[7]. Water supplies are derived from a mixture of surface water sources (mostly from large storage reservoirs supplied from the River Thames and River Lee) and groundwater sources. Thames Water also have a desalination water treatment works on the River Thames (Tideway) that can supplement water supplies at times of high demand and/or during drought conditions.

For water resource planning purposes, Thames Water's supply area is divided into six Water Resource Zones (WRZ). The London WRZ is the largest of the six zones and covers much of the Greater London area. The next largest is the Swindon and Oxfordshire WRZ (SWOX). The water resources for both of these zones are primarily reliant on abstraction of water from the River Thames for storage in large reservoirs. The other WRZs to the west of London are Kennet Valley (which includes Reading and Newbury); Henley; Slough, Wycombe and Aylesbury (SWA); and Guildford. These four WRZs are largely reliant on groundwater abstraction, although there are some significant abstractions directly from local rivers: the River Kennet in Reading and the Rivers Wey and Tillingbourne near Guildford.

Several other water companies provide water supply services to those areas of the River Thames catchment area not covered by the Thames Water WRZs. Each of these other companies will also be preparing a WRMP and consultation is ongoing with these companies, primarily through the Water Resources in the South East planning group.

Further details about the Thames Water supply system and the management of existing water resources are provided on the Thames Water website (www.thameswater.co.uk).

2.2 WRMP19

Water resources management planning is undertaken by all water companies in England and Wales in order to ensure reliable, resilient water supplies over the long term planning horizon. The minimum planning horizon is at least 25 years, but in view of the water supply-demand challenges in its supply area, Thames Water has adopted a much longer 80 year planning horizon to 2100. This particularly reflects the high anticipated population growth in many of its WRZs over this period as described in detail in the WRMP19. The planning process includes calculating and forecasting how much water customers will need over the planning period (assessing future demand) and how best to provide it (assessing options to reduce or constrain demand growth and/or augment reliable supplies of water) in an efficient, timely manner (programme appraisal). Companies seek to identify the preferred, 'best value' programme of demand management and water supply options to maintain a balance between reliable supply and demand in each WRZ and for their supply area as whole (the WRMP).

Water companies in England and Wales have a statutory requirement to prepare a WRMP every five years. The draft WRMP19 was submitted to Defra on 1 December 2017 and, following Defra approval, was published for consultation in early 2018. A revised draft WRMP19 and subsequent Addendum to the revised draft WRMP19 were prepared having regard to consultation comments and recent developments, such as changes to the demand requirements on Thames Water from other neighbouring water companies since the draft plan was published.

The WRMP also informs the regulatory water company business planning 'Price Review' process through which the Water Services Regulation Authority (Ofwat) sets the price that water companies can

[7] In April 2017 a competitive retail market for water services for business customers was introduced. This means that business customers can choose which retailer they buy their water and wastewater services from. The retailer provides billing, customer service and efficiency advice to the business customer, while Thames Water, as a wholesale water provider, still has an obligation to supply the water and sewerage services and manage the infrastructure.

charge their customers for water (and wastewater) services. The Business Plan for the 2019 Price Review (PR19) was submitted to Ofwat in September 2018.

Engagement with government, regulators, other licensed water suppliers and water companies, customers and a wide range of stakeholders is key to the WRMP process. Thames Water's WRMP19 consultation programme began in 2015 and included a Water Resources Forum where a wide range of stakeholders and the regulators meet to discuss Thames Water's emerging plans for water resources management. Information and consultation documents are also provided on Thames Water's website (www.thameswater.co.uk). The HRA Screening Report was published alongside the draft WRMP19 between 9 February and 29 April 2018 on the Thames Water website and issued to the statutory consultation bodies. This provided an opportunity for the statutory bodies, stakeholders and the public to express their views on the findings of the HRA Screening Report along with their views on the draft WRMP19. Changes have been made to the draft WRMP19 and to the SEA Environmental Report as a result of the representations received. An updated HRA Report was produced alongside the revised draft WRMP19 and a further Addendum was produced in April 2019 following further engagement with stakeholders.

In developing its WRMP19, Thames Water has examined the supply/demand balance for each WRZ and determined how any deficits between forecast demand and reliable water supplies should be addressed for the selected planning period. The planning process has considered key issues which affect future water supply reliability and demand for water, such as:

- population and housing growth
- water consumption behaviour and how these may change in the future
- future bulk water supply requirements from neighbouring water companies
- climate change implications for reliability of water supplies
- reductions to the availability of water supplies due to environmental impact of existing water source abstractions ('sustainability reductions')
- raw water quality deterioration due to land use and/or climate change

A wide range of alternative options has been considered by Thames Water to address any forecast supply shortfalls, including:

- alternative water tariffs to encourage water efficiency (linked to Thames Water's strategy to continue extending water metering to the majority of its customers)
- promotion of water efficiency measures
- reducing water leakage from the water supply network or at customers' properties
- water transfers from other water companies or other owners of water sources
- desalination
- indirect water reuse
- river or groundwater abstraction
- new reservoirs
- increased transfer of water between WRZs

Each of these options has been assessed to understand the costs, the benefits to the supply-demand balance, the effect on carbon emissions and the environmental and social effects (including the HRA process as well as the parallel Strategic Environmental Assessment (SEA) process and associated Water Framework Directive (WFD) assessments). The options have been subsequently compared through a comprehensive programme appraisal process (including use of an optimisation model to examine reasonable alternative programmes) to determine the 'best value' programme of options to maintain a supply-demand balance over the planning period for each WRZ. Decisions on the best value programme have taken account of a range of factors, such as the implications for water bills, the

resilience to future risks and uncertainties (e.g. climate change), deliverability considerations and the environmental and social effects of the programme (adverse and beneficial, as informed by the HRA and parallel SEA and WFD assessments). The resulting preferred programme developed for each WRZ collectively forms the WRMP19.

3 Methodology

The objective of the HRA is to establish whether options considered for inclusion in the WRMP19 are likely to have a significant effect on European sites (alone or in-combination with other supply schemes in the plan, or with other plans and projects), and where a significant effect is likely, to determine, through Appropriate Assessment, whether the option would adversely affect the integrity of the European site(s).

HRA screening was therefore completed for the Feasible Options list considered in the development of the Thames Water WRMP19, a range of reasonable alternative programmes and the preferred programme developed by Thames Water. The HRA has been undertaken in parallel with the SEA and WFD assessments to ensure an integrated approach to environmental assessment and ensure overall compliance of the WRMP19 with relevant legislation. In accordance with the recent April 2018 CJEU "People Over Wind" judgment, the updated HRA Stage 1 screening assessment has not considered any mitigation measures. As a consequence, it was not possible to rule out likely significant effects on European sites for several options (in the absence of mitigation measures) and these options were taken forward for Appropriate Assessment.

3.1 HRA approach within the WRMP

3.1.1 Introduction

Thames Water consulted Natural England, the Environment Agency, Natural Resources Wales and wider stakeholders on the HRA methodology in summer 2016. The HRA has been undertaken in accordance with available guidance for England[8,9,10,11,12,13] and has been based on a precautionary approach as required under the Habitats Regulations. It follows the staged HRA approach (as discussed below), commencing with the HRA Stage 1 screening of all the option 'elements' included within the Feasible Options list within the WRMP19: the option 'elements' comprised items such as water treatment works (WTWs), water conveyance systems (pipelines or tunnels), raw water abstraction intakes and discharges, pumping stations, reservoirs and groundwater sources.

Following modelling work by Thames Water to assess the costs and benefits associated with combinations of these option elements, a series of options were determined for inclusion in a wide range of reasonable alternative programmes that would address forecast supply deficits in each WRZ. A short-list of six reasonable alternative programmes were then assessed through HRA screening, both individually and in-combination with other programmes, plans and projects. Finally, HRA screening has been applied to the preferred programme that makes up the WRMP19, including in-combination assessment with other programmes, plans and projects. Where necessary, an Appropriate

[8] European Commission Environment DG (2001) Assessment of plans and projects significantly affecting European Sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.
[9] Department for Communities and Local Government (DCLG) (2006) Planning for the Protection of European Sites. Guidance for Regional Spatial Strategies and Local Development Documents.
[10] English Nature (1997) The Appropriate Assessment (Regulation 48) The Conservation (Natural Habitats &c) Regulations, 1994. Guidance Note HRGN1.
[11] English Nature (1997) The Determination of Likely Significant Effect under The Conservation (Natural Habitats &c.) Regulations 1994. Guidance Note HRGN3.
[12] Defra (2012) The Habitats and Wild Birds Directives in England and its seas: Core guidance for developers, regulators & land/marine managers
[13] Tyldesley, D. & Chapman, C. (2015) The Habitats Regulations Assessment Handbook. DTA Publications. Version 4.

Assessment has also been carried out for options and/or programmes where the HRA screening was unable to rule out likely significant effects on a European site.

3.1.2 HRA process

For each WRMP19 WRZ programme, option and Feasible List option element, HRA Stage 1 screening has considered whether there are any Likely Significant Effects (LSEs) arising from construction or implementation activities and/or operation of the option on one or more European sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) (also known as Natura 2000 sites).

- SPAs are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC; 'Birds Directive') for the protection of **wild birds and their habitats** (including particularly rare and vulnerable species listed in Annex 1 of the Birds Directive, and migratory species).
- SACs are designated under the Habitats Directive (92/43/EEC) and target particular **habitats** (Annex 1) **and/or species** (Annex II) identified as being of European importance.

The Government also expects potential SPAs (pSPAs), candidate SACs (cSACs), compensation habitat and Ramsar sites to be included within the assessment. Ramsar sites support **internationally important wetland habitats** and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

For ease of reference in this HRA Report, these designations will be collectively referred to as "European sites", despite Ramsar designations being made at the international level rather than EU level.

The first stage of the HRA process has been carried out for the WRMP19:

- **Stage 1 Screening**: A screening process has been undertaken to identify whether each individual option element and option (usually a specific combination of option elements) in Thames Water's preferred programme for the WRMP19 (either alone or in-combination with other plans or projects) is likely to have significant effects on European sites.

The purpose of the screening stage is to determine whether any part of the WRMP19 is likely to have a significant effect on any European sites (including areas of compensation habitat, areas of off-site functional habitat, and the ability for abstractions to occur for the management of designated wetland sites). This is judged in terms of the implications of the plan for a site's conservation objectives, which relate to its 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated[14], and Ramsar criteria). Significantly, HRA is based on a rigorous application of the precautionary principle.

The screening stage must also conclude whether any in-combination LSEs would result from the constituent option elements included within each option, the options within each programme and the plan as a whole, as well as in-combination with other programmes, plans or projects, and whether these would adversely affect the integrity of a European site.

Where LSE could not be ruled out at the screening stage of the Feasible List option elements (noting the adoption of the precautionary principle), the option element was further reviewed by Thames Water to determine whether it should continue to be included in the WRMP19 process or be rejected. If the option element was retained, it was flagged as having a high environmental risk within the subsequent option and programme appraisal process (see the SEA Environmental Report for further details).

Mitigation measures have been set out in the conceptual designs for each option element. In accordance with the April 2018 CJEU "People Over Wind" judgment, these have not been taken into account in carrying out the Stage 1 screening assessments. Where the Stage 1 screening assessment

[14] Annexes are contained within the relevant EC Directive.

was unable to rule out LSE in the absence of mitigation, the required mitigation measures have been considered as part of the Stage 2 Appropriate Assessment.

3.1.3 HRA screening

To provide an indication of those option elements more likely to have a significant effect on a European site(s), option elements within 10km of a European site were identified. Additionally, European sites within 20km downstream of the option element were investigated. Consideration was also given to the relative locations of schemes and European sites within the same surface and groundwater catchments to ensure that any connectivity over a longer distance than 20km that might affect water-dependent sites, qualifying features and designated mobile species was taken into account. GIS data was used to map the locations and boundaries of each of the European sites in relation to the option elements. Where location information for surface and groundwater catchments was not available, the precautionary principle was applied taking into account specialist input from hydrologists and hydrogeologists to determine whether there was a possible risk to a European site.

The attributes of the European sites, which contribute to and define their integrity, were considered with reference to Standard Data forms for SACs and SPAs and Information Sheets for Ramsar sites. An analysis of these information sources enabled the identification of the site's qualifying features. This information, as well as Article 17 reporting[15], site conservation objectives, Site Improvement Plans (SIPs) and any supporting Site of Special Scientific Interest Favourable Condition Tables, was used to identify those features of each site which determine current conservation status, site integrity and the specific sensitivities of the site. Analysis of how potential impacts of the option elements may affect a European site for the Stage 1 screening assessment 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 both construction effects (where applicable) and operational effects of each option element/option. Post operational effects (decommissioning) were not considered as part of this HRA as the WRMP option elements/options are very long-life assets which are maintained over a very long period and so are not planned with a specific decommissioning phase.

In determining the likelihood of significant effects on European sites from any WRMP19 option element/option, particular consideration has been given to the possible source-receptor pathways through which effects may be transmitted. Transmission of effects may occur from activities associated with the options contained within the WRMP, to features contributing to the integrity of the European sites (e.g. groundwater or surface water catchments, air, etc.). **Table 3-1** provides examples of the types of impacts the options might have on European site qualifying features and relevant references that informed these. These are examples only and do not constitute every potential impact pathway considered in this report.

Screening for LSEs was determined on a proximity basis for many of these types of impacts, based on the proximity of the potential location of each measure to each European site. However, there are many uncertainties associated with using threshold distances as there are very few standards available as a guide to how far impacts will extend. Different types of impacts can occur over different distances, and the assumptions and distances used in the HRA and justification for them are shown in **Table 3-1**.

Table 3-1 Example impacts of WRMP option elements on European sites

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts *(distance assumptions in italics)*
Physical habitat loss: • Removal (including offsite effects, e.g. foraging habitat) • 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.

[15] Every six years, Member States of the European Union are required (by Article 17 of the Directive) to report on implementation of the Habitats Directive to the European Commission.

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts *(distance assumptions in italics)*
	Physical loss is mostly 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 the species population for which a European site is designated).
Physical damage: • Sedimentation / silting • Prevention of natural processes • Habitat degradation • Erosion • Fragmentation • Severance/barrier effect • Edge effects	Impacts of construction and maintenance activities e.g. trampling, vegetation clearance, sedimentation/siltation. *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 • Visual presence • Human presence • Light pollution	Noise from temporary construction or temporary pumping activities. *Taking into consideration the noise level generated from general building activity[16] (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[17].* 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[18].* 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 the species population 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.* *From a review of Environment Agency internal guidance on HRA and various websites, it is considered that effects of vibration and noise and light 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	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,*

[16] British Standards Institute (BSI) (2009) BS5228 - Noise and Vibration Control on Construction and Open Sites. BSI, London.
[17] 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,
[18] A series of studies carried out in the Netherlands have shown that road noise levels above 42-43dB and 47dB results in a rapid fall in population of woodland and grassland breeding bird species, with disturbance distances varying between species from 20 to 1700 metres from the road (at 5000 cars a day) and up to 3.53 kilometres at 50,000 cars a day. The most recent study is: Reijnen, R.; Foppen, R.; Veenbaas, G. (1997) Disturbance by traffic of breeding birds: evaluation of the effect and considerations in planning and managing road corridors. Biodiversity and Conservation 6 (4), 567-581.

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts *(distance assumptions in italics)*
• Changes in groundwater levels and flows • Changes to coastal water movement	*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.*
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 vehicular traffic during construction and operation of schemes. *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*[19]
Non-toxic contamination: • Nutrient enrichment (e.g. of soils and water) • Algal blooms • Changes in salinity • 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	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. However, the construction of pipelines can act as conveyancing routes without suitable mitigation, and other forms of dispersal (e.g. via birds) also need to be considered.*

3.2 Habitats Regulations Review of Consents

The determination of the likely significant effects of continued utilisation of Thames Water's existing licensed abstraction sources (which underpin the WRMP19) on European sites was based on the 'Review of Consents' process undertaken by the Environment Agency. The Environment Agency is the 'competent authority' for the regulation of the impact of abstraction on the natural environment. The Environment Agency carried out the Review of Consents in accordance with requirements of the European Habitats Directive over the period 2004 to 2008.

The Review of Consents for existing abstractions is also relevant to new resource schemes, because some involve increasing existing abstractions at licensed sites while still remaining within the existing licensed limit. Where these existing licences have been assessed by the Environment Agency's Review of Consents as not having an adverse effect on Natura 2000 sites, the additional increase in abstraction from the new resource scheme (but which would remain within the existing licensed limit) has also been deemed not to have any LSEs on European sites as a result. Consideration has, however, been given

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

to any construction elements (e.g. new pipelines or treatment works) and any potential in-combination effects with other options, projects or plans.

The Environment Agency's Review of Consents was undertaken by considering all European sites within Thames Water's supply area. The European sites were initially screened to identify all sites with water dependent habitat within the Thames Water's supply area. Those sites that contained water dependent habitat were then reviewed to assess whether Thames Water abstractions were located within the same groundwater or surface water catchment and therefore could have potential to affect the hydrogeological or hydrological regime of the sites. Any sites that were in the same catchment as a Thames Water licensed abstraction source were assessed in more detail to determine whether the abstraction would be likely to have a significant effect. The Environment Agency looked in more detail at the sensitivities of the European site to water supply, and at the local hydrology. For example, a European site may be fed by surface water and the abstraction may be downstream, or the abstraction may be from a confined aquifer which could not impact the water supply at the protected site. In addition, the Environment Agency was also able to use simple drawdown calculations to conclude that the impact would be insignificant.

The European sites for which the Environment Agency's Review of Consents included Thames Water licensed water abstraction sources, and for which an Appropriate Assessment was required as part of the review process (in 2008), are listed below in Table **3-2**: "Habitats Directive Review of Consents Sustainability – sites requiring review of Thames Water licensed sources". The 'definitive' column in Table 2 shows those abstraction licences where the Environment Agency indicated that a sustainability reduction was definitely required in order to avoid a significant effect on European sites. For these sources, solutions to enable the reduction were included in the Final Business Plan and were funded for delivery during Asset Management Period (AMP) 5 (2010-2015).

The findings of the Review of Consents process have been used, where appropriate, to inform the HRA screening.

Table 3-2 Habitats Directive Review of Consents (2008) – Sites Requiring Review of Thames Water Licensed Sources[20]

Thames Water Utilities				**Date: August 2008**	
Site Name	**Driver**	**Priority**	**Licence Number**	**Definitive**	**Indicative**
Lee Valley Waterbodies SPA	HD	Medium	29/38/07/0034 29/38/07/0035 29/38/07/0036	Licence reduction 0Ml/d	
South West London Waterbodies SPA	HD	Low	N/A	N/A	N/A
Kennet and Lambourn Floodplain SAC	HD	Medium	28/39/22/47 28/39/22/394	Speen: Reduction of daily peak licence by 5Ml/d and annual average by 4Ml/d. Thatcham Reedbeds SSSI – requirement to install augmentation from the River Kennet for use in severe drought to counter potential impact of WBGWS operation. No licence reduction of WBGWS required.	
River Lambourn SAC	HD	Medium	28/39/22/390 28/39/22/391 28/39/22/392		The Environment Agency is reviewing the West Berkshire Groundwater Scheme (WBGWS) Operating Agreement and has indicated that any changes they propose will not have any impact on the deployable output of the scheme
North Meadow & Clattinger Farm SAC	HD	Medium	28/39/1/9 28/39/2/63 28/39/2/18 25/39/2/10	Licence reduction 0Ml/d	
Oxford Meadows SAC	HD	Medium	28/39/16/78	Licence reduction 0Ml/d	
Kennet Valley Alderwoods SAC	HD	Low	28/39/22/47	Speen: Reduction of daily peak licence by 5Ml/d and annual average by 4Ml/d	
Thursley Common SAC	HD		Mousehill & Rodborough	Licence reduction 0Ml/d	

Reference: Environment Agency (August 2008): Sustainability Reductions, 080829/SR

[20] The table includes status of requirement for sustainability reductions as provided by the Environment Agency August 2008

The European sites for which the Environment Agency's Review of Consents process required Appropriate Assessment in relation to Thames Water's licensed sources are considered in more detail below.

Lee Valley Waterbodies SPA

The Lee Valley Waterbodies SPA consists of a series of waterbodies in the Middle/Lower Lee Valley to the south of Ware. The existence of the waterbodies is predominantly as a result of old gravel workings. These waterbodies have become important locations for significant numbers of waterfowl that rely on the various lakes for roosting at certain times of the year. The Review of Consents identified a number of Thames Water's licensed sources that needed to be assessed to determine whether they had the potential to adversely affect the groundwater regime around the designated waterbodies so that the integrity of the sites was compromised. This Appropriate Assessment has been carried out by the Environment Agency and the Thames Water licensed sources have been concluded to have no adverse impact on the sites.

Thames Water was notified of this conclusion through a letter from the Environment Agency dated 7 May 2009.

South West London Waterbodies SPA

The South West London Waterbodies SPA consists of a series of waterbodies in the Lower Thames Valley. The existence of the waterbodies is as a result of development of reservoir storage for public water supply. These waterbodies have become important locations for significant numbers of waterfowl that rely on the various reservoirs for roosting at certain times of the year. The Review of Consents identified a number of Thames Water's water resource management activities that needed to be assessed to determine whether they had the potential to adversely affect the designated waterbodies so that the integrity of the sites was compromised. This Appropriate Assessment has been carried out by the Environment Agency and the sources have been concluded to have no adverse impact on the sites.

Thames Water was notified of this conclusion through a letter from the Environment Agency dated 7 May 2009.

Kennet and Lambourn Floodplain SAC

The Appropriate Assessment for the Kennet and Lambourn Floodplain SAC was required to assess the impact of the groundwater abstraction from the Chalk aquifer at Speen. The Environment Agency's Appropriate Assessment concluded that the groundwater abstraction posed a risk to the integrity of the site and so on the basis of the precautionary principle the Environment Agency required a reduction of the licensed abstraction at Speen. Thames Water was notified of this conclusion through a letter from the Environment Agency dated 28 November 2008 which included the final National Environment Programme.

The reduction required was from an average of 11.396Ml/d and a peak of 13.638Ml/d to an average of 7.396 Ml/d (reduction of 4Ml/d) and a peak of 8.638 Ml/d (reduction of 5Ml/d). This licence reduction reduced the deployable output of the source although it did not result in the Supply/Demand balance for the WRZ going into deficit. However, in order to maintain security of supply in the local area a scheme to improve the distribution network in and around Newbury was required. This scheme was implemented during 2010-2015. With the completion of this scheme, abstraction at Speen does not have any adverse impact on the integrity of the European site or present a risk to the integrity of the site.

The Appropriate Assessment also covered the Thatcham Reedbeds SSSI which is a component part of the Kennet and Lambourn Floodplain SAC. The Appropriate Assessment for the Kennet and Lambourn Floodplain SAC was required to assess the potential impact of groundwater abstraction from the Chalk aquifer under the West Berkshire Groundwater Scheme (WBGWS). The WBGWS is a strategic drought scheme for which the licences are held by the Environment Agency. The scheme

would be operated in drought conditions only and the use of the scheme is triggered through the Lower Thames Operating Agreement. The scheme is designed to operate only one year in twenty on average.

The conclusion of the Environment Agency's Appropriate Assessment was that the potential operation of the WBGWS in a prolonged drought could lead to lowering of groundwater levels under the Thatcham Reedbeds, with the potential for adverse impact on the surface water regime on which the habitat assemblage in the Reedbeds is dependent. Thames Water was notified of this conclusion through a letter from the Environment Agency dated 28 November 2008.

In view of the strategic nature of the WBGWS and the associated infrequency of its use, the requirement for a significant reduction in the licensed abstraction associated with the scheme was not deemed the most appropriate solution. The solution required by the Environment Agency was the development of a facility to enable augmentation of the Thatcham Reedbeds site in the event of a prolonged drought and operation of the WBGWS for a significant period. This scheme was included in Thames Water's Business Plan for 2010-2015. Completion of this scheme enables the abstraction under the WBGWS to be undertaken without any adverse impact on the integrity of the European site.

River Lambourn SAC

The Appropriate Assessment for the River Lambourn SAC was required to assess the potential impact of groundwater abstraction from the Chalk aquifer under the West Berkshire Groundwater Scheme (WBGWS). The WBGWS is a strategic drought scheme for which the licences are held by the Environment Agency. The scheme would be operated in drought conditions only and the use of the scheme is triggered through the Lower Thames Operating Agreement. The scheme is designed to operate only one year in twenty on average.

The Environment Agency considered that the prolonged operation of the WBGWS in the event of a significant drought had the potential to result in adverse environmental impact on the River Lambourn SAC. The Environment Agency considered that the basis for the operation of the WBGWS could be modified, through amendment to the WBGWS Operating Agreement such that the risk of adverse impact on the SAC is eliminated. In view of the Environment Agency's conclusions on the requirements for the WBGWS Operating Agreement, Thames Water was not required to implement a scheme to ensure the integrity of the River Lambourn SAC.

North Meadow and Clattinger Farm SAC

The North Meadow and Clattinger Farm SAC was designated for its grassland/flood meadow habitat and supports an important assemblage of flora and fauna. The Appropriate Assessment was required to determine whether the groundwater abstractions at Latton, Baunton and Ashton Keynes had the potential to adversely affect the groundwater regime supporting the European sites. The Appropriate Assessment was carried out by the Environment Agency and concluded that there was no adverse impact of the licensed abstraction on the integrity of the European site.

Thames Water was notified of this conclusion through a letter from the Environment Agency dated 18 June 2007.

Oxford Meadows SAC

The Oxford Meadows SAC is designated in view of the flood meadow habitat which is home to the important species Apium repens which requires a habitat with shallow groundwater and periodic inundation. The Appropriate Assessment was required to assess the impact of the abstraction at Farmoor from the River Thames on the flows in the River Thames and the potential for the abstraction to affect the pattern of inundation of the Oxford Meadows site. The Appropriate Assessment was carried out by the Environment Agency and concluded that there was no adverse impact of the licensed abstraction on the integrity of the European site.

Thames Water was notified of this conclusion through a letter from the Environment Agency dated 18 June 2007.

Kennet Valley Alderwoods SAC

The Appropriate Assessment for the Kennet Valley Alderwoods was required to assess the impact of the groundwater abstraction from the Chalk aquifer at Speen. The Environment Agency's Appropriate Assessment concluded that the groundwater abstraction posed a risk to the integrity of the site and so on the basis of the precautionary principle the Environment Agency required a reduction of the licensed abstraction at Speen. Thames Water was notified of this conclusion through a letter from the Environment Agency dated 28 November 2008.

The reduction required was from an average of 11.396Ml/d and a peak of 13.638Ml/d to an average of 4 Ml/d and a peak of 5 Ml/d. This licence reduction affected the deployable output of the source although it did not result in the Supply/Demand balance for the WRZ going into deficit. However, in order to maintain security of supply in the local area a scheme to improve the distribution network in and around Newbury was required. This scheme was included in Thames Water's Business Plan for 2010-2015. Completion of this scheme enabled abstraction to take place at Speen such that it does not have any adverse impact on the integrity of the European site.

Thursley Common SAC

The Thursley Common SAC is designated for its heathland habitat and supports an important assemblage of flora and fauna. The Appropriate Assessment was carried out to determine the impact of abstraction from Thames Water's source at Mousehill and Rodborough on the groundwater levels below the site. The Appropriate Assessment in relation to Thames Water's sites alone considered that there was no adverse impact on the integrity of the sites and the licences were affirmed. However further work was required to assess the impact of Thames Water's abstractions when considered in conjunction with other abstractions and so an 'In-Combination Assessment' of the aggregate impact of a series of abstractions was required including the Mousehill and Rodborough abstraction. This 'In-Combination Assessment' was undertaken by the Environment Agency and concluded that there was no adverse impact of the Mousehill and Rodborough source on the integrity of Thursley Common SAC.

Thames Water was notified of this conclusion through a letter from the Environment Agency dated 19 November 2007.

3.3 Review of potential in-combination effects

The HRA considers the in-combination effects of the elements, options and programmes with other options/programmes within the WRMP, and the in-combination effects with other programmes, plans and projects, that could have an impact on the European sites identified within the HRA. These include schemes identified in other Thames Water plans, neighbouring water company WRMPs and drought plans, major projects being brought forward by Thames Water and other neighbouring land users, and in other land use and infrastructure plans. In-combination effects can only occur on the same qualifying features within a given European site, i.e. in-combination effects cannot operate on the same qualifying features in different European sites or different qualifying features within the same European site.

The approach to the in-combination assessment is described as a series of questions below:

- **STEP 1** – Does the option/plan/project have no discernible adverse effect, whatsoever, on the European site? If not, then there's no need for in-combination assessment, as logic dictates it cannot have in-combination effects.
- **STEP 2** – Does this option/plan/project have a discernible effect, but one which is not significant alone (i.e. '*de minimus'* effect)? If so, then an in-combination assessment is required. (Effects that are adverse alone do not require in-combination assessment.)
- **STEP 3** – Identify the other options/plans/projects that also have discernible effects that (1) aren't an adverse effect alone but (2) might act in combination with effects of your option/plan/project. It is normal practice to agree this list of potential in-combination plans/projects with the Competent Authority before doing the assessment.
- **Step 4 –** Assess these other options/plans/projects in combination with this plan/project.

The above steps recognise that significant effects acting alone are already dealt with for that option/plan/project and should not form part of an in-combination assessment. It is only those otherwise-insignificant (*de minimus*) effects that may *become significant when acting in combination* that are included.

3.4 Consultation comments and responses

Formal consultation was carried out with Natural England and the Environment Agency on the proposed HRA methodology in summer 2016 (see Section 2). A number of general issues were raised by Natural England regarding the proposed approach, these are identified in Table **3-3** below. A full log of the further informal HRA screening consultation comments and responses is presented in **Error! Reference source not found.**, including those made on specific detailed assessment reports (for example, in relation to the series of Severn to Thames Transfer option reports prepared between 2015 to 2017).

Table 3-3 Summary of key comments on the HRA Methodology consultation and Thames Water response

Comment	Thames Water Response
The HRA should consider all applicable Site Improvement Plans affiliated with the relevant internationally European sites, and should clearly illustrate how the information within the Site Improvement Plans (SIP) has been applied.	The SIPs for each designated European site have been considered and the components that could be affected by each element have been identified and considered in the screening assessment.
There are no details on how potential impacts on SSSIs will be reviewed.	HRA is an assessment of impacts to European sites, whereas SSSIs are designated at the national level and do not fall under the European Habitats Directive. Where SSSIs are relevant to a European site qualifying features and

	potentially impacted these will be discussed in the HRA assessment. A separate SSSI assessment has been provided in the SEA Environmental Report.
The HRA should be amended to include assessment of options likely to have effects on functional habitat (habitat outside the designated boundary used by mobile species for feeding and other activities).	The potential for impacts to the relevant mobile qualifying feature species (birds, stag beetles, otters and fish) whilst using potential off-site functional habitat has been undertaken and the assessments updated accordingly. Potential functional habitat for birds (the main requirement) was searched for within 1km of each option element as this is the maximum distance at which significant disturbance is likely to occur.[21]
Assessment of options with significant construction traffic should consider air quality impacts, particularly on vulnerable habitats such as chalk grasslands, acid grassland and low heathland.	The potential for air quality impacts has been considered in full. The threshold for impact applied was 1000AADT or 200 HGVs daily within 200m of a European site with qualifying features sensitive to air quality.
The HRA should consider any opportunities for enhancements to European sites within the screening process	Enhancement is not required under HRA, further consideration of opportunities to be considered by Thames Water.
Non-bird Ramsar features are often missing from the list of site features and the list of water dependant features.	We will review and include screening assessment of such features for Ramsar sites.

Following representations made on the draft WRMP19, Thames Water issued a revised draft WRMP19 and a further addendum, this HRA Report provides an updated set of assessments to accompany the Final WRMP19. Statements of Response to the representations made on the draft WRMP19 and revised draft WRMP have been published on the Thames Water website (www.thameswater.co.uk) and includes the representations made on the HRA Report. The Statements of Response set out the actions Thames Water has taken to address the representations including a summary of any changes incorporated into this HRA Report.

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

4 HRA findings

4.1 Potentially affected European sites

The HRA of the WRMP19 initially considered all of the option elements included within the updated Feasible Options list. **Table 4-1** below sets out the European sites that might potentially be affected by construction and / or operation of each of these option elements.

Table 4-1 European designated sites potentially impacted by option elements

European designated site	Relevant option elements
Aston Rowant SAC	Henley to SWOX 5 Ml/d Henley to SWOX 2.37 Ml/d Britwell Removal of constraints
Berwyn and South Clywd Mountains SAC	Lake Vyrnwy - 148 Ml/d Lake Vyrnwy - 180 Ml/d Lake Vyrnwy - 60 Ml/d Vyrnwy Aqueduct Transfer to Shrewsbury via Oswestry 12 Ml/d Vyrnwy Aqueduct Transfer to Shrewsbury via Oswestry 30 Ml/d
Berwyn SPA	Lake Vyrnwy - 148 Ml/d Lake Vyrnwy - 180 Ml/d Lake Vyrnwy - 60 Ml/d Vyrnwy Aqueduct Transfer to Shrewsbury via Oswestry 12 Ml/d Vyrnwy Aqueduct Transfer to Shrewsbury via Oswestry 30 Ml/d
Bredon Hill SAC	Raw Water Transfer Deerhurst to Culham 300 Ml/d Raw Water Transfer Deerhurst to Culham 400 Ml/d Raw Water Transfer Deerhurst to Culham 500 Ml/d Mythe WTW
Burnham Beeches SAC	Datchet Groundwater Raw Water System - Datchet intake increase
Cannock Chase SAC	Oxford Canal to Cropredy Resource 15 Ml/d Oxford Canal to Dukes Cut Resource 15 Ml/d
Cannock Extension Canal SAC	Oxford Canal to Cropredy Resource 15 Ml/d Oxford Canal to Dukes Cut Resource 15 Ml/d
Chilterns Beechwood SAC	Henley to SWOX 2.37 Ml/d Henley to SWOX 5 Ml/d Henley to SWA 2.37 Ml/d Henley to SWA 5 Ml/d SWOX to SWA (48 Ml/d) SWOX to SWA (72 Ml/d) Medmenham WTW (24Ml/d) Medmenham Intake-53 SWA Pipelines (chalk streams)
Cothill Fen SAC	Abingdon to Farmoor Abingdon WTW (24 Ml/d) Didcot South East Strategic Reservoir 150Mm3 South East Strategic Reservoir 125Mm3 South East Strategic Reservoir 100Mm3 South East Strategic Reservoir 75Mm3 South East Strategic Reservoir 30+100Mm3 Phase 1 South East Strategic Reservoir 30+100Mm3 Phase 2 South East Strategic Reservoir 80+42Mm3 Phase 1 South East Strategic Reservoir 80+42Mm3 Phase 2 Raw Water Transfer Deerhurst to Culham 300 Ml/d Raw Water Transfer Deerhurst to Culham 400 Ml/d Raw Water Transfer Deerhurst to Culham 500 Ml/d Abingdon WTW (24Ml/d) Oxford Canal – Duke's Cut to Farmoor 15 Ml/d pipeline Oxford Canal to Dukes Cut Resource 15 Ml/d SWOX to SWA (48 Ml/d) SWOX to SWA (72 Ml/d) Culham to Farmoor 180 MLD (chalk streams)
Cotswolds Beechwoods SAC	Netheridge STW to River Severn 35 Ml/d
Dixton Wood SAC	Netheridge STW to River Severn 35 Ml/d Raw Water Transfer Deerhurst to Culham 300 Ml/d Raw Water Transfer Deerhurst to Culham 400 Ml/d Raw Water Transfer Deerhurst to Culham 500 Ml/d Mythe WTW

Ensors Pool SAC	Oxford Canal to Cropredy Resource 15 Ml/d Oxford Canal to Dukes Cut Resource 15 Ml/d
Epping Forest SAC	Desalination Beckton to Coppermills tunnel Desalination – Crossness to Beckton tunnel Beckton Desalination treatment plant 150Ml/d London confined Chalk north Coppermills WTW to New Honor Oak Service Reservoir TWRM Extension Beckton to Lockwood Conveyance (300 Ml/d) Deephams to TLT extension Conveyance Deephams to KGV Conveyance Deephams Reuse 46.5Ml/d Raw Water System - KGV Reservoir to Break Tank Raw Water System – TLT upgrade Raw Water System – Lockwood PS to KGV Reservoir Intake Raw Water System KGV Reservoir intake increase Network Reinforcement New Header tank at Coppermills WTW Network Reinforcement – New River Head Pump 4 replacement Coppermills WTW extension 100 Ml/d Coppermills WTW extension 150 Ml/d Raw Water System Conveyance from Break Tank to Coppermills Raw Water System Chingford South intake increase New River Head: Removal of constraints Chingford RWP River Lee New Gauge pipeline (chalk streams)
Fens Pool SAC	Oxford Canal to Cropredy Resource 15 Ml/d Oxford Canal to Dukes Cut Resource 15 Ml/d
Hackpen Hill SAC	South East Strategic Reservoir 150Mm3 South East Strategic Reservoir 125Mm3 South East Strategic Reservoir 100Mm3 South East Strategic Reservoir 75Mm3 South East Strategic Reservoir Phased 30+100Mm3 Phase 1 South East Strategic Reservoir Phased 30+100Mm3 Phase 2 South East Strategic Reservoir Phased 80+42Mm3 Phase 1 South East Strategic Reservoir Phased 80+42Mm3 Phase 2
Hartslock Wood SAC	Moulsford Groundwater Kennet Valley to SWOX 2.3 Ml/d Kennet Valley to SWOX 6.7 Ml/d
Kennet and Lambourn Floodplain SAC	East Woodhay borehole pumps
Kennet Valley Alderwoods SAC	East Woodhay borehole pumps
Lee Valley SPA and Ramsar	Coppermills WTW to New Honor Oak Service Reservoir TWRM Extension Network Reinforcement – Barrow Hill Pump 6 replacement Beckton to Lockwood Conveyance (300 Ml/d) Deephams to TLT extension Conveyance Deephams to KGV Conveyance Deephams Reuse 46.5Ml/d Raw Water System - KGV Reservoir to Break Tank Raw Water System – TLT upgrade Raw Water System – Lockwood PS to KGV Reservoir Intake Raw Water System KGV Reservoir intake increase Network Reinforcement New Header tank at Coppermills WTW Network Reinforcement – New River Head Pump 4 replacement Coppermills WTW extension 100 Ml/d Coppermills WTW extension 150 Ml/d Conveyance from Break Tank to Coppermills Raw Water System Chingford South intake increase New River Head: Removal of constraints Chingford RWP River Lee New Gauge pipeline (chalk streams)
Little Wittenham SAC	Abingdon to Farmoor Abingdon WTW (24 Ml/d) Didcot South East Strategic Reservoir 150Mm3 South East Strategic Reservoir 125Mm3 South East Strategic Reservoir 100Mm3 South East Strategic Reservoir 75Mm3 South East Strategic Reservoir 30+100Mm3 Phase 1 South East Strategic Reservoir 30+100Mm3 Phase 2 South East Strategic Reservoir 80+42Mm3 Phase 1 South East Strategic Reservoir 80+42Mm3 Phase 2 Raw Water Transfer Deerhurst to Culham 300 Ml/d Raw Water Transfer Deerhurst to Culham 400 Ml/d Raw Water Transfer Deerhurst to Culham 500 Ml/d

	SWOX to SWA (48 Ml/d) SWOX to SWA (72 Ml/d) Britwell Stream: Removal of constraints
Medway Estuary and Marshes SPA and Ramsar	Groundwater Southfleet/Greenhithe (new WTW) - 8 Ml/d
Mole Gap to Reigate Escarpment SAC	Shalford to Netley Mills Epsom Groundwater: Removal of constraints
North Meadow and Clattinger Farm SAC	Radcot WTW new 24 Ml/d (SWOX) RC Ashton Keynes borehole pumps - 2.5 Ml/d Wessex to SWOX (Flaxlands) SWA Pipelines (chalk streams)
Oxford Meadows SAC	Abingdon to Farmoor Abingdon WTW new 24 Ml/d (SWOX) Oxford Canal – Duke's Cut to Farmoor 15ML/D Oxford Canal to Dukes Cut Resource 15 Ml/d SWOX to SWA (48)
Pewsey Downs SAC	SWA Pipelines (chalk streams)
Richmond Park SAC	Kempton WTW expansion (100Ml/d) Kempton WTW expansion (150Ml/d) Kempton WTW expansion (300Ml/d) Network Reinforcement – Kempton WTW New shaft Hampton WTW to Battersea Extension London confined Chalk north AR Merton (SLARS3) - 5 Ml/d AR Streatham (SLARS2) - 4 Ml/d Raw Water System – Increase capacity of Surbiton intake Raw Water System – Queen Mary Reservoir to Kempton WTW site Epsom Groundwater: Removal of constraints South West London Pipelines (chalk streams)
River Lambourn SAC	East Woodhay borehole pumps
River Mease SAC	Oxford Canal to Cropredy Resource 15 Ml/d Oxford Canal to Dukes Cut Resource 15 Ml/d
River Wye SAC	River Wye to Deerhurst 60.3 ML/D
Severn Estuary SAC, SPA and Ramsar	Netheridge STW to River Severn 35 ML/D Raw Water Transfer Deerhurst to Culham 300 Ml/d Raw Water Transfer Deerhurst to Culham 400 Ml/d Raw Water Transfer Deerhurst to Culham 500 Ml/d
South West London Waterbodies SPA and Ramsar	Kempton WTW expansion (100Ml/d) Kempton WTW expansion (150Ml/d) Kempton WTW expansion (300Ml/d) Network Reinforcement – Kempton WTW New shaft Hampton WTW to Battersea Extension Thames Valley Central ASR Datchet Groundwater Raw Water System – Increase capacity of Surbiton intake Raw Water System – Queen Mary Reservoir to Kempton WTW site Raw Water System – Increase capacity of Littleton intake PS Raw Water System - Datchet intake increase Epsom Groundwater: Removal of constraints Datchet Groundwater South West London Pipelines (chalk streams)
Thames Basin Heaths SPA	Dapdune Licence Disaggregation Mortimer Recommissioning Guildford WSZ Shalford to Netley Mills Dapdune removal of constraints Ladymead WTW removal of constraints to DO - 7.8 Ml/d SEW to GUI 10 Ml/d Raw Water System – Queen Mary Reservoir to Kempton WTW site Raw Water System – Increase capacity of Littleton intake PS
Thames Estuary and Marshes SPA and Ramsar	Desalination – Crossness to Beckton tunnel Groundwater Southfleet/Greenhithe (new WTW) - 8 Ml/d Guildford WSZ Shalford to Netley Mill
Thursley and Ockley Bogs Ramsar	SEW to GUI 10 Ml/d
Thursley Hankley Frenshaw Common SPA	Dapdune Licence Disaggregation Guildford WSZ Shalford to Netley Mill Dapdune removal of constraints SEW to GUI 10 Ml/d SEW to Guildford

Thursley, Ash, Pirbright, and Chobham SAC	Dapdune Licence Disaggregation Dapdune removal of constraints Ladymead WTW removal of constraints to DO - 7.8 Ml/d SEW to GUI 10 Ml/d SEW to Guildford Raw Water System – Queen Mary Reservoir to Kempton WTW site Raw Water System – Increase capacity of Littleton intake PS
Walmore Common SPA and Ramsar	Hayden STW to River Severn 20 Ml/d Netheridge STW to River Severn 35 Ml/d
Wimbledon Common SAC	Kempton WTW expansion (100Ml/d) Kempton WTW expansion (150Ml/d) Kempton WTW expansion (300Ml/d) Direct River Abstraction Teddington to Thames Lee Valley Shaft 300 Ml/d Direct River Abstraction - Teddington Weir (Mogden Effluent Transfer) - 300 Ml/d Hampton WTW to Battersea Extension AR Merton (SLARS3) – 5 Ml/d AR Streatham (SLARS2) - 4 Ml/d Raw Water System – Increase capacity of Surbiton intake Mogden to Teddington 300 Ml/d Epsom Groundwater: Removal of constraints
Windsor Forest and Great Park SAC	Datchet Groundwater Eton removal of constraints to DO - 1.3 Ml/d Raw Water System – Queen Mary Reservoir to Kempton WTW site Raw Water System – Increase capacity of Littleton intake PS Raw Water System - Datchet intake increase Datchet Groundwater
Wormley and Hoddesdon Park Wood SAC	Raw Water System – Lockwood PS to KGV Reservoir Intake Raw Water System KGV Reservoir intake increase Chingford RWP
Wye Valley & Forest of Dean Bat Sites SAC	River Wye to Deerhurst 60.3 Ml/d
Wye Valley Woodlands SAC	River Wye to Deerhurst 60.3 Ml/d

4.2 Assessment of WRMP option elements

The HRA screening was carried out for all the option elements in Thames Water's Feasible List for the WRMP 2019. The full screening assessment findings for each of the European sites identified in Section 4.1 in relation to each option element is presented in

.

LSEs were identified for the option elements listed in **Table 4-2. All other option elements were assessed in the screening assessment as having no LSEs.**

Table 4-2 HRA Screening Assessment: Option elements where LSE could not be ruled out

Site	Option element[22]	Option reference	LSEs
Lee Valley SPA and Ramsar	Desalination Beckton to Coppermills tunnel	NET-DES-BEC-COP	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Coppermills WTW to New Honor Oak Service Reservoir TWRM Extension	NET-TWRM-COP-HON	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Beckton to Lockwood Conveyance (300 M/d)	CON-RU-BEC-LCK	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Deephams to KGV Conveyance	CON-RU-DPH-KGV	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Deephams to TLT extension Conveyance	CON-RU-DPH-TLTEX	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Deephams Reuse 46.5Ml/d	RES-RU-DPH	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Raw Water System - KGV Reservoir to Break Tank	CON-RWS-KGV-BT-300	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Raw Water System – TLT upgrade	CON-RWS-TLT-UPG-450	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Raw Water System – Lockwood PS to KGV Reservoir Intake	CON-RWS-LCK-KGV-800	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Raw Water System KGV Reservoir intake increase	CON-RWS-KGV-360	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Chingford South intake capacity increase	CON-RWS-CHS-PS-100	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Network Reinforcement New Header tank at Coppermills WTW	NET-TWRM-COP-HEA	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Coppermills WTW extension 100 Ml/d	WTW-LON-COP-100	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Coppermills WTW extension 150 Ml/d	WTW-LON-COP-150	
Lee Valley SPA and Ramsar	Raw Water System Conveyance from Break Tank to Coppermills	CON-RWS-BT-COP-800	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	River Lee New Gauge pipeline (chalk streams)		Potential disturbance impact of construction on wintering birds.
Wimbledon Common SAC	Hampton WTW to Battersea Extension	NET-TWRM-HAM-BAT	Potential mortality impact of construction

[22] For full description of options and option elements see the final WRMP.

			on stag beetle population.
Richmond Park SAC	Hampton WTW to Battersea Extension	NET-TWRM-HAM-BAT	Potential mortality impact of construction on stag beetle population.
South West London Waterbodies SPA and Ramsar	Kempton WTW expansion (100Ml/d)	WTW-LON-KEM-100	Potential disturbance impact of construction on wintering birds.
South West London Waterbodies SPA and Ramsar	Kempton WTW expansion (150Ml/d)	WTW-LON-KEM-150	
South West London Waterbodies SPA and Ramsar	Kempton WTW expansion (300Ml/d)	WTW-LON-KEM-300	
South West London Waterbodies SPA and Ramsar	Raw Water System – Queen Mary Reservoir to Kempton WTW site	CON-RWS-QMR-KEM-800	Potential disturbance impact of construction on wintering birds.
South West London Waterbodies SPA and Ramsar	Raw Water System – Increase capacity of Littleton intake PS	CON-RWS-LTN-300	Potential disturbance impact of construction on wintering birds.
South West London Waterbodies SPA and Ramsar	Raw Water System - Datchet intake increase	CON-RWS-DAT-300	Potential disturbance impact of construction on wintering birds.
South West London Waterbodies SPA and Ramsar	Network Reinforcement – Kempton WTW New shaft	NET-TWRM-KEM	Potential disturbance impact of construction on wintering birds.
South West London Waterbodies SPA and Ramsar	South West London Pipelines (chalk streams)		Potential disturbance impact of construction on wintering birds.
Thames Basin Heaths SAC	SEW to GUI 10 Ml/d	RES-ICT-SEW-GUI-MNT-10	Potential impact of construction on air quality.
Hartslock Wood SAC	Kennet Valley to SWOX 11 Ml/d	RES-IZT-KEN-SWOX-CLV-11	Potential impact of construction on designated flora.
Hartslock Wood SAC	Kennet Valley to SWOX 15.5 Ml/d	RES-IZT-KEN-SWOX-CLV-15.5	Potential impact of construction on designated flora.
Hartslock Wood SAC	Kennet Valley to SWOX		Potential impact of construction on designated flora.
Oxford Meadows SAC	Treated transfer to North SWA		Potential impact of construction via spread of invasive non-native species.
Oxford Meadows SAC	Oxford Canal 15 Ml/d/day (SWOX option)		Potential impact of construction via spread of invasive non-native species.
Oxford Meadows SAC	Oxford Canal – Duke's Cut to Farmoor 15 Ml/d	CON-RWS-OXC-FRM-15	Potential impact of construction via spread of invasive non-native species.
Oxford Meadows SAC	Network Reinforcement: North SWOX SWA	NET-IZT-AB-BS	Potential impact of construction and operation on

			groundwater flow regime.
Cothill Fen SAC	Abingdon WTW new 24 ML/D (SWOX)	WTW-SWOX-ABI	Potential impact of construction on groundwater flow regime.
Cothill Fen SAC	Treated transfer to North SWA		Potential impact of construction on groundwater flow regime.
Cothill Fen SAC	Abingdon to Farmoor	CON-RWS-ABI-FMR	Potential impact of construction and operation on groundwater flow regime.
Cothill Fen SAC	Culham to Farmoor	CON-RWS-CUL-FMR-180	Potential impact of construction and operation on groundwater flow regime.
Cothill Fen SAC	Network Reinforcement: North SWOX SWA	NET-IZT-AB-BS	Potential impact of construction and operation on groundwater flow regime.
Severn Estuary SAC, SPA and Ramsar	Raw Water Transfer Deerhurst to Culham 300 ML/D	CON-RWT-DEH-CLM-300	Impact on migratory fish species due to potential for reduced flows and in-channel barriers. Spread of invasive species between catchments.
Severn Estuary SAC, SPA and Ramsar	Raw Water Transfer Deerhurst to Culham 400 ML/D	CON-RWT-DEH-CLM-400	
Severn Estuary SAC, SPA and Ramsar	Raw Water Transfer Deerhurst to Culham 500 ML/D	CON-RWT-DEH-CLM-500	
River Wye SAC	River Wye to Deerhurst 60.3 Ml/d	RES-RWTS-WYE-60.3	Potential impacts to migratory fish, white-clawed crayfish and otters.
Wye Valley & Forest of Dean Bat Sites SAC	River Wye to Deerhurst 60.3 Ml/d	RES-RWTS-WYE-60.3	Potential impact of construction on qualifying bat species.
Wye Valley Woodlands SAC	River Wye to Deerhurst 60.3 Ml/d	RES-RWTS-WYE-60.3	Potential impact of construction on qualifying bat species.

4.3 Changes to Feasible List for WRMP19

As part of revisions to the WRMP, some option elements from the Feasible List were modified and some new option elements added. These have also been subject to HRA screening as summarised in Table **4-3**. Comprehensive screening tables for these new option elements are presented in **Error! Reference source not found.**.

Table 4-3 HRA Screening of new and modified option elements

Option	Relevant European site(s)	Element(s)	Change	HRA screening assessment outcome

Beckton Reuse Phase 1 (100)	Lee Valley SPA and Ramsar Epping Forest SAC	NET_Pumping Station to New Header tank at Coppermills WTW NET-TWRM-COP-PS	New option element	**LSEs cannot be ruled out.** **This element is similar to TWRM extension - Coppermills New Header tank option element. Although the pipeline is slightly closer (90m) to the Lee Valley SPA and Ramsar site than the header tank (160m), the LSEs are the same for both elements.**
Oxford Canal	River Mease SAC Ensors Pool SAC	RWP_15Ml/d Oxford Canal to Cropredy Resource CRT-RES-RCHR-CRO-15	Previously assessed as: Oxford Canal 15 Ml/d London (name change only)	No LSEs (no change)
Merton Recommissioning	Richmond Park SAC Wimbledon Common SAC	RES-RC-MTN	New option element	No LSEs This element is similar to the Merton SLARS option element. The closest point to Wimbledon Common SAC is 3.2km and Richmond Park 5.8km. This is beyond the maximum dispersal distance for stag beetle and there is no off-site functional habitat between the sites and Merton WTW. The London Clay underlying the SAC sites hydrogeologically separates the SACs from the abstraction site. Therefore operation of the scheme is unlikely to have any significant effects on the qualifying features of the SACs.
River Wye to Deerhurst 60.3 MLD	River Wye SAC Wye Valley & Forest of Dean Bat Sites SAC Wye Valley Woodlands SAC	RES-RWTS-WYE-60.3	New option element	**LSE cannot be ruled out to these SACs during construction.**
Minworth STW to River Avon 115 Ml/d	None	RES-RWTS-MIN	New option element	No LSEs.
Netheridge STW to River Severn 35 Ml/d	Cotswolds Beechwoods SAC Dixton Wood SAC Walmore Common SPA and Ramsar	RES-RWTS-NTH	New option element	No LSEs

	Severn Estuary SPA and Ramsar			
Hayden STW to River Severn 20 Ml/d	Cotswolds Beechwoods SAC Dixton Wood SAC Walmore Common SPA and Ramsar	RES-RWTS-HDN	New option element	No LSEs
River Avon to Willes Meadow Pond 50 Ml/d	None	RES-RWTS_DRA	New option element	No LSEs
Raw Water Systems: Abingdon to Farmoor.	Cothill Fen SAC Little Wittenham SAC Oxford Meadows SAC	CON-RWS-ABI-FMR	New option element	**LSEs at Cothill Fen SAC cannot be ruled out**
Inter-zonal Transfer Henley to SWA (5 Ml/d)	Chilterns Beechwoods SAC	RES-IZT-HEN-SWA-HAM-5	New option element	No LSEs
Inter-zonal Transfer Henley to SWOX (5 Ml/d)	Aston Rowant SAC Chilterns Beechwoods SAC	RES-IZT-HEN-SWX-NET-5	New option element	No LSEs
Guildford WSZ Shalford to Netley Mills	Thames Basin Heaths SPA Thursley, Hankley & Frensham Commons SPA Thursley, Ash, Pirbright & Chobham SAC Mole Gap to Reigate Escarpment SAC Thursley & Ockley Bogs Ramsar	NET-GUI-SFD-NML	New option element	No LSEs
Network Reinforcement North SWOX SWA (48)	Cothill Fen SAC Oxford Meadows SAC Chiltern Beechwoods SAC	NET-IZT-AB-BS-48	New option element	**LSEs at Cothill Fen SAC cannot be ruled out**

	Little Wittenham SAC			
Groundwater Honor Oak	None	RES-GW-HON	New option element	No LSEs
Removal of constraints Epsom Groundwater	Wimbledon Common SAC Richmond Park SAC Mole Gap to Reigate Escarpment SAC South West London Waterbodies SPA & Ramsar	RES-RC-EPS	New option element	No LSEs
Raw Water Systems Medmenham Intake-53	Chilterns Beechwoods SAC	CON-RWS-MMM-53	New option element	No LSEs
Groundwater Horton Kirby	None	RES-ASR-HTK	New option element	No LSEs
Groundwater New River Head Removal of Constraints	Lee Valley SPA & Ramsar Epping Forest SAC	RES-RC-NRV	New option element	No LSEs
Datchet Groundwater	South West London Waterbodies SPA and Ramsar Burnham Beeches SAC Windsor Forest and Great Park SAC	RES-GW-DAT	New option element	No LSEs
Vyrnwy Transfer to Severn Trent Water	Berwyn and South Clywd Mountains SAC Berwyn SPA	CON-TWT-VRY-SWY	New option element	No LSEs
Raw Water Transfer Upper Severn Vyrnwy	Berwyn and South Clywd Mountains SAC Berwyn SPA		Modified option element – different size (60Ml/d and 148Ml/d options)	No LSEs
Didcot	Cothill Fen SAC Little Wittenham SAC	RES-DRA-DID	New option element	No LSEs

Medmenham Raw water intake and transfer	Chilterns Beechwoods SAC	CON-RWS-MMM	Modified option element – different size (80 Ml/d)	No LSEs
Raw Water Systems Oxford Canal – Duke's Cut to Farmoor 15Ml/d	Oxford Meadows SAC Cothill Fen SAC	CON-RWS-OXC-FRM-15	New option element	No LSEs
Oxford Canal to Duke's Cut Resource	Oxford Meadows SAC Cothill Fen SAC Ensor's Pool SAC Fens Pool SAC Cannock Extension Canal SAC River Mease SAC Cannock Chase SAC	RES-RWTS-OXC-DKC-15	New option element	No LSEs
Oxford Canal to Cropredy Resource	Ensor's Pool SAC Fens Pool SAC Cannock Extension Canal SAC River Mease SAC Cannock Chase SAC	RES-RWTS-OXC-CRP-15	New option element	No LSEs
South East London Pipelines (chalk streams)	*No sites affected*		New option element	No LSEs
South West London Pipeline (chalk streams)	South West London Waterbodies SPA & Ramsar Richmond Park SAC		New option element	**LSEs at South West London SPA & Ramsar cannot be ruled out**
River Lee New Gauge pipeline (chalk streams)	Lee Valley SPA & Ramsar Epping Forest SAC		New option element	**LSEs at Lee Valley SPA & Ramsar cannot be ruled out**
SWA Pipelines (chalk streams)	Chilterns Beechwoods SAC Pewsey Downs SAC		New option element	No LSEs

	North Meadow and Clattinger Farm SAC			
Culham to Farmoor (chalk streams)	Cothill Fen SAC		New option element	**LSEs at Cothill Fen SAC cannot be ruled out**

4.4 Assessment of WRMP19 options in Preferred Programme

Table 4-4 summarises the screening assessments for each of the options included in the WRMP19 preferred programme.

LSEs have been identified for seven of the options.

Table 4-4 Option level HRA screening assessment for WRMP19 Preferred Programme

Option name	European sites assessed	Option elements	Element reference	Summary of key impacts	In-combination effects?	Stage 1 screening assessment
Demand Management London	*No sites affected*	Demand Management London	n/a	No likely significant effects identified	No	No LSEs
South East London Pipelines (chalk streams)	*No sites affected*	New Booster from Eltham to Southfleet FMZ Littlebrook Main reinforcement Honor Oak to Oxleas Wood main reinforcement		No likely significant effects identified	No	No LSEs
South West London Pipeline (chalk streams)	**South West London Waterbodies SPA & Ramsar** Richmond Park SAC	**Walton to Chessington reinforcement**		The Walton to Chessington pipeline runs adjacent to the South West London Waterbodies SPA & Ramsar and another reservoir that is not designated but has the potential to be utilised as off-site functional habitat by the qualifying bird species of the SPA & Ramsar. As such the proposals carry a risk of impacting upon the European sites and/or their qualifying features, namely over-wintering gadwall and shoveler. In the absence of mitigation, likely significant effects cannot be discounted for impacts to wintering birds and invasive non-native species. Construction of the option is at a sufficient distance from Richmond Park SAC (8.8km) to avoid mortality of qualifying stag beetles.	No	**LSE cannot be ruled out** **Stage 2 Appropriate Assessment is required**
River Lee New Gauge pipeline (chalk streams)	**Lee Valley SPA & Ramsar** Epping Forest SAC	**New River Transfer Tunnel pipeline and pumping station**		The new pipeline and pumping station are adjacent to the northern bank of the Chingford Reservoirs SSSI which has the potential to be used as off-site functional habitat for the Lee Valley SPA & Ramsar. As such, the proposals carry a risk of impacting upon the European sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Site. Construction of the option is at a sufficient distance from Epping Forest SAC (5km) to avoid mortality of qualifying stag beetles.	No	**LSE cannot be ruled out** **Stage 2 Appropriate Assessment is required**
SWA Pipelines (chalk streams)	Chilterns Beechwoods SAC Pewsey Downs SAC North Meadow and Clattinger Farm SAC	Loss of Clatford & Marlborough Sources - Source replacement from Farmoor area Loss of Pann Mill Source - Transfer of licence to Medmenham		No likely significant effects identified	No	No LSEs
New River Head – Removal of constraints	Lee Valley SPA & Ramsar Epping Forest SAC	New River Head – Removal of constraints	RES-RC-NRV	No likely significant effects identified	No	No LSEs
AR Merton (SLARS3) – 5 Ml/d	Richmond Park SAC Wimbledon Common SAC	AR Merton (SLARS3) – 5 Ml/d	RES-AR-SLARS3	No likely significant effects identified. Construction of the option is at a sufficient distance from Richmond Park SAC (2.7km) and Wimbledon Common SAC (5.3km) to avoid mortality of qualifying stag beetles. There are potential *de minimus* air quality impacts on Richmond Park SAC related to emissions from construction and operation traffic, however these are not expected to cause significant effects alone.	No	No LSEs

Aquifer Storage Recovery (ASR) Horton Kirby	*No sites affected*	Aquifer Storage Recovery (ASR) Horton Kirby	RES-AR-HTK	No likely significant effects identified	No	No LSEs
Addington Groundwater – 1Ml/d	*No sites affected*	Addington Groundwater – 1Ml/d	RES-GW-ADD	No likely significant effects identified	No	No LSEs
Deephams Reuse	**Lee Valley SPA/Ramsar (LSE)** Epping Forest SAC	**Deephams Reuse 46.5Ml/d** **Deephams to KGV Conveyance**	**RES-RU-DPH** **CON-RU-DPH-KGV**	The Deephams Reuse plant lies 130m to the west of the Chingford Reservoirs SSSI which has the potential to be used as off-site functional habitat for the Lee Valley SPA & Ramsar. The Deephams to KGV conveyance also runs along the western edge of the Chingford Reservoirs SSSI. As such, the proposals carry a risk of impacting upon the European sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Site. Construction of the option is at a sufficient distance from Epping Forest SAC (2km) to avoid mortality of qualifying stag beetles. There are potential *de minimus* air quality impacts on Lee Valley SPA & Ramsar and Epping Forest SAC related to emissions from construction and operation traffic, however these are not expected to cause significant effects alone.	No	**LSE cannot be ruled out** **Stage 2 Appropriate Assessment is required**
RC Epsom borehole pumps – 2.13Ml/d (groundwater scheme)	Wimbledon Common SAC Richmond Park SAC Mole Gap to Reigate Escarpment SAC South West London Waterbodies SPA & Ramsar	RC Epsom borehole pumps – 2.13Ml/d (groundwater scheme)	RES-RC-EPS	No likely significant effects identified.	No	No LSEs
Oxford Canal to Cropredy Resource 15Ml/d	Ensor's Pool SAC Fens Pool SAC Cannock Extension Canal SAC River Mease SAC Cannock Chase SAC	Oxford Canal to Cropredy Resource 15Ml/d	RES-RWTS-OXC-CRP-15	No likely significant effects identified	No	No LSEs
Groundwater Southfleet / Greenhithe (new WTW) – 8Ml/d	Thames Estuary SPA/Ramsar Medway Estuary SPA/Ramsar	Groundwater Southfleet / Greenhithe (new WTW) – 8Ml/d	RES-GW-SOU	No likely significant effects identified	No	No LSEs
Chingford Raw Water Purchase	*No sites affected*	Chingford Raw Water Purchase	RES-RWP-CHD	No likely significant effects identified	No	No LSEs

South East Strategic Reservoir Option	Cothill Fen SAC Hackpen Hill SAC Little Wittenham SAC	South East Strategic Reservoir Option 150Mm^3	RES-RRR-ABI-150-150Mm3	No likely significant effects identified	No	No LSEs
Culham to Farmoor (chalk streams)	**Cothill Fen SAC**	Culham to Farmoor 180Ml/d	CON-RWS-CUL-FAR-180	There is potential for a temporary minor impact to groundwater flow towards Cothill Fen SAC resulting from pipeline construction. Mitigation would be required to prevent an adverse effect on site integrity.	No	**LSE cannot be ruled out** **Stage 2 Appropriate Assessment is required**
ASR SE Lon Addington	*No sites affected*	ASR SE Lon Addington	RES-ASR-SEL	No likely significant effects identified	No	No LSEs
Merton recommissioning	Richmond Park SAC Wimbledon Common SAC	Merton recommissioning	RES-RC-MTN	No likely significant effects identified	No	No LSEs
AR SLARS Kidbrooke (SLARS1) – 7 Ml/d	*No sites affected*	AR SLARS Kidbrooke (SLARS1) – 7 Ml/d	RES-AR-SLARS1-7	No likely significant effects identified	No	No LSEs
Severn Thames Transfer	Cothill Fen SAC Little Wittenham SAC Bredon Hill SAC Dixton Wood SAC Cotswolds Beechwoods SAC Walmore Common SPA & Ramsar **Severn Estuary SAC, SPA & Ramsar** Berwyn and South Clywd Mountains SAC Berwyn SAC	**Raw Water Transfer Deerhurst to Culham 300 Ml/d** Netheridge Final Effluent Transfer Vyrnwy Transfer to Severn Trent Water 30Ml/d Raw Water Transfer: Upper Severn – Vyrnwy Reservoir Raw Water Transfer Mythe 15 Ml/d (London only)	**CON-RWT-DEH-CLM-300** RES-RWTS-NTH RES-RWTS-SHR-30 RES-RWTS-VYR-60 RES-RWT-MYT-15-LON	Off-site functional habitat for the three anadromous fish species (river lamprey, sea lamprey and twaite shad) that form qualifying features of the Severn Estuary SAC could potentially be affected along the Severn between the river intake at Deerhurst and the European Marine Site by both construction and operation. Inclusion of hands-off flow conditions is required to prevent operation of the option from impeding upstream passage of these species to a significant extent. There is also potential for impacts related to water pollution and invasive non-native species as a result of construction activities. Mitigation measures will be required to prevent adverse effects on the Severn Estuary SAC, SPA and Ramsar.	No	**LSE cannot be ruled out** **Stage 2 Appropriate Assessment is required**

Coppermills WTW extension	**Lee Valley SPA & Ramsar** Epping Forest SAC	Coppermills WTW extension 100Ml/d Riverhead Pump Replacement	WTW-LON-COP-100 NET-TWRM-NRV-PUM	The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar Site. As such, the proposals carry a risk of impacting upon the European sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Site. In the absence of mitigation, likely significant effects cannot be discounted for impacts to wintering birds, water pollution and invasive non-native species during construction of the treatment works. Construction of the option is at a sufficient distance from Epping Forest SAC (9.3km) to avoid mortality of qualifying stag beetles. There are potential *de minimus* air quality impacts on Lee Valley SPA & Ramsar and Epping Forest SAC related to emissions from construction and operation traffic.	Potential in-combination effect on air quality	**LSE cannot be ruled out** **Stage 2 Appropriate Assessment is required**
Kempton WTW	**South West London Waterbodies SPA & Ramsar** Richmond Park SAC Wimbledon Common SAC	**Kempton WTW expansion (100Ml/d)** **Network Reinforcement – Kempton WTW New shaft**	**WTW-LON-KEM-100** **NET-TWRM-KEM**	The Kempton Water Treatment Works is located approximately 520m from the South West London Waterbodies SPA & Ramsar. The proposed new shaft is approximately 220m from the SPA & Ramsar site. As such the proposals carry a risk of impacting upon the European sites and/or their qualifying features, namely over-wintering gadwall and shoveler. In addition, there is a non-designated waterbody at Kempton racecourse to the south that could be used as off-site functional habitat by the qualifying feature bird species of the SPA/Ramsar Site. As this lies approximately 490m to the south of the shaft option element it could be subject to significant noise/visual disturbance as a result of works. In the absence of mitigation, likely significant effects cannot be discounted for impacts to wintering birds and invasive non-native species. Construction of the option is at a sufficient distance from Richmond Park SAC (7.5km) and Wimbledon Common SAC (9.9km) to avoid mortality of qualifying stag beetles. There are potential *de minimus* air quality impacts on Richmond Park SAC related to emissions from construction and operation traffic.	Potential in-combination effect on air quality	**LSE cannot be ruled out** **Stage 2 Appropriate Assessment is required**
Didcot Raw Water Purchase	Cothill Fen SAC Little Wittenham SAC	Didcot	RES-DRA-DID	No likely significant effects identified	No	No LSEs
Datchet Groundwater	South West London Waterbodies SPA and Ramsar Burnham Beeches SAC Windsor Forest and Great Park SAC	Datchet Groundwater	RES-GW-DAT	No likely significant effects identified	No	No LSEs
Medmenham intake to SWA	Chilterns Beechwoods SAC	Medmenham Raw water intake and transfer 80Ml/d Medmenham WTW 24Ml/d	CON-RWS-MMM-80 WTW-SWA-MMM	Construction of the option is at a sufficient distance from Chilterns Beechwoods SAC (2.1km) to avoid mortality of qualifying stag beetles.	No	No LSEs
SWA Demand Management	*No sites impacted*	SWA Demand Management	n/a	No likely significant effects identified	No	No LSEs
SWOX Demand Management	*No sites impacted*	SWOX Demand Management	n/a	No likely significant effects identified	No	No LSEs
Ladymead and Shalford to Albury	Thames Basin Heaths SPA	Ladymead WTW removal of constraints Shalford to Netley Mill	RES-RC-LAD NET-GUI-SFD-NML	No likely significant effects identified	No	No LSEs

	Thursley, Ash, Pirbright and Chobham SAC Thursley, Hankley & Frensham Commons SPA Mole Gap to Reigate Escarpment SAC Thursley & Ockley Bogs Ramsar					
GW_Dapdune	Thursley, Ash, Pirbright and Chobham SAC Thursley Hankley Frenshaw Common SPA Thames Basin Heaths SPA	Groundwater Dapdune Licence Disaggregation	RES-GW-DAP	No likely significant effects identified	No	No LSEs
NTC_Dapdune	Thames Basin Heaths SPA Thursley, Ash, Pirbright and Chobham SAC	Dapdune removal of constraints	RES-RC-DAP	No likely significant effects identified	No	No LSEs
DMP HEN Metering	*No sites impacted*	DMP HEN Metering		No likely significant effects identified	No	No LSEs
DMP KV Metering	*No sites impacted*	DMP KV Metering		No likely significant effects identified	No	No LSEs
DMP GUI Metering	*No sites impacted*	DMP GUI Metering		No likely significant effects identified	No	No LSEs

Most of the options included in the WRMP19 Preferred Programme were assessed as having no LSE on any European sites (see Table 4-4). However, seven of the individual options that form part of the preferred programme require an Appropriate Assessment.

4.4.1 Appropriate Assessment

Appropriate assessments have been carried out for the seven options for which Likely Significant Effects could not be discounted. A summary of the assessment outcomes is presented in Table **4-5**. For all options, no adverse impact to site integrity or the ability of the site to achieve its conservation objectives is anticipated, subject to appropriate mitigation. A cost estimate has been prepared for each of the schemes which includes an allowance for mitigation to deliver the scheme.

The full Appropriate Assessment reports are included in **Error! Reference source not found.**F-L. A comprehensive list of required mitigation is included in **Error! Reference source not found.** E.

Table 4-5 Summary of Stage 2 Appropriate Assessment outcomes

Option	Impact	Relevant European site(s)	Mitigation	Adverse effect?
Coppermills WTW Extension 100 Ml/d	Noise and visual disturbance to qualifying wintering bird species during construction. Water pollution, air quality and invasive species impacts as a result of construction	Lee Valley SPA & Ramsar	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Noise assessment to be completed prior to commencement of works to ensure mitigation measures will be effective. • Adherence to EA Pollution Prevention Guidelines (now formally withdrawn but still relevant and useful) • Best practice construction methods. • Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction.	No
Culham to Farmoor 180 Ml/d (chalk streams)	Potential impact to groundwater flows during construction and operation.	Cothill Fen SAC	• Groundwater survey to be carried out prior to construction to ensure pipeline route runs to the west of the groundwater divide to prevent impacts to groundwater flow to the SAC. Minor route changes to be implemented if required. • Backfill pipe with gravel to maintain permeability around the pipeline.	No

Severn Thames Transfer	Water pollution and invasive species impacts to qualifying habitats during construction. Impacts to flow, water quality and qualifying migratory fish species as a result of operation of the transfer.	Severn Estuary SAC, SPA & Ramsar	• Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction.
			• Adherence to EA Pollution Prevention Guidelines (now formally withdrawn but still relevant and useful)
			• Best practice construction methods.
			• Inclusion of a two-stage hands-off flow (HOF) restriction in the abstraction licence.
			  ○ HOF of 1800Ml/d, below which no abstraction for transfers will be allowed to take place.
			  ○ HOF of 2490Ml/d, below which abstractions will be limited to a maximum of 240Ml/d.
			• Intake screens to guard against fish mortality through abstraction.
				No

Deephams Reuse	Noise and visual disturbance to qualifying wintering bird species during construction.	Lee Valley SPA & Ramsar	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Noise assessment to be completed prior to commencement of works to ensure mitigation measures will be effective.	No
Kempton WTW 100 Ml/d	Noise and visual disturbance to qualifying wintering bird species during construction. Risk of invasive species transfer during construction.	South West London Waterbodies SPA & Ramsar	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Noise assessment to be completed prior to commencement of works to ensure mitigation measures will be effective. • Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction.	No
South West Pipelines (chalk streams)	Noise and visual disturbance to qualifying wintering bird species during construction. Risk of invasive species transfer during construction.	South West London Waterbodies SPA & Ramsar	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Noise assessment to be completed prior to commencement of works to ensure mitigation measures will be effective. • Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction.	No
River Lee New Gauge pipeline (chalk streams)	Noise and visual disturbance to qualifying wintering bird species during construction.	Lee Valley SPA & Ramsar	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Noise assessment to be completed prior to commencement of works to ensure mitigation measures will be effective.	No

4.4.2 In-combination assessment

HRA screening has also been carried out (Table 4-4) to determine if the individual options comprising the programme may have any LSEs when implemented in-combination. Options which have some de minimus effects that are not significant alone may still have an overall LSE at the programme level. This may be a result of the in-combination effects of construction or operation, for example if construction dates overlap or if multiple options have minor effects on the same qualifying feature(s) of the same European site(s).

Figure 4-1 shows the timeline of planned construction and activation of the options included in the preferred programme. This has been used to identify programme-level LSEs during construction.

Construction period assessment:

Despite the 2-year overlap in construction between the ASR Horton Kirby, Southfleet/Greenhithe Groundwater and ASR South East London options, no in-combination effects have been identified on any European sites.

There is a 4-year overlap in construction between the five chalk stream options (Culham to Farmoor, South East London Pipelines, South West London Pipelines, River Lee New Gauge pipeline and SWA Pipelines options, however, no in-combination effects have been identified on any European sites.

Similarly, although there is a 1-year overlap in construction between the Deephams Reuse, Oxford Canal to Cropredy Resource, ASR South East London and AR SLARS Kidbrooke options, no in-combination effects have been identified on any European sites.

The following options overlap in construction for three years:

- AR Merton (SLARS3)
- Addington Groundwater
- Deephams Reuse
- RC Epsom borehole pumps
- Oxford Canal to Cropredy Resource
- South East Strategic Reservoir
- ASR South East London
- Merton Recommissioning (2 years only)
- AR SLARS Kidbrooke

Construction of AR Merton (SLARS3), South East Strategic Reservoir and ASR South East London also overlaps for a further one year. Construction of Deephams Reuse, AR SLARS Kidbrooke (SLARS1) and Oxford Canal to Cropredy Resource also overlaps for an extra year.

The only *de minimus* effects for these options that could act in combination relate to the following:

Richmond Park SAC – impacts to stag beetles

- AR Merton (SLARS3)
- RC Epsom borehole pumps
- Merton Recommissioning

Wimbledon Common SAC – impacts to stag beetles and air quality

- AR Merton (SLARS3)
- RC Epsom borehole pumps
- Merton Recommissioning

The potential *de minimus* effects on stag beetles and air quality are not deemed sufficient to act in combination to lead to a significant effect on the qualifying features of Richmond Park SAC or Wimbledon Common SAC. This is due to the considerable distance of the option from the European site compared to the typical dispersal ability of stag beetles (and the urban surroundings which they would have to cross) and the distance at which significant air quality impacts can be incurred.

The construction programme for the other options do not overlap at all and therefore in-combination likely significant effects can be excluded during construction.

In summary, no likely significant effects, either alone or in-combination, were identified in respect of the preferred programme during the construction phase.

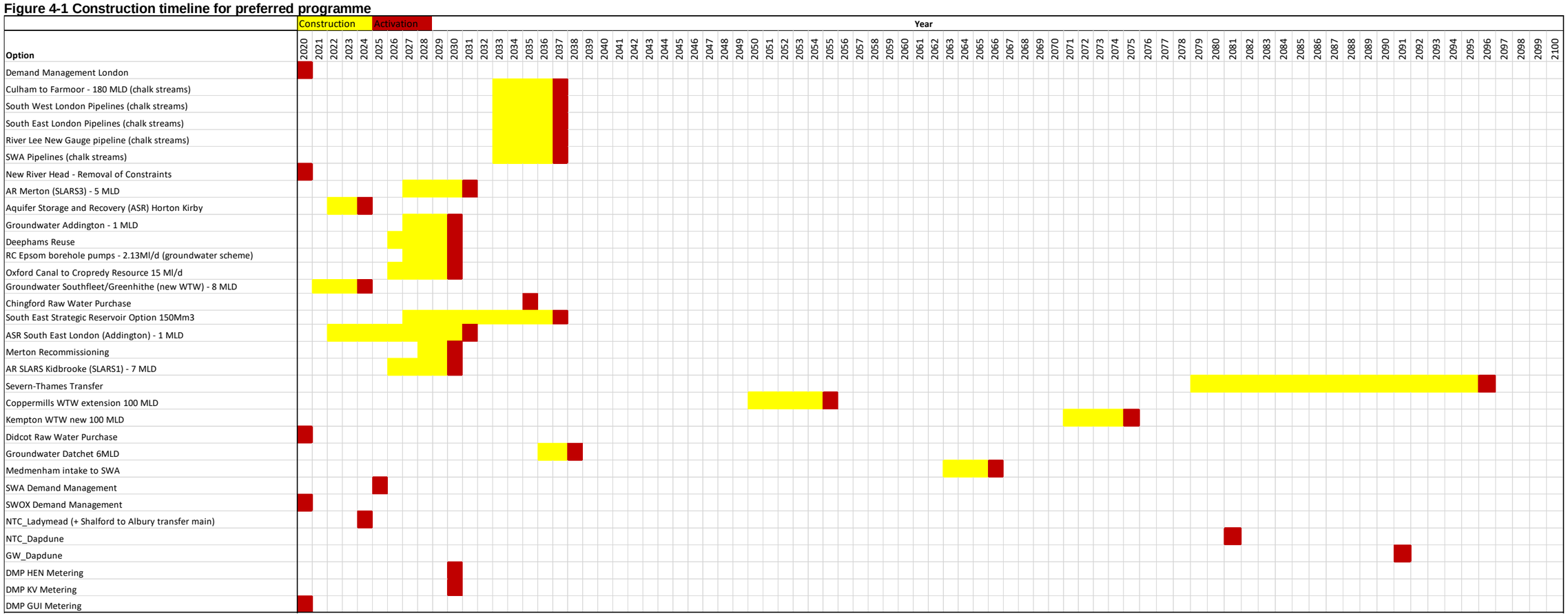
Operational assessment:

Potential sources of operational impacts include routine deliveries of chemicals or other materials by road, chemical spills and pollution risks, disturbance from maintenance activities and changes in water quality, water levels or river flows that might affect sensitive receptors. Given the long life-span of the schemes included in the preferred programme, there is significant overlap of options in the operational phase when compared to the construction phase.

Reference to the parallel WFD assessment confirmed that there would be no significant impact on either water quality or water levels within the King George V reservoirs as a result of the New River Head, Deephams reuse or Coppermills WTW extension options. This is because, as part of the proposed options, reuse water will be treated to a high standard during operation by Thames Water prior to being released in to the River Lee/King George V reservoirs. Compliance with the WFD is a pre-requisite to obtain the required Environment Agency discharge permit. Whilst the WFD assessment is a separate document and considers different impacts and receptors, the effect on water level and water quality of King George V reservoirs is relevant to determining likely significant effects on qualifying features of European sites in the vicinity.

Although there will be some increases in water levels as a result of operation, these are expected to be within the normal range for these reservoirs and, as such, will not lead to a significant effect on the qualifying bird species.

Figure 4-1 Construction timeline for preferred programme



5 Potential in-combination effects with other plans and projects

The term 'in-combination effects' is adopted as the collective term to include additive or synergistic (i.e. cumulative) effects. The in-combination effects include consideration of other plans, programmes and projects in the context of spatial and/or temporal proximity, including the following:

- Thames Water's draft Drought Plan 2016
- Neighbouring water companies' WRMPs and Drought Plans
- Environment Agency Drought Plans
- River Basin Management Plans
- Local development and land use plans
- Other major infrastructure projects and plans

An assessment of in-combination effects of these plans specific to European sites was carried out as part of the Habitat Regulations Assessment as presented below.

5.1 Thames Water's Draft Drought Plan

Thames Water's draft Drought Plan 2016[23] (and recent revisions being made in light of the public consultation on the draft plan) sets out the range of demand management and supply augmentation measures that the company may need to implement during drought conditions to maintain essential water supplies to its customers.

A review of the Thames Water's revised draft Drought Plan 2018 supply augmentation options identified the following possible cumulative effects with the WRMP19 supply augmentation schemes and/or drought order/drought permit options for the period up to end 2023:

- The Horton Kirby ASR option is common to both the WRMP19 and the revised draft Drought Plan 2018. After the planned operational date of the WRMP option in 2022, the option would no longer be considered as a drought option for the Drought Plan. The Horton Kirby ASR option does not impact any European sites, therefore no in-combination effects are possible.
- The WRMP19 includes a groundwater removal of constraints option at Southfleet/Greenhithe in the River Darent catchment, with construction commencing in 2021, which would be operational after the end of the period covered by the revised draft Drought Plan 2018. The potential for in-combination effects between this WRMP option and groundwater options in the revised draft Drought Plan 2018 which potentially affect surface flows in the River Darent catchment (Sundridge, Eynsford, Wansunt, Crayford) will be screened in the next Drought Plan.
- No cumulative effects are anticipated to arise from the Waddon groundwater drought permit and the ASR South East London scheme in the WRMP19.

5.2 Neighbouring Water Companies' 2019 WRMPs and Drought Plans

2019 WRMPs

Collaborative work with some of Thames Water's neighbouring water companies has taken place during the development of the 2019 WRMPs through the Water Resources South East (WRSE) group. Environmental assessment of the range of feasible supply options in the WRMPs of these companies

[23] Thames Water (2016). Draft Drought Plan. Consultation document issued January 2017.

has indicated that there is unlikely to be any in-combination adverse effects with the supply schemes included in the Thames Water WRMP 2019.

The WRSE cumulative effects assessment of feasible options in South-East England (mid-August 2018) flagged that the Groundwater Southfleet/Greenhithe option may act in combination with Southern Water's Recommission Meopham Greensand groundwater source on the Thames Estuary and Marshes SPA and Ramsar. However, neither option has any *de minimus* effects given the distance from the European site, therefore no in-combination effects are anticipated. No other schemes were identified that may give rise to in-combination LSEs from the latest information from the WRSE companies.

The Affinity Water WRMP19 identified the following two options that have the potential to result in a likely significant effect upon the South West London Waterbodies SPA and Ramsar both individually and in combination:

- AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50Ml/d)
- AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50Ml/d)

These schemes also have the potential to result in Likely Significant Effects in combination with three options included in the Thames Water WRMP19 (Kempton Park WTW, South West London Pipelines (Chalk Streams) and the Datchet Groundwater scheme).

The Appropriate Assessment of Kempton Park WTW identified a series of construction-period mitigation measures very similar to those identified by the HRA of Affinity Water's rdWRMP for schemes AFF-RTR-WRZ1-4010 and AFF-RTR-WRZ4-4011. This enabled the HRA to conclude no adverse effects on site integrity. Moreover, the Kempton WTW will be constructed between 2071 and 2075 and therefore long after schemes AFF-RTR-WRZ4-4010 and AFF-RTR-WRZ4-4011 are completed. As such no in combination adverse effects on site integrity will arise.

No likely significant effects are anticipated in relation to the Datchet Groundwater scheme because the scheme does not have a pipeline element and construction consists solely of a minor scale upgrade to existing assets (borehole pump and work inside the existing Water Treatment Works).

No in-combination effects are likely between Datchet Groundwater scheme and the Affinity Water schemes. This is due to both distance from the SPA/Ramsar waterbodies (c.800m) and the high level of existing disturbance at closer waterbodies. For example, the Queen Mother reservoir and Datchet gravel pit are of limited value for the qualifying feature species (gadwall and shoveller) due to the heavy disturbance levels from sailing/water-skiing. They are also screened from visual disturbance due to treelines and (for the reservoir) high embankments.

The Walton to Chessington pipeline which forms part of the Affinity Water schemes runs adjacent to the South West London Waterbodies SPA & Ramsar and another reservoir that is not designated but has the potential to be utilised as off-site functional habitat by the qualifying bird species of the designated site. As such the proposals carry a risk of impacting upon the European sites and/or their qualifying features, namely over-wintering gadwall and shoveler, without appropriate mitigation. The Appropriate Assessment for South West London pipelines (Chalk Streams) identified a series of construction-period mitigation measures very similar to those identified in the HRA of the Affinity Water WRMP for schemes AFF-RTR-WRZ1-4010 and AFF-RTR-WRZ1-4011. This enabled the HRA to conclude no adverse effects on site integrity. As such, since both the South West London pipelines (Chalk Streams) scheme and the two Affinity Water schemes will be implementing appropriate mitigation, even if construction occurs simultaneously, any low level residual effects (not significant alone) from the three schemes cannot act in combination to exceed the threshold for an adverse effect. Additionally, the South West London pipelines (Chalk Streams) scheme will be constructed between 2033-2037 and the two Affinity Water Abingdon Reservoir transfer schemes will be constructed after 2038, therefore no adverse cumulative effects will arise.

No other in-combination LSEs are currently anticipated in relation to other water companies outside of the WRSE group with the WRMP19.

This in-combination effects assessment will need to be regularly reviewed as WRMP schemes are progressed by other water companies over the coming years, and the specific details of the supply and demand management measures are confirmed.

Drought Plans

No in-combination LSEs between the WRMP19 and other water company current published Drought Plans on European sites are anticipated.

Drought Plans are required to be updated every five years by water companies. The in-combination effects assessments will need to be updated over time to reflect any changes to the Drought Plans.

5.3 Environment Agency Drought Plan and Canal & River Trust Drought Plan

Environment Agency National Drought Plan

Part of the Environment Agency's role is to reduce the impact of drought on the natural environment by taking specific actions. The Environment Agency can apply for environmental drought orders if the environment is suffering serious damage because of abstraction during a drought. The plan says that the Environment Agency would work with stakeholders including water companies to identify where and when it would be necessary and its potential effects on any essential public supplies or infrastructure.

Given that the Environment Agency drought actions will have a positive effect on river flows and lake levels and, therefore, the natural environment and ecology, there will be no in-combination LSEs with the WRMP19.

Canal & River Trust Drought Plan

No in-combination LSEs are anticipated in respect of the Canal & River Trust's (CRT) drought management plan. The Oxford Canal scheme utilises surplus resources available to the canal and no adverse effects should arise. No other WRMP19 scheme is likely to have in-combination effects with water resources required for the CRT canal system.

The information used to carry out these in-combination assessments is considered to be the most up to date information available at the time of writing, but the assessments may need to be reviewed at the time of drought option implementation.

5.4 River Basin Management Plans

The WRMP19 may have in-combination effects with the Thames River Basin Management Plan (RBMP) 2015[24] and the Severn RBMP 2015[25]. These RBMPs acknowledge that, to support economic growth and development, significant or large scale infrastructure projects will occasionally take place within the river basin district.

In accordance with these RBMPs, the WRMP19 includes measures to maintain a supply-demand balance while addressing the need to deliver sustainable abstraction from water bodies. Increased abstraction should be offset by demand management measures and/or measures to address unsustainable abstractions and therefore there will not be a significant decrease in water levels in the reservoirs that form European sites or their off-site functional habitat (i.e. Lee Valley SPA/Ramsar and South West London Waterbodies SPA/Ramsar), nor any overall adverse effects on the Severn Estuary European Marine Site. There are therefore no in-combination LSEs in respect of the Thames RBMP.

5.5 Local Development and Land Use Plans

Opportunity areas identified in the London Plan are described as major pools of brownfield land with capacity to accommodate new housing, commercial and other developments. All the WRMP19 schemes

[24] Defra and Environment Agency (2016). Water for life and livelihoods: Thames river basin district River Basin Management Plan 2015. Updated December 2015.
[25] Defra and Environment Agency (2016). Water for life and livelihoods: Severn river basin district River Basin Management Plan 2015. Updated December 2015.

located within Greater London are within 10km of at least one Opportunity Area and therefore any remaining de minimus effects on European sites have the potential to act in-combination with those developments. Areas for Intensification can support redevelopment at high densities but at a level below that of Opportunity Areas. As with Opportunity Areas, all of the WRMP19 schemes within Greater London are located within 10km of one or more of these Areas for Intensification. With careful planning and dialogue with the Greater London Authority and relevant London Boroughs (particularly with regard to the potential for in-combination effects on wintering birds, stag beetles and air quality and appropriate mitigation to offset any such effects to applicable European sites), no in-combination effects are anticipated on European sites as a result of future development of these Opportunity or Intensification Areas. It should be noted that some schemes (such as Severn-Thames Transfer) will not be developed for many decades and therefore the in-combination effects assessment will need to be updated in the future to take account of the prevailing London Plan or equivalent strategic plan. Outside of Greater London, no specific in-combination effects with land use and development plans have been identified.

5.6 Other Major Infrastructure Projects and Plans

Most of the confirmed or well-developed plans for significant infrastructure schemes are scheduled to be constructed and commissioned within the next 5-10 years. Relevant schemes have been reviewed in relation to spatial and temporal proximity to the WRMP19 schemes to assess whether any in-combination effects might arise. Key schemes reviewed included:

- River Thames Flood Alleviation Scheme (Datchet to Teddington)
- Oxford Flood Alleviation Scheme
- Abingdon Flood Alleviation Scheme
- Thames Tideway Tunnel Project
- Crossrail 1: construction (2013-2020) and the westerly extension (post-2020)
- Crossrail 2
- High Speed Two Rail Network (HS2): Construction of Phase 1 of the HS2 network from Euston station (London) to Birmingham.
- North London Heat and Power Project.
- North London (Electricity Line) Reinforcement.
- A2 Bean and Ebbsfleet Junction Improvements

Of these schemes, the following can be excluded from the in-combination effects assessment:

- HS2 – this scheme has no spatial proximity to any of the options within the preferred programme (or their applicable European sites) and therefore cannot act in-combination with them.
- Crossrail 1 – works due to be complete by 2020 and therefore no potential construction in-combination effects.

Some temporary in-combination effects are possible in relation to the flood alleviation schemes for the main River Thames referenced above during construction depending on the precise timing of the construction. Thames Water will liaise closely with the Environment Agency on these schemes over the next few years as they are progressed to ensure no significant in-combination effects on European sites occur.

No in-combination adverse construction effects will arise in connection with the Thames Tideway project (construction due to be completed by 2021). No in-combination adverse operational effects are anticipated.

Crossrail 2 has been developed to the stage of an outline strategy with an indicative route and stations, but no firm decisions have yet been reached on the funding of the line. Should Crossrail 2 gain approval in the next few years, there is a possible risk of some temporal and spatial overlaps of construction activities with some of the new conveyance routes in south-west London associated with the Kempton water treatment works expansion and South West London pipeline options, and Merton groundwater is

in a similar area. To the north of London there are potential overlaps with parts of the River Lee New Gauge pipeline, Deephams reuse and Coppermills WTW schemes. No operational in-combination effects are anticipated. Thames Water will liaise closely with the Department for Transport and Transport for London to assess the potential risks of construction in-combination effects on European sites as the Kempton water treatment works and Merton options are brought forward for development.

There are no likely in-combination construction effects associated with Deephams Reuse together with the North London Heat and Power Project and the North London (Electricity Line) Reinforcement as both are anticipated to be operational before Deephams Reuse is constructed

Given the considerable mitigation proposed in the Stage 2 Appropriate Assessments to avoid impacts to wintering birds associated with the Lee Valley SPA/Ramsar no significant in-combination effects are anticipated with the North London Heat and Power Project; especially as this project is being constructed largely in existing industrial land with an existing high disturbance baseline meaning that birds should already be habituated to such disturbance. The works are located well in excess of the 200m zone within which significant air quality impacts can occur. Negligible potential stag beetle habitat would be impacted and the works are located at a sufficient distance from Epping Forest SAC (and Richmond Park SAC) that dispersal of members of the qualifying feature population in to the works area is considered highly unlikely. As such, no in-combination effects are expected in relation to the North London Heat and Power Project.

As the North London (Electricity Line) Reinforcement runs adjacent to the Chingford and Banbury Reservoirs and passes in close proximity to the Lee Valley SPA and Ramsar at Waltham Cross and Tottenham substations it carries with it a clear potential to impact upon the wintering bird qualifying features of the site and therefore act in-combination with the Coppermills WTW option. However, if the most disruptive construction activities are timed to avoid the wintering period, as advocated in the Stage 2 Appropriate Assessment, then there would be no de minimus effect at all as a result of WRMP19 that could act in-combination. The scheme is understood to be a sufficient distance from Epping Forest SAC that no adverse impacts on air quality or stag beetles would be experienced with mitigation. No impact pathway with Richmond Park SAC or Wormley and Hoddesdon Park Woods SAC has been identified.

Whilst there is potential construction overlap between the A2 Bean and Ebbsfleet Junction Improvements and the Southfleet/Greenhithe GW option, in-combination effects are considered unlikely as the *de minimus* disturbance effect to qualifying bird species using functional habitat within 1km of the option are too minor to lead to a significant effect in-combination (given the significant distance of the European sites from the option meaning major use of that functional habitat is unlikely and the fact that the functional habitat is near the maximum distance at which disturbance impacts could occur in any case). Similarly, if future extensions to Crossrail south-eastwards from the current terminus at Abbey Wood to the Gravesend area were to take place then no in-combination effects would occur. There are, however, no definitive plans at present to construct any such extension.

There are no known other confirmed or well-developed plans for significant infrastructure schemes, and particularly none beyond 2030, although a number of significant developments are probable (for example, further expansion of Heathrow airport). The in-combination effects assessment will therefore need to be updated in the future to take account of the prevailing plans for such schemes as Thames Water brings forward its WRMP19 schemes for development over the coming decades.

6 HRA findings for WRMP19 alternative programmes

Thames Water identified six reasonable alternative programmes for HRA screening prior to reaching its decision on the final preferred programme for the WRMP19. These are:

- favouring intergenerational equity;
    - (Min_IGEQ)[26]
- favouring resilience and cost equally;
    - (Multi-obj_RES)
- favouring customer preference for the frequency of restrictions and cost equally;
    - (Multi-obj_FP)
- favouring resilience with a programme cost restriction of 120% of least cost ;
    - (NearO_RES)
- favouring customer preference for type of options with a programme cost restriction of 120% of least cost;
    - (NearO_TP)[27]; and
- least cost programme;
    - (Phased_LC)

The HRA screening assessments (including in-combination effects) for these alternative programmes are presented in **Table 6-1**. Option-level assessments for options included in these alternative programmes but which were not included in the final preferred programme are presented in **Error! Reference source not found.**.

No in-combination effects with other water company plans or projects are anticipated based on the information currently available.

Table 6-1 Screening assessment of reasonable alternative programmes

Option	HRA ASSESSMENT	Least cost	Option included in "reasonable alternative" programme					
			Multi-obj_RES	Multi-obj_FP	NearO_RES	NearO_TP	Min-IGEQ	Preferred Programme
Aquifer Storage and Recovery (ASR) Horton Kirby	No LSE	✓	✓	✓	✓		✓	✓
AR SLARS Kidbrooke (SLARS1) 7 Ml/d	N/A		✓	✓				✓
AR Streatham (SLARS2) 5 Ml/d	No LSE	✓	✓	✓			✓	
AR Merton (SLARS3) 5 Ml/d	No LSE	✓	✓	✓	✓		✓	✓
ASR South East London (Addington) 1 Ml/d	N/A	✓	✓	✓	✓			
ASR South East London (Addington) 3 Ml/d	N/A							✓

26 Min_IGEQ = (Minimum Intergenerational Equity) An optimisation run that uses a 1% discount rate instead of 3.5% in order to decrease the incentive to defer spend to the future (lower IGEQ values represent better performance in the modelling outputs)

27 NearO_TP = (Near optimal type preference) An optimisation run that meets customer preferences for option type, constrained to within 120% of the Least Cost

Option	HRA ASSESSMENT	Least cost	Option included in "reasonable alternative" programme					
			Multi-obj_RES	Multi-obj_FP	NearO_RES	NearO_TP	Min-IGEQ	Preferred Programme
ASR Thames Valley/Thames Central 3 Ml/d	No LSE	✓	✓	✓	✓		✓	
Beckton Desalination 150	LSE	✓		✓	✓	✓	✓	
Beckton Reuse 200 Ml/d (phased 100)	No LSE		✓					
Beckton Reuse 300 Ml/d (phased 150)	No LSE			✓				
Chingford Raw Water Purchase	No LSE	✓	✓	✓	✓	✓	✓	✓
Coppermills WTW extension 100 Ml/d	LSE	✓	✓	✓	✓	✓	✓	✓
Culham to Farmoor 180 Ml/d	LSE							✓
Deephams Reuse	LSE	✓		✓	✓		✓	✓
Didcot Raw Water Purchase	No LSE	✓	✓	✓	✓	✓	✓	✓
Groundwater Addington 1 Ml/d	N/A	✓	✓	✓	✓		✓	✓
Groundwater Datchet 6Ml/d	No LSE	✓	✓	✓	✓		✓	✓
Groundwater London confined Chalk (north) 2 Ml/d	No LSE	✓		✓	✓		✓	
Groundwater Moulsford 1 - 3.5 Ml/d	No LSE	✓	✓	✓	✓		✓	
Groundwater Southfleet/Greenhithe (new WTW) 8 Ml/d	No LSE	✓	✓	✓	✓		✓	✓
Honor Oak	No LSE		✓				✓	
ITZ_North SWX to SWA 72	LSE		✓					
ITZ_North SWX to SWA 48	LSE			✓				
Kempton WTW new 100 Ml/d	LSE	✓	✓	✓	✓	✓	✓	✓
River Lee New Gauge pipeline (chalk stream)	LSE							✓
Medmenham intake to SWA	No LSE	✓			✓	✓	✓	✓
Merton Recommissioning	No LSE	✓	✓	✓			✓	✓
New River Head - Removal of Constraints	No LSE	✓	✓	✓	✓		✓	✓
Oxford Canal to Cropredy Resource 15 Ml/d	No LSE	✓	✓	✓	✓		✓	✓
RC Ashton Keynes borehole pumps 2.5 Ml/d	No LSE	✓	✓	✓	✓		✓	
RC Britwell 1.31 Ml/d	No LSE	✓	✓	✓	✓		✓	
RC Epsom borehole pumps - 2.13Ml/d (groundwater scheme)	No LSE	✓	✓	✓	✓		✓	✓
Severn-Thames Transfer	LSE				✓			
Severn-Thames Transfer 1	LSE							✓
Severn-Thames Transfer 2	LSE		✓					
Severn-Thames Transfer 3	LSE			✓				
South East Strategic Reservoir Option 125Mm^3	No LSE	✓		✓				
South East Strategic Reservoir Option 150Mm^3	No LSE		✓			✓	✓	✓
South East London Pipelines	No LSE							✓
South West London Pipelines	LSE							✓
SWA Pipelines	No LSE							✓
Wessex to SWOX (Flaxlands)	No LSE	✓	✓				✓	

The following options are those for which no Likely Significant Effects could not be concluded and which therefore would require a Stage 2 Appropriate Assessment if the option is included in the preferred programme. The applicable Appropriate Assessments for any of these options that are included in the Preferred Programme are provided at Appendix F-L.

Option Name	Assessment	Summary
Beckton Desalination 150	Appropriate Assessment required.	Potential disturbance to over wintering birds.

Option Name	Assessment	Summary
Coppermills WTW extension 100 Ml/d	Appropriate Assessment required. See Appendix I	LSEs on over wintering birds from construction noise, visual stimuli from the construction workforce and plant on the site, and light pollution.

Option Name	Assessment	Summary
Culham to Farmoor 180 Ml/d	Appropriate Assessment required. See Appendix G.	LSEs to/from groundwater flows, dust and physical damage. Stage 2 Appropriate Assessment required to address previous Natural England concerns.

Option Name	Assessment	Summary
Deephams Reuse	Appropriate Assessment required. See Appendix F.	LSEs on over wintering birds from construction noise, visual stimuli from the construction workforce and plant on the site, and light pollution.

Option Name	Assessment	Summary
Kempton WTW new 100 Ml/d	Appropriate Assessment required. See Appendix J.	LSEs on over wintering birds from construction noise, visual stimuli from the construction workforce and plant on the site, and light pollution.

Option Name	Assessment	Summary
River Lee New Gauge pipeline (chalk stream)	Appropriate Assessment required. See Appendix L.	LSEs on over wintering birds from construction noise, visual stimuli from the construction workforce and plant on the site, and light pollution.

Option Name	Assessment	Summary
Severn Thames Transfer Options (x 4)	Appropriate Assessment required. See Appendix H – Thames Transfer 1.	LSEs to estuarine habitats from operational abstraction.

Option Name	Assessment	Summary
South West London Pipelines	Appropriate Assessment required. See Appendix K.	LSEs on over wintering birds from construction noise, visual stimuli from the construction workforce and plant on the site, and light pollution.

Option Name	Assessment	Summary
ITZ_North SWX to SWA 48 ITZ_North SWX to SWA 72	Appropriate Assessment required.	LSEs to/from groundwater flows.

6.1 Potential in-combination effects of alternative programmes with other plans and projects

Potential in-combination effects of each of the alternative programmes are outlined in Appendix G of the Strategic Environmental Report. This identifies the groups of schemes which have potential cumulative construction and operational effects which has been used to assess the potential for in-combination effects on European sites:

- Favouring intergenerational equity programme
  No potential in-combination effects.

- Favouring resilience and cost equally programme
  No potential in-combination effects.

- Favouring customer preference for the frequency of restrictions and cost equally programme
  No potential in-combination effects.

- Favouring resilience with a programme cost restriction of 120% of least cost programme
  Potential in-combination construction impacts with Kempton WTW new 100 Ml/d and ASR Thames Valley/Thames Central 3 Ml/d. In-combination impacts to qualifying bird species of the South West London Waterbodies SPA & Ramsar would require a Stage 2 Appropriate Assessment if this programme were to replace the Preferred Programme in the final WRMP19.

There are no anticipated in-combination operational effects with Beckton Desalination 150, Deephams Reuse and Beckton Reuse 200 Ml/d (phased 100).

Potential in-combination operational effects with Groundwater Datchet 6Ml/d and ASR Thames Valley/Thames Central 3 Ml/d. In-combination impacts to qualifying bird species of the South West London Waterbodies SPA & Ramsar would require a Stage 2 Appropriate Assessment if this programme were to replace the Preferred Programme in the final WRMP19.

- Favouring customer preference for type of options with a programme cost restriction of 120% of least cost programme

  There are no anticipated in-combination operational effects with Beckton Desalination 150 and Coppermills WTW.

- Least Cost programme

  No potential in-combination effects

7 Conclusions

The HRA of the WRMP19 has been undertaken in parallel with the Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment and to ensure its overall compliance with international and national environmental legislation.

The HRA screening assessment of the WRMP19 has concluded that of the 33 options included within the preferred programme, 26 options are not likely to have any significant effect on any European site. A Stage 2 Appropriate Assessment was required for seven options where it had not been possible at the screening stage to conclude no likely significant effects in order to determine whether these would adversely affect the integrity of a European site(s) after the consideration of mitigation measures. These Stage 2 Appropriate Assessments have determined that, with the application of mitigation measures as set out in each assessment, none of the options are likely to have any adverse effect on site integrity or the ability of the site to achieve its conservation objectives.

With the inclusion of the mitigation measures, Thames Water's WRMP19 has been assessed to have no adverse effects on the integrity of any European site, either alone or in-combination with other plans or projects.

HRA will still need to be carried out (at the individual project level) as and when each of the schemes included in the preferred programme are brought forward by Thames Water for promotion and applications are made for planning permission and environmental permits. At that stage, the HRA will need to be revisited to take account of any changes to scheme design, construction and operational arrangements, as well as the final package of mitigation measures. In-combination effects will also need to be re-assessed to take account of prevailing, updated, information on other projects, programmes and plans.

Ricardo Energy & Environment

Habitats Regulation Assessment

Appendix A: HRA screening assessment of WRMP19 Feasible Option Elements

Report for: Thames Water Utilities Limited

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This Appendix presents the findings of the HRA Stage 1 screening assessment of the option elements considered by Thames Water in its Resources Management Plan 2019 (WRMP19). This document forms part of the statutory HRA report to accompany the submission of the WRMP19.

Table 1 below sets out the potential European sites that might be affected by construction and/or operation of each option element. The sites were selected using the methodology set out in Section 3 of the main HRA report. The subsequent tables in this Appendix provide the screening assessments for each of the identified European sites, indicating whether any option element has likely significant effects (LSE) on designated features of the site.

Table 1. List of European sites that may be affected by each WRMP19 option element

Option Element Type	Element Name	Element Reference	European Sites that might be affected
Conveyance: Raw Water System	Raw Water System – Lockwood PS to KGV Reservoir Intake	CON-RWS-LCK-KGV-800	Lee Valley SPA and Ramsar Wormley and Hoddesdon Park Wood SAC Epping Forest SAC
Conveyance: Raw Water System	Raw Water System – Increase capacity of Surbiton intake	CON-RWS-SUR-100	Wimbledon Common SAC Richmond Park SAC South West London Waterbodies SPA and Ramsar
Conveyance: Raw Water System	KGV Reservoir intake increase	CON-RWS-KGV-360	Lee Valley SPA and Ramsar Wormley and Hoddesdon Park Wood SAC Epping Forest SAC
Conveyance: Raw Water System	Chingford South intake increase	CON-RWS-CHS-100	Lee Valley SPA and Ramsar Epping Forest SAC
Conveyance: Raw Water System	Raw Water System – Queen Mary Reservoir to Kempton WTW site	CON-RWS-QMR-KEM-800	Richmond Park SAC Windsor Forest Great Park SAC South West London Waterbodies SPA and Ramsar Thursley, Ash, Pirbright, and Chobham SAC Thames Basin Heaths SPA
Conveyance: Raw Water System	Raw Water System - KGV Reservoir to Break Tank	CON-RWS-KGV-BPT	Epping Forest SAC Lee Valley SPA and Ramsar
Conveyance: Raw Water System	Raw Water System – TLT upgrade	CON-RWS-TLT-UPG-450	Epping Forest SAC Lee Valley SPA and Ramsar
Conveyance: Raw Water System	Raw Water System - Datchet intake increase	CON-RWS-DAT-300	South West London Waterbodies SPA and Ramsar Burnham Beeches Windsor Forest and Great Park SAC
Conveyance: Raw Water System	Raw Water System – Increase capacity of Littleton intake PS	CON-RWS-LTN-300	South West London Waterbodies SPA and Ramsar Thames Basin Heaths SPA Windsor Forest and Great Park SAC Thursley, Ash, Pirbright and Chobham SAC
Conveyance: Raw Water System	SWA south: Medmenham Raw water intake and transfer	CON-RWS-SWA-MMM	Chilterns Beechwoods SAC
Conveyance: Raw Water Transfer	Raw Water Transfer Deerhurst to Culham 300 Ml/d	CON-RWT-DEH-CLM-300	Cothill Fen SAC

Option Element Type	Element Name	Element Reference	European Sites that might be affected
			Little Wittenham SAC Bredon Hill SAC Dixton Wood SAC Severn Estuary SAC, SPA and Ramsar
Conveyance: Raw Water Transfer	Raw Water Transfer Deerhurst to Culham 400 Ml/d	CON-RWT-DEH-CLM-400	Cothill Fen SAC Little Wittenham SAC Bredon Hill SAC Dixton Wood SAC Severn Estuary SAC, SPA and Ramsar
Conveyance: Raw Water Transfer	Raw Water Transfer Deerhurst to Culham 500 Ml/d	CON-RWT-DEH-CLM-500	Cothill Fen SAC Little Wittenham SAC Bredon Hill SAC Dixton Wood SAC Severn Estuary SAC, SPA and Ramsar
Conveyance: Reuse	Beckton to Lockwood Covneyance (300 Ml/d)	CON-RU-BEC-LCK	Lee Valley SPA and Ramsar Epping Forest SAC
Conveyance: Reuse	Deephams to KGV Conveyance	CON-RU-DPH-KGV	Lee Valley SPA and Ramsar Epping Forest SAC
Conveyance: Reuse	Deephams to TLT extension Conveyance	CON-RU-DPH-TLTEX	Lee Valley SPA and Ramsar Epping Forest SAC
Conveyance: River Abstraction	Direct River Abstraction Teddington to Thames Lee Valley Shaft 300 Ml/d	CON-RA-TED-TLT	South West London Waterbodies SPA and Ramsar Richmond Park SAC Wimbledon Common SAC
Conveyance: River Abstraction	Mogden to Teddington 300 Ml/d	CON-RA-MOG-TED	Wimbledon Common SAC Richmond Park SAC South West London Waterbodies SPA and Ramsar
Conveyance: Raw Water System	Conveyance from Break Tank to Coppermills	CON-RWS-BT-COP-800	Epping Forest SAC Lee Valley SPA and Ramsar
Network: Desalination	Desalination Beckton to Coppermills tunnel	NET-DES-BEC-COP	Epping Forest SAC Lee Valley SPA and Ramsar
Network: Desalination	Desalination – Crossness to Beckton tunnel	NET-DES-CRO-BEC	Epping Forest SAC Thames Estuary SPA and Ramsar
Network: TWRM	Hampton WTW to Battersea Extension	NET-TWRM-HAM-BAT	South West London Waterbodies SPA and Ramsar Wimbledon Common SAC Richmond Park SAC
Network: TWRM	Coppermills WTW to New Honor Oak Service Reservoir TWRM Extension	NET-TWRM-COP-HON	Lee Valley SPA and Ramsar Epping Forest SAC

Option Element Type	Element Name	Element Reference	European Sites that might be affected
Network: TWRM	Network Reinforcement New Header tank at Coppermills WTW	NET-TWRM-COP-HEA	Lee Valley SPA and Ramsar Epping Forest SAC
Network: TWRM	Network Reinforcement – New River Head Pump 4 replacement	NET-TWRM-NRV-PUM	Lee Valley SPA and Ramsar Epping Forest SAC
Network: TWRM	Network Reinforcement – Barrow Hill Pump 6 replacement	NET-TWRM-BAR-PUM	Lee Valley SPA and Ramsar
Network: TWRM	Network Reinforcement – Kempton WTW New shaft	NET-TWRM-KEM	South West London Waterbodies Richmond Park SAC
Resource: Inter-Company Transfers	SEW to GUI 10 Ml/d	RES-ICT-SEW-GUI-MNT-10	Thursley, Ash, Pirbright and Chobham SAC Thursley Hankley Frenshaw Common SPA Thames Basin Heaths SPA Thursley and Ockley Bogs Ramsar
Resource: Aquifer Recharge	AR and SLARS Kidbrooke	RES-AR-SLARS1-7	None
Resource: Aquifer Recharge	AR Merton (SLARS3) - 5 Ml/d	RES-AR-SLARS3	Richmond Park SAC Wimbledon Common SAC
Resource: Aquifer Recharge	AR Streatham (SLARS2) - 4 Ml/d	RES-AR-SLARS2	Richmond Park SAC Wimbledon Common SAC
Resource: Aquifer Storage & Recovery	ASR SE Lon Addington	RES-ASR-SEL	None
Resource: Aquifer Storage & Recovery	Thames Valley Central ASR	RES-ASR-TV	South West London Waterbodies SPA and Ramsar
Resource: Desalination	Beckton Desalination treatment plant 150Ml/d	RES-DES-BEC-150	Epping Forest SAC
Resource: Desalination	Crossness Desal Treatment Plant 3 phases of 100Ml/d	RES-DES-CRO-100	None
Resource: Groundwater	Datchet Groundwater	RES-GW-DAT	South West London Waterbodies SPA and Ramsar Burnham Beeches SAC Windsor Forest and Great Park SAC
Resource: Groundwater	Mortimer Recommissioning	RES-GW-MOR	Thames Basin Heaths SPA
Resource: Groundwater	London confined Chalk north	RES-GW-LCC	Richmond Park SAC
Resource: Groundwater	Groundwater Southfleet/Greenhithe (new WTW) - 8 Ml/d	RES-GW-SOU	Thames Estuary and Marshes SPA and Ramsar Medway Estuary and Marshes SPA and Ramsar
Resource: Groundwater	Dapdune Licence Disaggregation	RES-GW-DAP	Thursley, Ash, Pirbright and Chobham SAC Thursley Hankley Frenshaw Common SPA Thames Basin Heaths SPA
Resource: Groundwater	Groundwater Arla Foods Licence Trading/Transfer - 2 Ml/d	RES-GW-ARF	Lee Valley SPA and Ramsar Epping Forest SAC
Resource: Groundwater	Addington Groundwater - 1 Ml/d	RES-GW-ADD	None
Resource: Groundwater	Moulsford Groundwater	RES-GW-MOU	Hartslock Wood SAC
Resource: Inter-Company Transfers	Wessex to SWOX (Flaxlands)	RES-ICT-WSX-FLX	North Meadow and Clattinger Farm SAC
Resource: Inter-Zonal Transfers	Henley to SWOX 2.37 Ml/d	RES-IZT-HEN-SWOX-NET-2.37	Aston Rowant SAC Chilterns Beechwood SAC
Resource: Inter-Zonal Transfers	Henley to SWOX 5 Ml/d	RES-IZT-HEN-SWOX-NET-5	Aston Rowant SAC Chilterns Beechwood SAC

Option Element Type	Element Name	Element Reference	European Sites that might be affected
Resource: Inter-Zonal Transfers	Kennet Valley to SWOX 2.3 Ml/d	RES-IZT-KEN-SWOX-CLV-2.3	Hartslock Wood SAC
Resource: Inter-Zonal Transfers	Kennet Valley to SWOX 6.7 Ml/d	RES-IZT-KEN-SWOX-CLV-6.7	Hartslock Wood SAC
Resource: Inter-Zonal Transfers	Henley to SWA 5 Ml/d	RES-IZT-HEN-SWA-HAM-5	Chilterns Beechwood SAC
Resource: Inter-Zonal Transfers	Henley to SWA 2.37 Ml/d	RES-IZT-HEN-SWA-HAM-2.37	Chilterns Beechwood SAC
Resource: Raw water transfer support	Lake Vyrnwy - 180 Ml/d	RES-RWTS-VYR-180	Berwyn and South Clywd Mountains SAC Berwyn SPA
Resource: Raw water transfer support	Mythe WTW	RES-RWTS-MYT	Bredon Hill Dixton Wood
Resource: Removal of Constraints	RC Ashton Keynes borehole pumps - 2.5 Ml/d	RES-RC-ASH	North Meadow and Clattinger Farm SAC
Resource: Removal of Constraints	East Woodhay borehole pumps	RES-RC-EWO	River Lambourn SAC Kennet Valley Alderwoods SAC Kennet and Lambourn Floodplain SAC
Resource: Removal of Constraints	Dapdune removal of constraints	RES-RC-DAP	Thames Basin Heaths SPA Thursley, Ash, Pirbright and Chobham SAC
Resource: Removal of Constraints	Eton removal of constraints to DO - 1.3 Ml/d	RES-RC-ETN	South West London Waterbodies SPA and Ramsar Burnham Beeches SAC Windsor Forest and Great Park SAC
Resource: Removal of Constraints	Ladymead WTW removal of constraints to DO - 7.8 Ml/d	RES-RC-LAD	Thames Basin Heaths SPA Thursley, Ash, Pirbright and Chobham SAC
Resource: Reservoir	South East Strategic Reservoir 150Mm3	RES-RRR-ABI-150Mm3	Cothill Fen SAC Hackpen Hill SAC Little Wittenham SAC
Resource: Reservoir	South East Strategic Reservoir 125Mm3	RES-RRR-ABI-125Mm3	Cothill Fen SAC Hackpen Hill SAC Little Wittenham SAC
Resource: Reservoir	South East Strategic Reservoir 100Mm3	RES-RRR-ABI-100Mm3	Cothill Fen SAC Hackpen Hill SAC Little Wittenham SAC
Resource: Reservoir	South East Strategic Reservoir 75Mm3	RES-RRR-ABI-75Mm3	Cothill Fen SAC Hackpen Hill SAC Little Wittenham SAC
Resource: Reservoir	South East Strategic Reservoir 30+100Mm3 Phase 1	RES-RRR-ABI-30+100Mm3-P1	Cothill Fen SAC Hackpen Hill SAC Little Wittenham SAC
Resource: Reservoir	South East Strategic Reservoir 30+100Mm3 Phase 2	RES-RRR-ABI-30+100Mm3-P2	Cothill Fen SAC Hackpen Hill SAC Little Wittenham SAC
Resource: Reservoir	South East Strategic Reservoir 80+42Mm3 Phase 1	RES-RRR-ABI-80+42Mm3-P1	Cothill Fen SAC Hackpen Hill SAC Little Wittenham SAC

Option Element Type	Element Name	Element Reference	European Sites that might be affected
Resource: Reservoir	South East Strategic Reservoir 80+42Mm3 Phase 2	RES-RRR-ABI-80+42Mm3-P2	Cothill Fen SAC Hackpen Hill SAC Little Wittenham SAC
Resource: Reuse	Beckton Reuse 100 Ml/d	RES-RU-BEC-100	Epping Forest SAC
Resource: Reuse	Beckton Reuse 150 Ml/d	RES-RU-BEC-150	Epping Forest SAC
Resource: Reuse	Deephams Reuse 46.5Ml/d	RES-RU-DPH	Lee Valley SPA and Ramsar Epping Forest SAC
Resource: River Abstraction	Direct River Abstraction - Teddington Weir (Mogden Effluent Transfer) - 300 Ml/d	RES-DRA-TED	Richmond Park SAC Wimbledon Common SAC South West London Waterbodies SPA and Ramsar
Treatment: London	Kempton WTW expansion (100Ml/d)	WTW-LON-KEM-100	Richmond Park SAC Wimbledon Common SAC South West London Waterbodies SPA and Ramsar
Treatment: London	Kempton WTW expansion (150Ml/d)	WTW-LON-KEM-150	Richmond Park SAC Wimbledon Common SAC South West London Waterbodies SPA and Ramsar
Treatment: London	Kempton WTW expansion (300Ml/d)	WTW-LON-KEM-300	Richmond Park SAC Wimbledon Common SAC South West London Waterbodies SPA and Ramsar
Treatment: London	Coppermills WTW extension 100 Ml/d	WTW-LON-COP-100	Lee Valley SPA and Ramsar Epping Forest SAC
Treatment: London	Coppermills WTW extension 150 Ml/d	WTW-LON-COP-150	Lee Valley SPA and Ramsar Epping Forest SAC
Treatment: SWOX	Abingdon WTW new 24 Ml/d (SWOX)	WTW-SWOX-ABI	Cothill Fen SAC Little Wittenham SAC
Treatment SWA	Medmenham WTW (24Ml/d)	WTW-SWA-MMM	Chilterns Beechwoods SAC
Treatment SWA	Treated transfer to North SWA (SWOX to SWA)	NET-IZT-AB-LC	Oxford Meadows SAC Cothill Fen SAC Little Wittenham SAC
Treatment: SWOX	Radcot WTW new 24 Ml/d (SWOX)	WTW-SWOX-RAD	None
Conveyance: River Abstraction	River abstraction in South SWA		Chilterns Beechwoods SAC Aston Rowant SAC

The following tables report the screening assessments for each of the European sites identified above (set out in geographical order from east to west) in relation to each relevant option element.

Designated site name:	**Medway Estuary and Marshes**		
Designation type: (SAC, SPA, Ramsar):	**SPA and Ramsar**		
Qualifying features:	• A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding) • A048 *Tadorna tadorna*; Common shelduck (Non-breeding) • A054 *Anas acuta*; Northern pintail (Non-breeding) • A132 *Recurvirostra avosetta*; Pied avocet (Breeding) • A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding) • A137 *Charadrius hiaticula*; Ringed plover (Non-breeding) • A141 *Pluvialis squatarola*; Grey plover (Non-breeding) • A143 *Calidris canutus*; Red knot (Non-breeding) • A149 *Calidris alpina alpina*; Dunlin (Non-breeding) • A162 *Tringa totanus*; Common redshank (Non-breeding) • A195 *Sterna albifrons*; Little tern (Breeding) • Waterbird assemblage • Breeding bird assemblage	**Ramsar Criterion 2:** The site supports several species of rare plants and animals. The site holds 10 nationally scarce plants. A total of at least twelve British Red Data Book species of wetland invertebrates have been recorded on the site. A significant number of non-wetland British Red Data Book species also occur. **Ramsar Criterion 5:** Assemblages of international importance: Species with peak counts in winter: 47637 waterfowl **Ramsar Criterion 6:** Species/populations occurring at levels of international importance. Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn: • Grey plover, *Pluvialis squatarola*, E Atlantic/W Africa -wintering • Common redshank, *Tringa totanus totanus*, Species with peak counts in winter: • Dark-bellied brent goose, *Branta bernicla bernicla*, • Common shelduck, *Tadorna tadorna*, NW Europe • Northern pintail, *Anas acuta*, NW Europe • Ringed plover, *Charadrius hiaticula*, Europe/Northwest Africa • Red knot, *Calidris canutus islandica*, W & Southern Africa • Dunlin, *Calidris alpina alpina*, W Siberia/W Europe	**Water Dependency:** All of the bird species that form the qualifying features of this site are water dependant as they are either waders or waterfowl, relying heavily on water/water dependant habitats for feeding and protection from predators. The Ramsar Site and its various qualifying criteria (by definition) are all water dependent.
Current conservation status:	• A046a(NB) *Branta bernicla bernicla*; Dark-bellied brent goose - Population numbers: Sufficient, Range coverage: Sufficient, Ecological sufficiency: insufficient • A048(NB) *Tadorna tadorna*: Common shelduck - Population numbers: Sufficient, Range coverage: Sufficient, Ecological sufficiency: sufficient • A054(NB) *Anas acuta*; Northern pintail - Population numbers: Sufficient, Range coverage: Sufficient, Ecological sufficiency: sufficient • A132(NB) *Recurvirostra avosetta*: Pied avocet - population numbers: insufficient, range coverage: insufficient, especially in northern parts of the range, ecological sufficiency: sufficient • A137(NB) *Charadrius hiaticula*: Ringed plover - population numbers: sufficient, range coverage: sufficient, ecological sufficiency: sufficient • A141(NB) *Pluvialis squatarola*: Grey plover – population numbers: sufficient, range coverage: sufficient, ecological sufficiency: sufficient • A143(NB) *Calidris canutus*: Red knot - population numbers: sufficient, range coverage: sufficient, ecological sufficiency: sufficient • A149(NB) *Calidris alpina alpina*: Dunlin - population numbers: sufficient, range coverage: sufficient, ecological sufficiency: sufficient • A162(NB) *Tringa totanus*: Common redshank - population numbers: insufficient, range coverage: insufficient, ecological sufficiency: sufficient • A195(B) *Sterna albifrons*; Little tern - population numbers: insufficient, range coverage: insufficient, ecological sufficiency: sufficient		
Conservation objectives:	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and 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 populations of qualifying features • the distribution of qualifying features within the site		
SSSI Condition assessment:	Medway Estuary and Marshes SSSI: 53.72% Unfavourable – recovering, 0.24% unfavourable no change, 45.56% unfavourable declining, 0.47% destroyed		

Site Improvement Plan:	1. Public Access/Disturbance – pressure/threat – A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler - Agree and implement an over-arching access management strategy 2. Under grazing – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement an over-arching habitat management strategy 3. Forestry and woodland management – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Review and agree forestry plans/policies to ensure compatibility with objectives 4. Hydrological changes – threat – H4010 Wet heathland with cross-leaved heath, H7150 Depressions on peat substrates Hydrological investigations 5. Inappropriate scrub control – pressure- A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Agree habitat management strategies for all sites 6. Invasive species – pressure/threat - H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Agree and implement invasive control strategies at all relevant sites 7. Wildlife/arson – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement fire risk reduction strategies at all sites 8. Air Pollution: impact of atmospheric nitrogen deposition – pressure/threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates Agree and implement Nitrogen management/mitigation strategies at all sites 9. Feature location/ extent/ condition unknown – Threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler Develop and implement improved bird monitoring strategy 10. Military – threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement integrated management plans for military sites 11. Habitat fragmentation – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Commission study to identify habitat management priorities to reduce fragmentation	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Groundwater Southfleet/Greenhithe (new WTW) - 8 Ml/d	The closest part of this option element to the SPA component of the site is approximately 16.5km to the east; the closest part of the Ramsar component of the site is approximately 12km to the south east. The only potential off-site functional habitat for birds within 1km of the works is a large waterbody approximately 800m to the east. Whilst this may be used sporadically by individual waders this is expected to be a rarity due to the narrow shoreline and the abundant alternative functional habitat along the River Thames closer to the SPA/Ramsar Sites. As such, no significant disturbance impact to functional habitat is expected. The SIP elements of potential relevance to this proposed option are (4) hydrological changes, (6) invasive species and (8) air pollution. Given the significant distance of the option element to the SPA and Ramsar Site, invasive species impacts on heathland and air quality impacts can be immediately excluded. The SSSI conditions (vast majority unfavourable – either recovering or declining) could potentially be affected by hydrological changes, which in turn could affect the ability to achieve the various sites conservation objectives. The remainder of this assessment considers the likely impacts on hydrological changes. Groundwater in the chalk aquifer from which water will be abstracted is likely to be fairly close to the surface (information obtained from surrounding boreholes). It is estimated that groundwater could be drawn down by an additional 3.6m at a distance of 500m from the abstraction, and 0.7m at a distance of 2km under the full annual abstraction scenario. There is some uncertainty around these drawdown estimates which require further modelling and/or pump test investigations to confirm if this option were to be taken forward. However, considering the contribution of the groundwater flow into the Thames Estuary, the effects of this abstraction are highly unlikely to be significant to the flows to the Medway estuary and as such no hydrological changes should be observed at these sites. Operation of this option element is unlikely to affect the qualifying features of either the SPA or Ramsar. No construction impacts are likely to arise to the SPA/Ramsar Sites or their qualifying features as the option element is located at a sufficient distance from the sites.	No

Designated site name:	**Thames Estuary and Marshes**		
Designation type: SPA, Ramsar):	**SPA and Ramsar**		
Qualifying features:	• A141(NB) *Pluvialis squatarola*: Grey plover • A132(NB) *Recurvirostra avosetta*: Pied avocet • A156(NB) *Limosa islandica*: Black-tailed godwit • A143(NB) *Calidris canutus*: Red knot • A137(NB) *Charadrius hiaticula*: Ringed plover • A082(NB) *Circus cyaneus*: Hen harrier Waterbird assemblage • A149(NB) *Calidris alpina alpina*: Dunlin • A162(NB) *Tringa totanus*: Common redshank	Ramsar Criterion: **Ramsar criterion 2** - The site supports one endangered plant species and at least 14 nationally scarce plants of wetland habitats. The site also supports more than 20 British Red Data Book invertebrates. **Ramsar criterion 5** - Assemblages of international importance: Species with peak counts in winter: 45118 waterfowl (5-year peak mean 1998/99-2002/2003)	Water Dependency: Species identified as water dependent: • *Pluvialis squatarola*: Grey plover • *Recurvirostra avosetta*: Pied avocet • *Limosa limosa islandica* • *Calidris canutus*: Red knot • *Charadrius hiaticula*: Ringed plover • *Circus cyaneus*: Hen harrier • *Calidris alpina alpina*: Dunlin • *Tringa totanus*: Common redshank

		Ramsar criterion 6 – species/populations occurring at levels of international importance. • Ringed plover, *Charadrius hiaticula*, • Black-tailed godwit, Species with peak counts in winter: • Grey plover, • Red knot, Calidris *canutus islandica*, W • Dunlin, • Common redshank	The Ramsar Site and its various qualifying criteria (by definition) are all water dependent.
Current conservation status (Article 12):	• A141(NB) *Pluvialis squatarola*: Grey plover – population numbers: sufficient, range coverage: sufficient, ecological sufficiency: sufficient • A132(NB) *Recurvirostra avosetta*: Pied avocet - population numbers: insufficient, range coverage: insufficient, especially in northern parts of the range, ecological sufficiency: sufficient • A156(NB) *Limosa limosa islandica*: Black-tailed godwit – population numbers: sufficient, range coverage: sufficient, ecological sufficiency: sufficient • A143(NB) *Calidris canutus*: Red knot - population numbers: sufficient, range coverage: sufficient, ecological sufficiency: sufficient • A137(NB) *Charadrius hiaticula*: Ringed plover - population numbers: sufficient, range coverage: sufficient, ecological sufficiency: sufficient • A082(NB) *Circus cyaneus*: Hen harrier - population numbers: insufficient, range coverage: insufficient, ecological sufficiency: insufficient • Waterbird assemblage • A149(NB) *Calidris alpina alpina*: Dunlin - population numbers: sufficient, range coverage: sufficient, ecological sufficiency: sufficient • A162(NB) *Tringa totanus*: Common redshank - population numbers: insufficient, range coverage: insufficient, ecological sufficiency: sufficient		
Conservation objectives (SPA):	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:	Mucking Flats & Marshes SSSI: 94.13% Favourable, 5.875 unfavourable recovering South Thames Estuary & Marshes SSSI: 95.28% favourable, 2.35% unfavourable recovering, 0.59% unfavourable – no change, 1.79% unfavourable – declining		
Site Improvement Plan:	1. Coastal squeeze Pressure - A046a(NB) Dark-bellied Brent Goose, A048(NB) Common shelduck, A054(NB) Pintail, A056(NB) Shoveler, A081(B) Marsh Harrier, A082(NB) Hen Harrier, A132(B) Avocet, A132(NB) Avocet, A137(NB) Ringed Plover, A140(NB) Golden Plover, A141(NB) Grey Plover, A143(NB) Red knot, A149(NB) Dunlin, A156(NB) Black-tailed Godwit, A157(NB) Bar-tailed Godwit, A162(NB) Common redshank, A176(B) Mediterranean Gull, A195(B) Little Tern, Breeding bird assemblage, Waterbird assemblage - Implement the South East Habitat Creation Programme 2. Public Access/Disturbance – Pressure/threat - A046a(NB) Dark-bellied Brent Goose, A048(NB) Common shelduck, A054(NB) Pintail, A056(NB) Shoveler, A081(B) Marsh Harrier, A082(NB) Hen Harrier, A132(B) Avocet, A132(NB) Avocet, A137(NB) Ringed Plover, A140(NB) Golden Plover, A141(NB) Grey Plover, A143(NB) Red knot, A149(NB) Dunlin, A156(NB) Black-tailed Godwit, A157(NB) Bar-tailed Godwit, A162(NB) Common redshank, A176(B) Mediterranean Gull, A195(B) Little Tern, Breeding bird assemblage, Waterbird assemblage - Investigate sources of disturbance within the SPAs to inform management 3. Invasive species – Threat - A046a(NB) Dark-bellied Brent Goose, A048(NB) Common shelduck, A054(NB) Pintail, A056(NB) Shoveler, A081(B) Marsh Harrier, A082(NB) Hen Harrier, A132(B) Avocet, A132(NB) Avocet, A137(NB) Ringed Plover, A140(NB) Golden Plover, A141(NB) Grey Plover, A143(NB) Red knot, A149(NB) Dunlin, A156(NB) Black-tailed Godwit, A157(NB) Bar-tailed Godwit, A162(NB) Common redshank, A176(B) Mediterranean Gull, A195(B) Little Tern, Breeding bird assemblage, Waterbird assemblage - Establish the baseline of Carpet sea squirt and Pacific Oyster distribution 4. Changes in species distributions – pressure/threat - A046a(NB) Dark-bellied Brent Goose, A048(NB) Common shelduck, A054(NB) Pintail, A056(NB) Shoveler, A081(B) Marsh Harrier, A082(NB) Hen Harrier, A132(B) Avocet, A132(NB) Avocet, A137(NB) Ringed Plover, A140(NB) Golden Plover, A141(NB) Grey Plover, A143(NB) Red knot, A149(NB) Dunlin, A156(NB) Black-tailed Godwit, A157(NB) Bar-tailed Godwit, A162(NB) Common redshank, A176(B) Mediterranean Gull, A195(B) Little Tern, Breeding bird assemblage, Waterbird assemblage - Investigation to identify cause of the decline in SPA birds 5. Fisheries: Commercial marine and estuarine – pressure/threat - A046a(NB) Dark-bellied Brent Goose, A048(NB) Common shelduck, A054(NB) Pintail, A056(NB) Shoveler, A081(B) Marsh Harrier, A082(NB) Hen Harrier, A132(B) Avocet, A132(NB) Avocet, A137(NB) Ringed Plover, A140(NB) Golden Plover, A141(NB) Grey Plover, A143(NB) Red knot, A149(NB) Dunlin, A156(NB) Black-tailed Godwit, A157(NB) Bar-tailed Godwit, A162(NB) Common redshank, A176(B) Mediterranean Gull, A195(B) Little Tern, Breeding bird assemblage, Waterbird assemblage - Investigate fishing activity, and mechanisms for regulating it 6. Invasive species – threat - Breeding bird assemblage, Waterbird assemblage - Investigate the impact of freshwater invasives on SPA birds 7. Invasive species – threat - A046a(NB) Dark-bellied Brent Goose, A048(NB) Common shelduck, A054(NB) Pintail, A056(NB) Shoveler, A082(NB) Hen Harrier, A132(NB) Avocet, A137(NB) Ringed Plover, A140(NB) Golden Plover, A141(NB) Grey Plover, A143(NB) Red knot, A149(NB) Dunlin, A156(NB) Black-tailed Godwit, A157(NB) Bar-tailed Godwit, A162(NB) Common redshank - Investigate the impact of Spartina anglica on native saltmarsh and birds 8. Vehicles: illicit – pressure - A046a(NB) Dark-bellied Brent Goose, A048(NB) Common shelduck, A054(NB) Pintail, A056(NB) Shoveler, A081(B) Marsh Harrier, A082(NB) Hen Harrier, A132(B) Avocet, A132(NB) Avocet, A137(NB) Ringed Plover, A140(NB) Golden Plover, A141(NB) Grey Plover, A143(NB) Red knot, A149(NB) Dunlin, A156(NB) Black-tailed Godwit, A157(NB) Bar-tailed Godwit, A162(NB) Common redshank, A176(B) Mediterranean Gull, A195(B) Little Tern, Breeding bird assemblage, Waterbird assemblage - Collate and report incidences of illicit vehicle use 9. Fisheries: commercial marine and estuarine – threat - A046a(NB) Dark-bellied Brent Goose, A048(NB) Common shelduck, A054(NB) Pintail, A056(NB) Shoveler, A081(B) Marsh Harrier, A082(NB) Hen Harrier, A132(B) Avocet, A132(NB) Avocet, A137(NB) Ringed Plover, A140(NB) Golden Plover, A141(NB) Grey Plover, A143(NB) Red knot, A149(NB) Dunlin, A156(NB) Black-tailed Godwit, A157(NB) Bar-tailed Godwit, A162(NB) Common redshank, A176(B) Mediterranean Gull, A195(B) Little Tern, Breeding bird assemblage, Waterbird assemblage Introduce appropriate management as required, and ensure compliance with bye-laws		

	10. Air pollution: risk of atmospheric nitrogen deposition – threat - A082(NB) Hen Harrier, A195(B) Little Tern, Seabird assemblage Control, reduce and ameliorate atmospheric nitrogen impacts	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Desalination – Crossness to Beckton tunnel	The closest part of this option element (Crossness) to the Thames Estuary Ramsar Site is 19.5km away. The SPA is located just over 20km away from Crossness. The SIP elements of potential relevance to this proposed option are (3) and (7) invasive species and (10) air pollution. Given the significant distance of the option element to the SPA and Ramsar Site, both invasive species impacts and air quality impacts can be immediately excluded. The SSSI conditions (vast majority favourable) could potentially be affected by hydrological/salinity changes, which in turn could affect the ability to achieve the various sites conservation objectives. No SSSIs were identified within 1km of the option element. The remainder of this assessment considers the likely impacts of any hydrological/salinity changes. No Likely Significant Effects to the SPA or Ramsar Site are envisaged as a result of the abstraction of water from the Middle Thames Tideway or the return of diluted brine effluent from the desalination treatment works back to the Middle Thames Tideway (the brine will be diluted through mixing with the final effluent from Crossness Sewage Treatment Works to reduce the salinity concentration). The diluted brine effluent will have a salinity of approximately 40% which is less than that prevailing in the tidal Thames and the estuary is known to be well mixed due to the greater tidal inflow compared to freshwater outflow; consequently, the diluted brine discharge will be thoroughly mixed with river and tidal flows upstream of the designated sites such that no adverse effect on salinity or water quality would be discernible within the designated sites and as such no impact on their qualifying features would result. Members of the populations of wading birds that form a qualifying feature of both the SPA/Ramsar could make use of the off-site exposed mud banks of the Thames during low tide and, as such, be subject to a degree of disturbance as a result of construction when within 1km of the desalination site, raw water tunnel and conveyance pipeline. However any such disturbance is thought to be negligible given the significant distance of the option element from the designated site, the existing high disturbance levels in this area (both residential and industrial), the short term nature of any use as a result of daily tides and the significant alternative habitat along the length of the Thames. Similarly, the four large waterbodies off-site within 1km of the option element to the south of the Thames are not expected to offer any significant habitat to wintering waders or hen harriers due to a paucity of exposed shoreline or islands. Therefore, no likely significant effect on members of the qualifying bird species populations is expected to occur when using potential off-site functional habitat. The significant distance of the option element to the SPA and Ramsar Sites is such that no construction or operational disturbance impact would occur to the bird qualifying features of either site.	No
Groundwater Southfleet/Greenhithe (new WTW) - 8 Ml/d	The closest part of this option element to the Ramsar Site is approximately 6km to the west, with the closest part of the SPA being approximately 6.8km. The only potential off-site functional habitat for birds within 1km of the works is a large waterbody approximately 800m to the east. Whilst this may be used sporadically by individual waders, this is expected to be a rarity due to the narrow shoreline and the abundant alternative functional habitat along the River Thames closer to the SPA/Ramsar Sites. As such, no significant disturbance impact to off-site functional habitat is expected. The SIP element of potential relevance to this proposed option is (10) air pollution. Given the significant distance of the option element to the SPA and Ramsar Site, air quality impacts can be immediately excluded. The SSSI conditions (vast majority favourable) could potentially be affected by hydrological changes, which in turn could effect the ability to achieve the various sites conservation objectives. The remainder of this assessment considers the likely impacts of any hydrological changes. Groundwater in the chalk aquifer is likely to be fairly close to the surface (information obtained from surrounding boreholes). It is estimated that groundwater could be drawn down by an additional approximately 0.7m at a distance of 2km under the full annual abstraction scenario. There is some uncertainty around the drawdown estimates which would require further modelling or pump test investigations to confirm; however it is considered unlikely that habitats supporting the qualifying features of the SPA/Ramsar would be significantly adversely affected, given the volume of abstraction relative to the overall flows to the Thames Estuary and the distance upstream from the designated sites - the change in flow contribution due to the abstraction is unlikely to significantly affect qualifying features of the SPA and Ramsar. No construction impacts (e.g. disturbance of birds and air quality degradation) are likely to arise as the scheme is located at a sufficient distance from the sites and the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded (in total construction will involve 1000 HGV movements).	No

Designated site name:	**Lee Valley**		
Designation type: (SAC, SPA, Ramsar):	**SPA and Ramsar**		
Qualifying features:	• A021 *Botaurus stellaris*; Great bittern (Non-breeding) • A051 *Anas strepera*; Gadwall (Non-breeding) • A056 *Anas clypeata*; Northern shoveler (Non-breeding)	**Ramsar criterion 2:** The site supports the nationally scarce plant species whorled water-milfoil *Myriophyllum verticillatum* and the rare or vulnerable invertebrate *Micronecta minutissima* (a water-boatman).	Water Dependency: SPA species identified as water dependent: • *Botaurus stellaris*; Great bittern (Non-breeding) • *Anas strepera*; Gadwall (Non-breeding)

		Ramsar criterion 6: Species with peak counts in spring/autumn: Northern shoveler, *Anas clypeata*, NW & C Europe 287 individuals, representing an average of 1.9% of the GB population Species with peak counts in winter: Gadwall, *Anas strepera strepera*, NW Europe. 445 individuals, representing an average of 2.6% of the GB population.	• *Anas clypeata*; Northern shoveler (Non-breeding) The Ramsar Site and its various qualifying criteria (by definition) are all water dependent.
Current conservation status (Article 12):	Great bittern: Population numbers: Insufficient, Range coverage: Insufficient, Ecological sufficiency: Sufficient Gadwall: Population numbers: Sufficient, Range coverage: Sufficient, Ecological sufficiency: Sufficient Northern shoveler: Population numbers: Sufficient, Range coverage: Sufficient, Ecological sufficiency: Sufficient		
Conservation objectives (SPA):	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:	Amwell Quarry SSSI: 100% favourable Turnford & Cheshunt Pits SSSI: 100% favourable Rye Meads SSSI: 39.95% favourable, 60.05% unfavourable recovering Walthamstow Reservoirs SSSI: 100% unfavourable recovering		
Site Improvement Plan:	1. Water Pollution - A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler - Investigate and agree appropriate water quality 2. Hydrological Changes A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler - Investigate and agree appropriate water levels 3. Public Access/Disturbance A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler - Investigate recreational pressure priority areas and agree management measures 4. Inappropriate scrub control - A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler - Manage scrub to required levels to maintain/restore habitat 5. Fisheries: Fish stocking - A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler - Investigate and agree appropriate fish stocking 6. Invasive Species - A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler - Investigate and agree appropriate management response 7. Inappropriate cutting/mowing - A021(NB) Bittern - Manage reed beds for bitterns 8. Air Pollution: risk of Threat Natural England atmospheric nitrogen deposition - A021(NB) Bittern - Investigate the potential impacts of air pollution		
Potential Effects			
Option Element:	Assessment:		Likely Significant Effects?
Desalination Beckton to Coppermills tunnel	The Coppermills Water Treatment Works lies immediately adjacent to the Walthamstow Reservoirs SSSI, which forms a constituent part of the Lee Valley SPA/Ramsar Site. There is, however, no off-site functional habitat for wintering birds within 1km of the proposed tunnel. The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes, (3) disturbance (only), (6) invasive species and (8) air pollution. Whilst all of these elements are considered in this assessment, the focus is on the potential for water pollution/hydrological impacts and disturbance as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. As such, the required construction activities at the Coppermills site carry a risk of impacting upon the site and/or its qualifying features. Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler). This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull.According to a report (cited above) from the Institute of Estuarine and Coastal Studies in 2009, if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or occurs in excess of 250m from the site, then there should be no significant disturbance effect on bird behaviour. The reservoirs that form a constituent part of the SSSIs are formed by bunded embankments and, as such, no impacts to water levels or quality are anticipated that could impact upon the SPA/Ramsar Site or the qualifying features during the construction phase of works. Best practice construction measures to guard against potential pollution incidents would be employed as standard. Whilst construction (and therefore construction traffic) is required within 200m of the designated site boundaries in order to construct the Coppermills reception shaft, air quality impacts are not anticipated because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. Construction traffic will not come within 200m of any designated site. No operational effects are anticipated on the European sites – the existing operation of the water treatment works will be largely unchanged as a result of the scheme – the works will simply be treating a mix of desalinated water and water abstracted from the Lee Valley Reservoirs. No changes to water levels or water quality in the Lee Valley reservoirs are expected, which in turn excludes impacts on the qualifying features of both the SPA and Ramsar Sites.		Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

Groundwater Arla Foods Licence Trading/Transfer - 2 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes, (3) disturbance (only), (6) invasive species and (8) air pollution. Whilst all of these elements are considered in this assessment, the focus is on the potential for water pollution/hydrological impacts and disturbance as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The closest part of this option element to the Lee Valley SPA/Ramsar Site is approximately 3.5km to the north-west. At this distance, no likely significant effects are anticipated during any minor construction activities at the site on any of the qualifying features of the SPA as disturbance effects for wintering birds are only likely to extend to a maximum of ~1 kilometre (precautionary distance applied based on 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, referencing Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. No potential off-site functional habitat was identified within 1km. No impact pathway to the Ramsar Site exists during the construction phase as a result of the distance and isolation of the works from the European Sites. No air quality impacts are anticipated as the option element is a significant distance from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200HGV movements per day (within 200m of a designated site). During operation, there is no anticipated effect of the abstraction on water levels or water quality of the standing water habitats within the European sites (SPA and Ramsar): the reservoir habitats are fed from surface water abstractions from the River Lee and Lower River Thames (via the Thames-Lee Tunnel).	No
Coppermills WTW to New Honor Oak Service Reservoir TWRM Extension	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes, (3) disturbance (only), (6) invasive species and (8) air pollution. Whilst all of these elements are considered in this assessment, the focus is on the potential for water pollution/hydrological impacts and disturbance as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Aside from Walthamstow Reservoirs, the only SSSI within 1km of this option element is Walthamstow Marshes (not a constituent part of the SPA/Ramsar). This SSSI does not represent off-site functional habitat for the qualifying bird species as it lacks large areas of open water or reedbeds. The closest part of this option element to the Lee Valley SPA/Ramsar Site is approximately 180m to the south east, with a new tunnel shaft being located within approximately 220m. As such, the required construction works carry a risk of impacting upon the site and/or qualifying features. Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Site. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull._The only potential off-site functional habitat for the bird qualifying features of the SPA/Ramsar Site identified within 1km of the option element was two waterbodies to the south of the Thames in the Canada Water/Surrey Quays area, however, these are not expected to be particularly suitable as they are surrounded by dense residential and industrial land use and, if they were used as functional habitat any birds doing so would be habituated to high levels of disturbance. Therefore no significant noise or visual disturbance to birds outside of the European Sites is anticipated. According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. Qualifying feature bird species using the SPA/Ramsar would therefore be vulnerable to visual disturbance as well as noise disturbance. The reservoirs that form a constituent part of the SSSIs are formed by bunded embankments and, as such, no impacts to water levels or quality are anticipated that could impact upon the SPA/Ramsar Site or their qualifying features during construction. Best practice construction measures to guard against potential pollution incidents would be employed as standard. Whilst construction (and therefore construction traffic) is required within 200m of the designated site boundaries, air quality impacts are not anticipated because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) is not expected to be exceeded (in total, shaft construction will involve 26000 HGV movements but this is over a 4 year period and for the scheme as a whole). No operational effects are anticipated on the two European sites – the existing operation of the water treatment works will be unchanged as a result of the scheme.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.
Network Reinforcement – Barrow Hill Pump 6 replacement	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes, (3) disturbance (only) and (8) air pollution. Given the significant distance of the option element to the SPA and Ramsar Site disturbance and air quality impacts can be immediately excluded. Whilst all of these elements are considered in this assessment, the focus is on the potential for water pollution and hydrological impacts as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives.	No

	The closest part of this option element to the Lee Valley SPA/Ramsar Site is approximately 8km to the south west. At this distance, no likely significant effects are anticipated during the construction activities for any of the bird qualifying features of the SPA/Ramsar Site as disturbance effects for wintering birds are only likely to extend a maximum of ~1 kilometre from the site. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull Whilst there is a lake approximately 880m to the south that could offer potential off-site functional habitat to the qualifying feature bird populations, this is not thought to be likely and given the distance, the small scale of the proposed works and the expected high existing baseline disturbance, no disturbance impacts on over-wintering birds is anticipated. The paper cited above advocates a usable threshold for bird disturbance of only 250m (the more precautionary threshold of 1km is used here as an intial screening tool only) and therefore supports the absence of disturbance effects at 880m from the source. No air quality impacts are anticipated as the option element is a significant distance from the designated sites, traffic routes will avoid coming within 200m of any designated site and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200HGV movements per day (within 200m of a designated site). Construction and operation of this scheme element will have no effects on water levels or water quality of the standing water habitats within the two designated sites and therefore there will be no impacts to either the SPA or Ramsar Site qualifying features.	
Beckton to Lockwood Covneyance (300 Ml/d)	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes, (3) disturbance (only), (6) invasive species and (8) air pollution. Whilst all of these elements are considered in this assessment, the focus is on the potential for water pollution/hydrological impacts and disturbance as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The 3.5m diameter water conveyance tunnel passes directly beneath the Lee Valley SPA/Ramsar Site with a drive shaft located approximately 110m to the north west of the site boundary and an intermediate shaft located approximately 25m to the south. Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms the qualifying features for the SPA and (part of those for the) Ramsar Site. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. As such, the construction works carry a risk of impacting upon the sites and/or their qualifying features. There is no off-site functional habitat for wintering birds within 1km of the proposed tunnel. According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. Qualifying feature bird species using the SPA/Ramsar site within 250m of this option element would therefore be vulnerable to visual as well as noise disturbance. The reservoirs that form a constituent part of the SSSIs are formed by bunded embankments and, as such, no impacts on water levels or quality are anticipated that could impact upon the SPA/Ramsar Site or their qualifying features during construction. Whilst construction (and therefore construction traffic) is required within 200m of the designated site boundaries in order to construct the drive shaft and intermediate shaft, significant air quality impacts are not anticipated because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The tunnel is expected to pass beneath the SPA/Ramsar Site at a depth of approximately 28m or more below ground level (based on the shaft depth) which is beneath the reservoirs and no effects to the reservoirs themselves are likely during construction. During operation, there will be no adverse effects on water levels or water quality of the standing water habitats within the site and therefore there will be no impacts to the qualifying features of either the SPA or Ramsar Site.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.
Deephams to KGV Conveyance	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes, (3) disturbance (only) and (8) air pollution. Given the significant distance of the option element to the SPA and Ramsar Site (2.8km at the closest point), disturbance and air quality effects can be immediately excluded. Whilst all of these elements are considered in this assessment, the focus is on the potential for water pollution and hydrological impacts as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The pipeline terminates approximately 2.8km to the south of the designated sites. The closest part of the Deephams Sewage Treatment Works is approximately 7.2km to the south of the SPA/Ramsar Site. At these distances, no likely significant effects are anticipated at the European Sites during construction works for any of the bird qualifying features of the SPA/Ramsar Site as disturbance effects for wintering birds only extend a maximum of ~1 kilometre from the designated site. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009)	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

	Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. However, the adjacent William Girling and King Georges Reservoir collectively form the Chingford Reservoirs SSSI, which are in part designated for their importance to overwintering wildfowl. As such, these reservoirs have clear potential to be used as off-site functional habitat for the bird qualifying features of the SPA/Ramsar Site. At its closest point, the conveyance pipeline comes within approximately 60m of these reservoirs and runs in close proximity to them for approximately 4km, therefore its construction could lead to significant disturbance of the bird qualifying features of the European Sites. As the works are located within 1km of a SSSI that provides functional habitat to the Lee Valley SPA/Ramsar, there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site, namely over-wintering bittern, gadwall and shoveler. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the Environment Agency report cited above, however the Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects[1] takes this work further and looks at the sensitivity of a number of specific species to visual and noise disturbance. This showed that effects of disturbance on wintering waterbirds (estuarine) did not tend to extend beyond 250m from the source of the noise, and also derived a generic overview table to calculate the likely disturbance effect for a noise level and the distance required from the source to the receptor allowing for a likely 'acceptable' noise dose of 70dB(A) (The 50dB(A) cited elsewhere in this report is a more precautionary noise level taken from the same study, used for initial screening purposes, at which no behavioural response was observed). Assuming a 250m radius from source within which birds could be disturbed, a large proportion of the works would be within this including the pipeline route and site for the permanent treatment works (south east corner of the Deephams site). Baseline noise surveys completed for the Deephams upgrade included a sampling location at the William Girling Reservoir. The main existing noise sources in the area were identified as from traffic on Meridian Way (A1055) and the London to Cambridge railway, as well as potential noise from the light industrial premises around the site. This recorded ambient noise levels (L_{Aeq}) of 53.7dB during the day time (0700-1900) and 50.1dB during the evening (1900-2300). Calculations for the construction works identified that the existing bund of the William Girling Reservoir provided noise attenuation equalling approximately 11dB. Although this offers some mitigation, the noise generated by the demolition and construction for the treatment works, and pipe jacking pits for the pipeline, will need to be considered and an Appropriate Assessment completed to identify any residual adverse effects after mitigation. During construction and operation of the scheme, no adverse effects on water levels or water quality of the standing water habitat features of the designated sites are anticipated: the scheme may result in temporarily slightly higher water levels in the King George V reservoir (prior to re-abstraction for water supply) but water quality will not be adversely affected due to the enhanced water treatment that will be applied to the treated sewage effluent prior to discharge to the reservoir. No air quality impacts are anticipated as the option element is a significant distance from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200HGV movements per day (within 200m of a designated site). All of the Deephams options combined will result in an anticipated 3300 vehicle movements over a three year construction period, with a further 230 HGV movements per year to deliver chemicals to the treatment plant.	
Deephams to TLT extension Conveyance	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes, (3) disturbance (only) and (8) air pollution. Given the distance of the option element to the SPA and Ramsar Site (approximately 2.5km) disturbance and air quality impacts can be immediately excluded. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution and hydrological impacts as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The closest part of the Deephams WTW site from the SPA/Ramsar Site is approximately 2.5km to the north. At this distance, no likely significant effects to any of the bird qualifying features for this site are anticipated during construction, as disturbance effects for wintering birds only extend a maximum of ~1 kilometre from the designated site. However, the adjacent William Girling Reservoir collectively forms part of the Chingford Reservoirs SSSI, which are in part designated for their importance to overwintering wildfowl. As such, this reservoir has clear potential to be used as functional habitat for the bird qualifying features of the SPA/Ramsar Site and therefore be at risk of disturbance. As the works are located within 1km of a SSSI that provides functional habitat to the Lee Valley SPA/Ramsar, there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site, namely over-wintering bittern, gadwall and shoveler (this 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. _The Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects[2] takes this work further and looks at the sensitivity of a number of specific species to visual and noise disturbance. This showed that effects of disturbance on wintering waterbirds (estuarine) did not tend to extend beyond 250m from the source of the noise, and also derived a generic overview table to calculate the likely disturbance effect for a noise level and the distance required from the source to the receptor allowing for a likely 'acceptable' noise dose of 70dB(A) (The 50dB(A) cited elsewhere in	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

[1] 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.
[2] 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.

	this report is a more precautionary noise level taken from earlier studies, used for initial screening purposes, at which no behavioural response was observed). Assuming a 250m radius from source within which birds could be disturbed, a large proportion of the works would be within this including the pipeline route and site for the permanent treatment works (south east corner of the Deephams site). Baseline noise surveys completed for the Deephams upgrade included a sampling location at the William Girling Reservoir. The main existing noise sources in the area were identified as from traffic on Meridian Way (A1055) and the London to Cambridge railway, as well as potential noise from the light industrial premises around the site. This recorded ambient noise levels (L_{Aeq}) of 53.7dB during the day time (0700-1900) and 50.1dB during the evening (1900-2300). Calculations for the construction works identified that the existing bund of the William Girling Reservoir provided noise attenuation equalling approximately 11dB. Although this offers some mitigation, the noise generated by the pipe jacking pits for the pipeline will need to be considered and an Appropriate Assessment completed to identify any residual adverse effects after mitigation. No impact pathways exist that could result in significant construction impacts to the non-bird qualifying features of the Ramsar Site. No air quality impacts are anticipated as the option element is a significant distance from the designated sites and the anticipated number of vehicle movements (100 HGV movements in total) comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). Operation of this conveyance asset will have no adverse effects on the two designated sites (SPA and Ramsar Site).	
Deephams Reuse 46.5Ml/d	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes (3) disturbance (only) and (8) air pollution. Given the distance of the option element to the SPA and Ramsar Site (approximately 2.5km) disturbance and air quality impacts can be immediately excluded. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution and hydrological impacts as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The closest part of the Deephams WTW site from the SPA/Ramsar Site is approximately 2.5km to the north. At this distance, no likely significant effects to any of the bird qualifying features for this site are anticipated at the European Sites themselves during construction, as disturbance effects for wintering birds only extend a maximum of ~1 kilometre from the designated site. However, the adjacent William Girling and King Georges Reservoir collectively form the Chingford Reservoirs SSSI, which are in part designated for their importance to overwintering wildfowl. As such, these reservoirs have clear potential to be used as off-site functional habitat for the bird qualifying features of the SPA/Ramsar Site. At its closest point this option element lies approximately 130m to the west of these reservoirs and therefore its construction could lead to disturbance of the bird qualifying features of the European Sites. As the works are located within 1km of a SSSI that provides functional habitat to the Lee Valley SPA/Ramsar, there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site, namely over-wintering bittern, gadwall and shoveler (this 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. _The Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects[3] takes this work further and looks at the sensitivity of a number of specific species to visual and noise disturbance. This showed that effects of disturbance on wintering waterbirds (estuarine) did not tend to extend beyond 250m from the source of the noise, and also derived a generic overview table to calculate the likely disturbance effect for a noise level and the distance required from the source to the receptor allowing for a likely 'acceptable' noise dose of 70dB(A) (The 50dB(A) cited elsewhere in this report is a more precautionary noise level taken from earlier studies, used for initial screening purposes, at which no behavioural response was observed). Assuming a 250m radius from source within which birds could be disturbed, a large proportion of the works would be within this including the pipeline route and site for the permanent treatment works (south east corner of the Deephams site). Baseline noise surveys completed for the Deephams upgrade included a sampling location at the William Girling Reservoir. The main existing noise sources in the area were identified as from traffic on Meridian Way (A1055) and the London to Cambridge railway, as well as potential noise from the light industrial premises around the site. This recorded ambient noise levels (L_{Aeq}) of 53.7dB during the day time (0700-1900) and 50.1dB during the evening (1900-2300). Calculations for the construction works identified that the existing bund of the William Girling Reservoir provided noise attenuation equalling approximately 11dB. Although this offers some mitigation, the noise generated by the demolition and construction for the treatment works will need to be considered and an Appropriate Assessment completed to identify any residual adverse effects after mitigation. No impact pathways exist that could result in construction impacts to the non-bird qualifying features of the Ramsar Site. No air quality impacts are anticipated as the option element is a significant distance from the designated sitesand the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). All of the Deephams options combined will result in an anticipated 3300 vehicle movements over a three year construction period, with a further 230 HGV movements per year to deliver chemicals to the treatment plant. Operation of this option element will have no adverse effects on the two designated sites (SPA and	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

[3] 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.

	Ramsar Site): this option element will result in lower river flows in the Salmons Brook and Pymmes Brook due to the diversion of treated sewage effluent for reuse. However, no significant adverse effects on water quality or ecology are anticipated and therefore no significant adverse effects on any of the qualifying features utilising these water courses as off-site functional habitat would be experienced.	
Raw Water System - KGV Reservoir to Break Tank	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes (3) disturbance (only) and (8) air pollution. Given the distance of the option element to the SPA and Ramsar Site (approximately 2.1km) disturbance and air quality impacts can be immediately excluded. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution and hydrological impacts these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The closest part of the construction corridor for this raw water conveyance pipeline to the SPA/Ramsar Site is approximately 2.1km to the north east. At this distance, no likely significant effects to any of the bird qualifying features for these sites are anticipated, as disturbance effects for wintering birds only extend a maximum of ~1 kilometre from the site. However, the new 54" main will be constructed immediately adjacent to the eastern banks of William Girling Reservoir which forms part of the Chingford Reservoirs SSSI. These are in part designated for their importance to overwintering wildfowl. As such, these reservoirs have clear potential to be used as off-site functional habitat for the bird qualifying features of the SPA/Ramsar Site. The close proximity of this option element to the reservoirs means that construction could lead to disturbance of the bird qualifying features of the European Sites. As the works are located within 1km of a SSSI that provides functional habitat to the Lee Valley SPA/Ramsar, there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site, namely over-wintering bittern, gadwall and shoveler (this 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. _The Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects[4] takes this work further and looks at the sensitivity of a number of specific species to visual and noise disturbance. This showed that effects of disturbance on wintering waterbirds (estuarine) did not tend to extend beyond 250m from the source of the noise, and also derived a generic overview table to calculate the likely disturbance effect for a noise level and the distance required from the source to the receptor allowing for a likely 'acceptable' noise dose of 70dB(A). (The 50dB(A) cited elsewhere in this report is a more precautionary noise level taken from earlier studies, used for initial screening purposes, at which no behavioural response was observed). Assuming a 250m radius from source within which birds could be disturbed, a large proportion of the works would be within this including the pipeline route and site for the permanent treatment works (south east corner of the Deephams site). Baseline noise surveys completed for the Deephams upgrade included a sampling location at the William Girling Reservoir. The main existing noise sources in the area were identified as from traffic on Meridian Way (A1055) and the London to Cambridge railway, as well as potential noise from the light industrial premises around the site. This recorded ambient noise levels (L_{Aeq}) of 53.7dB during the day time (0700-1900) and 50.1dB during the evening (1900-2300). Calculations for the construction works identified that the existing bund of the William Girling Reservoir provided noise attenuation equalling approximately 11dB. Although this offers some mitigation, the noise generated by the pipe jacking pits for the pipeline will need to be considered and an Appropriate Assessment completed to identify any residual adverse effects after mitigation. No significant air quality impacts are anticipated as the option element is a significant distance from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). No effects on water quality or levels would be experienced within the designated sites during construction or operation and therefore the qualifying features of the SPA or Ramsar Site would not be affected.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.
Raw Water System – TLT upgrade	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes (3) disturbance (only) (6) invasive species and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution/hydrological impacts and disturbance as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The closest part of this option element lies approximately 360m to the west of the SPA/Ramsar Site. Construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) and, as such, the proposals carry a risk of impacting upon the sites and/or their bird qualifying features. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

4 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.

	University of Hull. The Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects[5] takes this work further and looks at the sensitivity of a number of specific species to visual and noise disturbance. This showed that effects of disturbance on wintering waterbirds (estuarine) did not tend to extend beyond 250m from the source of the noise, and also derived a generic overview table to calculate the likely disturbance effect for a noise level and the distance required from the source to the receptor allowing for a likely 'acceptable' noise dose of 70dB(A). (The 50dB(A) cited elsewhere in this report is a more precautionary noise level taken from earlier studies, used for initial screening purposes, at which no behavioural response was observed). The location of the required shaft and 0.1ha temporary construction compound (the only above ground works) along the existing TLT route is not yet known. The reservoirs that form a constituent part of the SSSIs are formed by bunded embankments and, as such, no impacts to water levels or quality are anticipated that could impact upon the SPA/Ramsar Site or their qualifying features during construction. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds, water pollution and spread of invasive non-native species.	
Raw Water System – Lockwood PS to KGV Reservoir Intake	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes (3) disturbance (only) (6) invasive species and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution/hydrological impacts and disturbance as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The Lockwood end of this 3.5m diameter tunnel originates within the Lee Valley SPA/Ramsar Site at the drive shaft at Lockwood RPS and passes along its western edge (below ground) within 150m for a length of approximately 1.2km. The drive shaft will have a diameter of 12.5m and an associated temporary construction compound of 0.5ha. Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) and, as such, the proposals carry a clear risk of impacting upon the sites and/or their bird qualifying features (this 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull). In addition, the tunnel is routed adjacent to the western edge of the Chingford Reservoirs SSSI which provides potential off-site functional habitat for the qualifying bird species. The impact to any functional habitat is thought to be minimised by the fact that the above ground construction works are restricted to three shaft construction sites with a likely footprint of just 2500m^2 each meaning that any disturbance impact would be reduced and localised.. The reservoirs that form a constituent part of the SSSIs are formed by bunded embankments and, as such, no impacts to water levels or quality are anticipated that could impact upon the SPA/Ramsar Site or their qualifying features during construction. According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. Qualifying feature bird species utilising the SPA/Ramsar itself and the potential functional habitat within 250m of this option element would therefore be vulnerable to visual disturbance as well as noise disturbance. Whilst construction (and therefore construction traffic) is required within 200m of the designated site boundaries in order to construct the drive shaft and associated pipeline, air quality impacts are not anticipated because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The tunnel is expected to pass beneath the SPA/Ramsar Site for approximately 220m but at a depth that will likely have no adverse effect on the reservoir itself or other standing water habitats within the designated sites. No operational impacts are anticipated to water levels and/or water quality of the standing water habitats of the designated sites from this water conveyance scheme and therefore there will be no significant impacts to either the SPA or Ramsar Site qualifying features. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds, water pollution and spread of invasive non-native species.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.
KGV Reservoir intake increase	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes (3) disturbance (only) (6) invasive species and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution/hydrological impacts and disturbance as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

[5] 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.

	Construction will require deminimus HGV movements and where possible traffic routes will avoid coming within 200m of any designated site. As such, no significant air quality impacts are anticipated. The closest part of this option element to the Lee Valley SPA/Ramsar Site is approximately 3km to the south. At this distance, no likely significant effects are anticipated during construction works to any of the bird qualifying features of the European Sites, as disturbance effects for wintering birds only extend a maximum of ~1 kilometre from the designated site. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. King George V Reservoir (with William Girling Reservoir) forms part of the Chingford Reservoirs SSSI, which are in part designated for their importance to overwintering wildfowl. As such, these reservoirs have clear potential to be used as off-site functional habitat for the bird qualifying features of the SPA/Ramsar Site. The intake is located at the northern tip of King George V Reservoir and as such during construction there is the potential for noise and visual disturbance of members of the qualifying feature populations of wildfowl. It is anticipated that this would be minimal, however, given the localised nature of the works. According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. Qualifying feature bird species utilising the potential functional habitat within 250m of this option element would therefore be vulnerable to visual disturbance as well as noise disturbance. . The reservoirs that form a constituent part of the SSSIs are formed by bunded embankments and, as such, no impacts to water levels or quality are anticipated that could impact upon the SPA/Ramsar Site or their qualifying features during construction. Construction and operation of the increased intake capacity will have no adverse effects on water levels or water quality in King George V reservoir or any of the waterbodies that form the Lee Valley SPA/Ramsar Site. As such, no adverse hydrological impacts on the qualifying features of either the SPA or Ramsar Site are anticipated. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds, water pollution and spread of invasive non-native species.	
Network Reinforcement New Header tank at Coppermills WTW	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes (3) disturbance (only) (6) invasive species and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution/hydrological impacts and disturbance as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Aside from Walthamstow Reservoirs, the only SSSI within 1km of this option element is Walthamstow Marshes (not a constituent part of the SPA/Ramsar). This SSSI does not represent off-site functional habitat for the qualifying bird species as it lacks large areas of open water or reedbeds. The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar Site. As such, the proposals carry a risk of impacting upon the designated sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Sites. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. The new header tank is proposed to be located at the same site as the TWRM extension - Coppermills to Honor Oak drive shaft (within the Coppermills WTW site), which lies approximately 160m from the SPA/Ramsar Site. No off-site potential functional habitat for the bird qualifying features of the SPA/Ramsar Site was identified within 1km of the option element and therefore no noise or visual disturbance to birds outside of the European Sites is anticipated. According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. Qualifying feature bird species utilising the SPA/Ramsar within 250m of this option element would therefore be vulnerable to visual disturbance as well as noise disturbance. Construction traffic will not exceed the 1000 AADT or 200 HGV movement per day threshold commonly used to determine the potential for air quality impact (when within 200m of a designated site). In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds, water pollution and spread of invasive non-native species during construction.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme..

	No operational impacts are anticipated to water levels and/or water quality of the standing water habitats of the designated site from this water conveyance control asset and therefore there would not be impacts to either the SPA or Ramsar Site qualifying features in this regard.	
Network Reinforcement – New River Head Pump 4 replacement	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes (3) disturbance (only) and (8) air pollution. Given the significant distance of the option element to the SPA and Ramsar Site (approximately 5.8km) disturbance and air quality impacts can be immediately excluded. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution and hydrological impacts these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. This option is simply the replacement of an existing pump with a new more suitable variant and as such there should be no effects on water quality or levels. This option lies approximately 5.8km to the south west of the SPA/Ramsar Site. At this distance no effects to any of the qualifying features for these sites (SPA or Ramsar Site) are anticipated from the very minor construction activity. There is no potential functional habitat within 1km. No operational impacts will arise as a result of the replacement pump.	No
Coppermills WTW extension 100 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes (3) disturbance (only) (6) invasive species and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution/hydrological impacts and disturbance as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar Site. As such, the proposals carry a risk of impacting upon the designated sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Site. It is understood that the 100 Ml/d WTW expansion works would be located approximately 105m from the SPA/Ramsar Site to the east. No potential functional habitat for the bird qualifying features of the SPA/Ramsar Site was identified within 1km of the option element and therefore no noise or visual disturbance to birds outside of the European Sites is anticipated. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull.According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. Qualifying feature bird species utilising the SPA/Ramsar within 250m of this option element would therefore be vulnerable to visual disturbance as well as noise disturbance. . Whilst construction (and therefore construction traffic) is required within 200m of the designated site boundaries, significant air quality impacts are not anticipated because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds, water pollution and spread of invasive non-native species during construction. No operational impacts are anticipated to water levels and/or water quality of the standing water habitats of the designated site from operation of the water treatment works extension, as the works is being expanded to treat water abstracted from other sources rather than from the Lee Valley Reservoirs located within the designated site. Therefore there will be no significant impacts to either the SPA or Ramsar Site qualifying features in this regard.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.
Coppermills WTW extension 150 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes (3) disturbance (only) (6) invasive species and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution/hydrological impacts and disturbance as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. This SSSI does not represent off-site functional habitat for the qualifying bird species as it lacks large areas of open water or reedbeds. The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar Site. As such, the proposals carry a risk of impacting upon the designated sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Site. It is understood that the 150 Ml/d WTW expansion works would be located approximately 105m from the SPA/Ramsar Site to the east. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. No potential off-site functional habitat for the bird qualifying features of the SPA/Ramsar Site was identified within 1km of the option element and therefore no noise or visual disturbance to birds outside of the European Sites is anticipated.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

	According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. Qualifying feature bird species utilising the SPA/Ramsar within 250m of this option element would therefore be vulnerable to visual disturbance as well as noise disturbance. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds, water pollution and spread of invasive non-native species. Whilst construction (and therefore construction traffic) is required within 200m of the designated site boundaries, significant air quality impacts are not anticipated because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. No operational impacts are anticipated to water levels and/or water quality of the standing water habitats of the designated site from operation of the water treatment works extension, as the works is being expanded to treat water abstracted from other sources rather than from the Lee Valley Reservoirs located within the designated site. Therefore there will be no impacts to either the SPA or Ramsar Site qualifying features in this regard.	
Conveyance from Break Tank to Coppermills	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes (3) disturbance (only) (6) invasive species and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution/hydrological impacts and disturbance as these are considered to be the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The 4.4m diameter water conveyance tunnel passes directly beneath the Lee Valley SPA/Ramsar Site and it also terminates within a 10x 20m reception shaft located within the SPA/Ramsar Site. The underground pipeline runs tight alongside the eastern perimeter of the European Site and there is also an intermediate shaft located approximately 122m to the north of the European Site. Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature for both the SPA/Ramsar Sites. As such, the construction works carry a risk of impacting upon the sites and/or their qualifying features (particularly wintering birds). This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. The spine 2 pipeline route will be constructed immediately adjacent to William Girling and the southern tip of King Georges Reservoir which collectively form the Chingford Reservoirs SSSI. These are in part designated for their importance to overwintering wildfowl. As such, these reservoirs have clear potential to be used as off-site functional habitat for the bird qualifying features of the SPA/Ramsar Site. The close proximity of this option element to the reservoirs means that construction could lead to disturbance of the bird qualifying features of the European Sites. Similarly, the pipeline route passes close to the western edge of Banbury reservoir which is equidistant between the SPA/Ramsar Site and Chingford Reservoirs SSSI and could equally be used as off-site functional habitat by members of the qualifying feature bird populations. This fact increases the possibility of significant disturbance being experienced by the bird qualifying features as a result of construction. According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. Qualifying feature bird species utilising the SPA/Ramsar and any offsite functional habitat within 250m of this option element would therefore be vulnerable to visual disturbance as well as noise disturbance. The reservoirs that form a constituent part of theSSSIs are formed by bunded embankments and, as such, no impacts to water levels or quality are anticipated that could impact upon the SPA/Ramsar Site or their various qualifying features during construction. Whilst construction (and therefore construction traffic) is required within 200m of the designated site boundaries, significant air quality impacts are not anticipated because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds, water pollution and spread of invasive non-native species, particularly during the construction phase.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.
Chingford South intake increase	The SIP elements of potential relevance to this proposed option element are (1) water pollution, (2) hydrological changes (3) disturbance (only) and (8) air pollution. Given the distance of the option element to the SPA and Ramsar Site (approximately 4.5km) disturbance and significant air quality impacts can be immediately excluded. Whilst all of these elements are considered in this assessment the focus is on the potential for water pollution and hydrological impacts as these are the most feasible. The closest constituent SSSI (Walthamstow Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The closest known part of this option element to the Lee Valley SPA/Ramsar Site is approximately 4.5km to the south west at the existing Chingford South raw water pumping station/Chingford WTW. The new pumping station will be adjacent to this existing infrastructure. An open channel will be used for flows to the new pumping station – this channel length will be minimised and is thought to be approximately 1km in length. As such the option is not thought to extend closer than about 3.5km from the European Site as a worse case. At this distance, no likely significant effects are anticipated during construction works (or operation) to any of the bird qualifying features of the European Sites (SPA and Ramsar Site) as disturbance effects for wintering birds only extend a maximum of ~1 kilometre from the designated site (this 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report Environment Agency (2013) Bird Disturbance from Flood and Coastal Risk Management Construction Activities. Overarching Interpretive	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme

	Summary Report. Prepared by Cascade Consulting and Institute of Estuarine and Coastal Studies, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull). However, the new pumping station and open cut channel will be constructed immediately adjacent to William Girling and King Georges Reservoir which collectively form the Chingford Reservoirs SSSI. These are in part designated for their importance to overwintering wildfowl. As such, these reservoirs have clear potential to be used as off-site functional habitat for the bird qualifying features of the SPA/Ramsar Site. The close proximity of this option element to the reservoirs means that construction could lead to disturbance of the bird qualifying features of the European Sites. According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. Qualifying feature bird species utilising any offsite functional habitat within 250m of this option element would therefore be vulnerable to visual disturbance as well as noise disturbance. No adverse effects are expected on the non-bird qualifying features of the Ramsar Site at this distance. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds or air pollution.	

Designated site name:	**Epping Forest**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion roboripetraeae*. or *Ilici-Fagenion*) - Epping Forest represents Atlantic acidophilous beech forests in the north-eastern part of the habitat's UK range. Although the epiphytes at this site have declined, largely as a result of air pollution, it remains important for a range of rare species, including the moss *Zygodon forsteri*. The long history of pollarding, and resultant large number of veteran trees, ensures that the site is also rich in fungi and dead-wood invertebrates. • H4010 Northern Atlantic wet heaths with *Erica tetralix* • H4030 European dry heaths • S1083 *Lucanus cervus*: Stag beetle - Epping Forest is a large woodland area in which records of stag beetle *Lucanus cervus* are widespread and frequent; the site straddles the Essex and east London population centres. Epping Forest is a very important site for fauna associated with decaying timber, and supports many Red Data Book and Nationally Scarce invertebrate species.	Water Dependency: SAC habitats identified as water dependent: • H4010 Northern Atlantic wet heaths with *Erica tetralix* • H4030 European dry heaths
Current conservation status:	Atlantic acidophilous beech forests: **Bad but improving** (range: favourable, area: inadequate but improving, structure and function: bad but improving, future prospects: favourable). Main pressures and threats: removal of hedges and copses; general Forestry management; planting; artificial planting; replanting; forestry clearance; removal of undergrowth; removal of dead and dying trees; air pollution; biocenotic evolution; invasion by a species; antagonism arising from introduction of species; other forms or mixed forms of interspecific faunal competition; other natural processes. Northern Atlantic wet heaths with *Erica tetralix*: **Bad and deteriorating** (range: favourable, area: favourable, structure and function: bad and deteriorating, future prospects: bad but improving). Main pressures: grazing; abandonment of pastoral systems; burning; urbanised areas, human habitation; continuous urbanisation; discontinuous urbanisation; communication networks; energy transport; other forms of transportation and communication; air pollution; drainage; invasion by a species. Main threats: as for pressures but also other pollution or human impacts/activities. European dry heaths: **Bad and deteriorating** (range: favourable, area: favourable, structure and function: bad and deteriorating, future prospects: bad but improving). Main pressures: grazing; abandonment of pastoral systems; burning; urbanised areas, human habitation; continuous urbanisation; discontinuous urbanisation; communication networks; energy transport; other forms of transportation and communication; air pollution; invasion by a species. Main threats: grazing; abandonment of pastoral systems; burning; discontinuous urbanisation; other pollution or human impacts/activities; invasion by a species. *Lucanus cervus*: Stag beetle: **Favourable** (range: favourable, population: favourable, habitat: unknown, future prospects: favourable. Main pressures Urbanised areas, human habitation: Forest and Plantation management & use. Main threats: As stated in pressures	
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. Further detailed advice is provided in the Supplementary Advice document in relation to the application and achievement of these objectives.	
SSSI Condition assessment:	Epping Forest SSSI: 35.48% favourable, 48.17% unfavourable recovering, 14.53% unfavourable no change, 1.83% unfavourable declining.	
Site Improvement Plan:	1. Air Pollution: impact of atmospheric nitrogen deposition - H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H9120 Beech forests on acid soils - Establish a Site Nitrogen Action Plan	

	2. Undergrazing – H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Partnership agreement to ensure sufficient resources for appropriate grazing 3. Public Access/Disturbance - H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H9120 Beech forests on acid soils - Identify key areas and agree a plan to maintain SAC features 4. Changes in Species distributions - H9120 Beech forests on acid soils - Investigate tree health and recruitment in key areas to establish a baseline for monitoring. Agree actions and implement a management plan 5. Inappropriate water levels - H4010 Wet heathland with cross-leaved heath - Hydrological monitoring, and a possible water level management plan 6. Water Pollution - H4010 Wet heathland with cross-leaved heath - Investigate water quality run-off from roads, agree actions and implement a management plan 7. Invasive Species - H4010 Wet heathland with cross-leaved heath - Investigate impact, agree actions and implement a management plan 8. Disease - H9120 Beech forests on acid soils - Investigate impact, agree actions and implement a management plan 9. Invasive Species - H9120 Beech forests on acid soils - Investigate impact and review the current monitoring programme, agree actions and implement a management plan	
Potential Effects		
Option Element:	*Assessment:*	*Likely Significant Effect?*
Desalination Beckton to Coppermills tunnel	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option element to Epping Forest SAC is approximately 1.56km to the south - this is for the main underground transfer tunnel which will be a minimum of 21m deep. This is beyond the maximum dispersal distance for female stag beetles (~1km), and considerably below the depth of soil and dead wood which stag beetle utilise for their larval stages and therefore significant impacts to members of the qualifying feature population are not expected to occur. The depth of the construction activity is unlikely to significantly affect water levels, water availability or water quality to the water-dependant qualifying features of the site. No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). No construction impacts to other qualifying features of the SAC are anticipated due the distance of the option from the designated site and the type of qualifying features it is notified for (beech woodland, North Atlantic wet heathland and European dry heaths). No operational effects are anticipated from this water conveyance asset.	No
Desalination – Crossness to Beckton tunnel	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population.	No

	The closest part of this option to Epping Forest SAC is approximately 7km to the north west. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated during construction (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). The paucity of suitable habitat for stag beetles between the SAC and the option element would inhibit dispersal and mean that impacts to members of the qualifying feature population when occupying functional habitat would not occur. No significant air quality impacts are anticipated as the option element is a sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). No operational effects are anticipated from this water conveyance asset.	
Beckton Desalination treatment plant 150Ml/d	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option to Epping Forest SAC is approximately 7km to the south east. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated during construction (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). No significant air quality impacts are anticipated as the option element is a sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). No operational effects are anticipated from this desalination treatment plant.	No
Groundwater Arla Foods Licence Trading/Transfer - 2 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option to Epping Forest SAC is approximately 6.3km to the west. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated during construction (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site).	No

	No operational effects are anticipated from operation of this asset – there is no increase to the abstraction licence volume with the abstraction rights being transferred from a third party to Thames Water.	
Coppermills WTW to New Honor Oak Service Reservoir TWRM Extension	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option to Epping Forest SAC is approximately 3.6km to the west. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated during construction (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). No operational effects are anticipated from this water conveyance asset.	No
Beckton to Lockwood Covneyance (300 Ml/d)	The SIP elements of potential relevance to this proposed option element is (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. No likely significant effects to any of the qualifying features for this site are anticipated during construction (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). The closest part of the asset construction activity (the construction of the intermediate shaft No. 9) is approximately 1.1km away from the SAC to the west. This is beyond the maximum dispersal distance for female stag beetles (~1km) and therefore significant impacts to members of the qualifying feature population are not expected to occur. No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). The depth of the construction activity is unlikely to affect water levels, water availability or water quality to the water-dependant qualifying features of the site. No operational effects are anticipated from this water conveyance asset.	No
Deephams to KGV Conveyance	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential	No

	significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. No likely significant effects to any of the qualifying features for this site are anticipated (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles) The closest part of the pipeline is approximately 1.1km away from the SAC to the west but the closest part of the main works is approximately 2km away to the south west. This is beyond the maximum dispersal distance for female stag beetles (~1km) and therefore significant impacts to members of the qualifying feature population are not expected to occur. Construction is too distant to lead to air pollution (dust/particulate contamination) which could impact on the habitats that form the majority of the site's qualifying features. Traffic routes to the site will be sensitively selected to ensure that they do not come within 200m (minimum) of the designated site. The anticipated number of vehicle movements for this option element comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). All of the Deephams options combined will result in an anticipated 3300 vehicle movements over a three year construction period, with a further 230 HGV movements per year to deliver chemicals to the treatment plant. The depth of the construction activity is unlikely to affect water levels, water availability or water quality to the water-dependant qualifying features of the site. No operational effects are anticipated from this water conveyance asset.	
KGV Reservoir intake increase	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of the construction works from the SAC is approximately 2km away to the south west. This is beyond the maximum dispersal distance for female stag beetles (~1km) and therefore significant impacts to members of the qualifying feature population are not expected to occur. Construction is too distant to lead to air pollution (dust/particulate contamination) which could impact on the habitats that form the majority of the site's qualifying features. The anticipated number of vehicle movements for this option element (100 HGV movements in total) comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). The depth of the construction activity is unlikely to affect water levels, water availability or water quality to the water-dependant qualifying features of the site. No operational effects are anticipated from this water conveyance asset.	No
Deephams Reuse 46.5Ml/d	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential	No

	significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of the Deephams sewage treatment works site from the SAC is approximately 2km away to the south west. This is beyond the maximum dispersal distance for female stag beetles (~1km) and therefore significant impacts to members of the qualifying feature population are not expected to occur. Construction is too distant to lead to air pollution (dust/particulate contamination) which could impact on the habitats that form the majority of the site's qualifying features. The anticipated number of vehicle movements for this option element comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). All of the Deephams options combined will result in an anticipated 3300 vehicle movements over a three year construction period, with a further 230 HGV movements per year to deliver chemicals to the treatment plant. The construction is not anticipated to interfere with water levels, water availability or water quality to water dependant features of the designated site. Operation of the water reuse treatment works will not have any adverse effects on water levels or water availability to water dependant features of the designated site – the scheme involves the advanced treatment of treated sewage effluent that would otherwise be discharged to the Salmons Brook and downstream River Lee.	
Beckton Reuse 100 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of the Beckton site from the SAC is approximately 7km to the south east. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated during construction of the treatment plant (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). Operation of the water reuse treatment works will not have any adverse effects on water levels, water availability or water quality to water dependant features of the designated site – the scheme involves the advanced treatment of treated sewage effluent that would otherwise be discharged to the Middle Thames Tideway.	No
Beckton Reuse 150 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives.	No

	Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of the Beckton site from the SAC is approximately 7km to the south east. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated during construction of the treatment plant (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). Operation of the water reuse treatment works will not have any adverse effects on water levels, water availability or water quality to water dependant features of the designated site – the scheme involves the advanced treatment of treated sewage effluent that would otherwise be discharged to the Middle Thames Tideway.	
Raw Water System - KGV Reservoir to Break Tank	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of the new raw water conveyance pipeline construction corridor lies approximately 660m to the west of the SAC. This lies within the precautionary maximum ~1km dispersal distance for female stag beetles such that, in theory, egg laying females could reach the pipeline site (and potentially be followed there by males which can disperse up to around 2km) – however, in practice, this risk is considered unlikely because there is a lack of trees and associated deadwood habitat along the pipeline route that would attract stag beetles to that location from the SAC (aerial imagery indicates the pipeline corridor route appears to be managed grassland habitat) and females typically return to where they emerged from for their oviposition so members of the qualifying feature population would therefore remain in close proximity to the SAC. No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). The pipeline construction may locally intercept groundwater but the scale of this effect is unlikely to lead to adverse effects on water availability, water levels or water quality for water dependant features of the designated site. Operation of this water conveyance asset will not have any adverse effects on the designated site.	No
Raw Water System – TLT upgrade	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives.	No

	Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of the TLT capacity enhancement works from the SAC are approximately 4.8km to the west. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles) during construction. No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). Operation of this water conveyance asset will not have any adverse effects on the designated site.	
Raw Water System – Lockwood PS to KGV Reservoir Intake	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of the pipeline is approximately 1.1km away from the SAC to the west. This is beyond the maximum dispersal distance for female stag beetles (~1km) and therefore significant impacts to members of the qualifying feature population are not expected to occur. No significant air quality impacts are anticipated as the option element is a reasonable distance from the designated site and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). Due to the depth of the tunnelling works, construction is unlikely to adversely affect water levels, water availability or water quality to the water dependant features of the designated site. Operation of this water conveyance asset will not have any adverse effects on the designated site.	No
Raw Water System – TLT upgrade	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population.	No

	The closest part of the King George V Reservoir intake from the SAC is approximately 1.7km to the north west. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles) during construction. Construction will require deminimus HGV movements and traffic routes will not come within 200m of any designated site. As such, no significant air quality impacts are anticipated. Construction work will not adversely affect water levels, water availability or water quality to the water dependant features of the designated site. Operation of this expanded river intake will not adversely affect water levels, water availability or water quality to the water dependant features of the designated site – the additional capacity is to allow water released upstream of the intake from water reuse plants to be re-abstracted and discharged into the King George V reservoir.	
Network Reinforcement New Header tank at Coppermills WTW	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option to Epping Forest SAC is approximately 3.7km to the west. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated during construction (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). These works are highly localised and no potential functional habitat for stag beetles will be impacted. Operation of this water header tank asset will not have any adverse effects on the designated site.	No
Network Reinforcement – New River Head Pump 4 replacement	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. This option is simply the replacement of an existing pump with a new more suitable variant. This option lies approximately 9.3km to the south west. At this distance no likely significant effects to any of the qualifying features for this site are anticipated (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). Operation of this replacement pump will not have any adverse effects on the designated site.	No
Coppermills WTW extension 100 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded	No

	dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option to Epping Forest SAC is approximately 3.4km to the west. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated during construction (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). Operation of the expanded water treatment works will not have any adverse effects on the designated site – the expansion is required to treat additional volumes of water provided by reuse and/or desalination treatment plants and would not lead to any changes to water availability, water levels or water quality for water dependant features of the designated site.	
Coppermills WTW extension 150 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option to Epping Forest SAC is approximately 3.4km to the west. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated during construction (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). Operation of the expanded water treatment works will not have any adverse effects on the designated site – the expansion is required to treat additional volumes of water provided by reuse and/or desalination treatment plants and would not lead to any changes to water availability, water levels or water quality for water dependant features of the designated site.	No
Conveyance from Break Tank to Coppermills	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population.	No

	The closest part of this option to Epping Forest SAC is approximately 2.8km to the west. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated during construction (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles). No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site).	
Chingford South intake capacity increase	The SIP elements of potential relevance to this proposed option element are (1) air pollution, (5) inappropriate water levels and (6) water pollution. The majority of the constituent SSSI (Epping Forest SSSI) is currently unfavourable but a large proportion of this is recovering. Any significant potential impacts identified could hinder this current recovery, cause a decline in the 35.48% that is currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of the new raw water conveyance pumping station and associated channel lies approximately 720m to the west of the SAC. This lies within the precautionary maximum ~1km dispersal distance for female stag beetles such that, in theory, egg laying females could reach the construction site (and potentially be followed there by males which can disperse up to around 2km) – however, in practice, this risk is considered unlikely because there are minimal trees and associated deadwood habitat that are in the vicinity of the existing infrastructure that would attract stag beetles to that location from the SAC, there are much more significant wooded areas between the European Site and construction area that stag beetles would be likely to favour and females typically return to where they emerged from for their oviposition so members of the qualifying feature population would therefore remain in close proximity to the SAC. No significant air quality impacts are anticipated as the option element is a significant distance from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). Operation of this water conveyance asset will not have any adverse effects on the designated site.	No

Designated site name:	**Wormley Hoddesdonpark Woods**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• 9160 Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*	Water Dependency: Habitat not identified as water dependent
Current conservation status:	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*: **Bad but improving** (range: favourable, area: favourable, structure and function: bad but improving, future prospects: inadequate but improving). Main Pressures: Fertilisation, deer grazing/browsing/trampling, Air pollution, air-borne pollutants, use of biocides, hormones and chemicals, restructuring agricultural land holding, Forest and Plantation management and use, Forestry activities not referred to above, Urbanised areas, human habitation, Mining and quarrying, Industrial or commercial areas, Sport and Leisure structures, Interspecific floral relations. Threats: As listed in pressures plus: invasive non-native species, changes in abiotic conditions.	
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:	Wormley-Hoddesdonpark Woods North SSSI: 91.75% favourable, 7.67% unfavourable recovering, 0.58% unfavourable no change Wormley-Hoddesdonpark Woods South SSSI: 97.21% favourable, 2.79% unfavourable no change	
Site Improvement Plan:	1. Disease - H9160 Oak-hornbeam forests - Survey SAC and adjacent woodlands for disease, and advise owners 2. Invasive Species - H9160 Oak-hornbeam forests - Survey SAC and adjacent woodlands for invasive species, advise owners	

	3. Air Pollution: risk of Threat atmospheric nitrogen deposition - H9160 Oak-hornbeam forests - Further investigate the impacts of atmospheric nitrogen deposition 4. Deer - H9160 Oak-hornbeam forests - Improve and extend monitoring of deer impacts, advise owners 5. Vehicles: illicit - H9160 Oak-hornbeam forests - Identify areas still being damaged and take remedial action 6. Forestry and Woodland management H9160 Oak-hornbeam forests - Promote Countryside Stewardship Scheme woodland management options for units requiring active management 7. Public Access/Disturbance - H9160 Oak-hornbeam forests - Monitor site features sensitive to disturbance and take remedial action	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Raw Water System – Lockwood PS to KGV Reservoir Intake	The only SIP element of potential relevance to this proposed option element is (3) air pollution but given the significant distance of the option element to the SAC (approximately 8.6km), significant air quality impacts can be immediately excluded. The constituent SSSIs (Wormley-Hoddesdonpark Woods South SSSI and Wormley-Hoddesdonpark Woods North SSSI:) are largely in a favourable condition and the majority of the small unfavourable portions are currently recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the majority of the site that is currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of the TLT extension works from the SAC are approximately 8.6km to the south east. At this distance, no likely significant effects to the qualifying feature for this site are anticipated due to construction activities (oak and oak-hornbeam forests). Construction traffic is not expected to exceed the 1000 AADT or 200 HGV movement per day threshold commonly used to determine the potential for air quality impact (when within 200m of a designated site). No operational effects are anticipated from this water conveyance tunnel.	No
KGV Reservoir intake increase	The only SIP element of potential relevance to this proposed option element is (3) air pollution but given the significant distance of the option element to the SAC (approximately 8.6km), significant air quality impacts can be immediately excluded. The constituent SSSIs (Wormley-Hoddesdonpark Woods South SSSI and Wormley-Hoddesdonpark Woods North SSSI:) are largely in a favourable condition and the majority of the small unfavourable portions are currently recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the majority of the site that is currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of the King George V Reservoir intake from the SAC is approximately 8.6km to the south east. At this distance, no likely significant effects to the qualifying feature for this site are anticipated due to construction activities (oak and oak-hornbeam forests). Construction traffic is not expected to exceed the 1000 AADT or 200 HGV movement per day threshold commonly used to determine the potential for air quality impact (when within 200m of a designated site). No operational effects are anticipated from this water conveyance tunnel.	No

Designated site name:	**Wimbledon Common**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H4010 Northern Atlantic wet heaths with *Erica tetralix* • H4030 European dry heaths • S1083 *Lucanus cervus*: Stag beetle	Water Dependency: SAC habitats identified as water dependent: • H4010 Northern Atlantic wet heaths with *Erica tetralix* • H4030 European dry heaths
Current conservation status:	Northern Atlantic wet heaths with *Erica tetralix*: **Bad and deteriorating** (range: favourable, area: favourable, structure and function: bad and deteriorating, future prospects: bad but improving). Main pressures: grazing; abandonment of pastoral systems; burning; urbanised areas, human habitation; continuous urbanisation; discontinuous urbanisation; communication networks; energy transport; other forms of transportation and communication; air pollution; drainage; invasion by a species. Main threats: as for pressures but also other pollution or human impacts/activities. European dry heaths: **bad and deteriorating** (range: favourable, area: favourable, structure and function: bad and deteriorating, future prospects: bad but improving). Main pressures: grazing; abandonment of pastoral systems; burning; urbanised areas, human habitation; continuous urbanisation; discontinuous urbanisation; communication networks; energy transport; other forms of transportation and communication; air pollution; invasion by a species. Main threats: grazing; abandonment of pastoral systems; burning; discontinuous urbanisation; other pollution or human impacts/activities; invasion by a species. *Lucanus cervus*: Stag beetle: **Favourable** (range: favourable, population: favourable, habitat: unknown, future prospects: favourable. Main pressures Urbanised areas, human habitation: Forest and Plantation management & use. Main threats: As stated in pressures	

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. Supplementary advice document provides further details in respect of this conservation objectives.	
SSSI Condition assessment:	Wimbledon Common SSSI: Unfavourable recovering 94.99%, unfavourable no change 5.01%	
Site Improvement Plan:	1. Public Access/Disturbance. H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, S1083 Stag beetle - Implement measures to reduce visitor impact 2. Habitat Fragmentation – S1083 Stag Beetle – Species recovery projects 3. Invasive Species - H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, S1083 Stag beetle – Develop an invasives response plan 4. Air Pollution: impact of atmospheric nitrogen deposition - H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths. Establish a Site Nitrogen Action Plan	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Kempton WTW expansion (100Ml/d)	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the significant distance of the option element to the SAC (approximately 9.9km), significant air quality impacts can be excluded (assuming sensitive construction traffic routing). The constituent SSSI (Wimbledon Common SSSI) is currently 100% unfavourable but the majority is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. No Likely Significant Effects are anticipated during construction due to the distance of Kempton WTW from Wimbledon Common SAC (approximately 9.9km). No impacts to North Atlantic wet or European dry heaths or stag beetles are considered possible due to this distance and the lack of a source to receptor pathway. Air quality impacts are not anticipated because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) is not expected to be exceeded (in total, construction will involve 4500 HGV movements over a 3 year period for the scheme as a whole). Operation of this water treatment works would have no likely significant effects on the SAC – the asset will treat water abstracted from new water sources located a similar or further distance away from this SAC such that there will be no adverse effects on water levels or water availability for water dependant features of the SAC.	No
Kempton WTW expansion (150Ml/d)	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the significant distance of the option element to the SAC (approximately 9.9km), significant air quality impacts can be excluded (assuming sensitive construction traffic routing). The constituent SSSI (Wimbledon Common SSSI) is currently 100% unfavourable but the majority is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population.	No

	No Likely Significant Effects are anticipated during construction due to the distance of Kempton WTW from Wimbledon Common SAC (approximately 9.9km). No impacts to North Atlantic wet or European dry heaths or stag beetles are considered possible due to this distance and the lack of a source to receptor pathway. Air quality impacts are not anticipated because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) is not expected to be exceeded (in total, construction will involve 5,200 HGV movements over a 3 year period for the scheme as a whole). Operation of this water treatment works would have no likely significant effects on the SAC – the asset will treat water abstracted from new water sources located a similar or further distance away from this SAC such that there will be no adverse effects on water levels or water availability for water dependant features of the SAC.	
Kempton WTW expansion (300Ml/d)	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the significant distance of the option element to the SAC (approximately 9.9km), significant air quality impacts can be excluded (assuming sensitive construction traffic routing). The constituent SSSI (Wimbledon Common SSSI) is currently 100% unfavourable but the majority is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. No Likely Significant Effects are anticipated during construction due to the distance of Kempton WTW from Wimbledon Common SAC (approximately 9.9km). No impacts to North Atlantic wet or European dry heaths or stag beetles are considered possible due to this distance and the lack of a source to receptor pathway. Air quality impacts are not anticipated because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) is not expected to be exceeded (in total, construction will involve 10,500 HGV movements over a 3 year period for the scheme as a whole). Operation of this water treatment works would have no likely significant effects on the SAC – the asset will treat water abstracted from new water sources located a similar or further distance away from this SAC such that there will be no adverse effects on water levels or water availability for water dependant features of the SAC.	No
Direct River Abstraction Teddington to Thames Lee Valley Shaft 300 Ml/d	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the distance of the option element to the SAC (approximately 4km), significant air quality impacts are considered to be unlikely. The constituent SSSI (Wimbledon Common SSSI) is currently 100% unfavourable but the majority is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. No SSSIs were identified within 1km of this option element. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of* Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The Thames Lee Valley Shaft 300 Ml/d option element lies approximately 4km to the west of Wimbledon Common SAC, with the Teddington shaft being located further away. No impacts to North Atlantic wet or European dry heaths or stag beetles are considered possible during construction due to this distance and the lack of a source to receptor pathway. No significant air quality impacts are anticipated as the option element is a significant distance from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site).	No

	Operation of this water conveyance asset would have no likely significant effects on the SAC.	
Direct River Abstraction - Teddington Weir (Mogden Effluent Transfer) - 300 Ml/d	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the distance of the option element to the SAC (approximately 4.5km), significant air quality impacts are considered to be unlikely. The constituent SSSI (Wimbledon Common SSSI) is currently 100% unfavourable but the majority is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. No SSSIs were identified within 1km of this option element. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option element lies approximately 4.5km to the west of Wimbledon Common SAC. No impacts to North Atlantic wet or European dry heaths or stag beetles are considered possible during construction or operation due to this distance and the lack of a source to receptor pathway. No significant air quality impacts are anticipated as the option element is a significant distance from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site).	No
Hampton WTW to Battersea Extension	The only SIP element of potential relevance to this proposed option element is (4) air pollution given the relatively close proximity of the option element to the SAC. The constituent SSSI (Wimbledon Common SSSI) is currently 100% unfavourable but the majority is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option element lies approximately 550m to the north of Wimbledon Common SAC at the location of intermediate shaft no. 6. No impacts to the North Atlantic wet or European dry heaths are considered likely at this distance. However, as stag beetles (egg laying females) can disperse a maximum of 1km any above ground works that take place within this distance of the SAC have the potential to impact upon this qualifying feature, including potential reproduction sites. This applies to intermediate shaft 6 for this option element. Altough aerial imagery of the shaft site location suggests the shaft site avoids mature trees an appropriate assessment is required to confirm this and recommend appropriate mitigation with respect to precautionary mitigation measures. The intermediate shafts are between 30m and 70m deep. At this depth, the tunnel running between shafts should have no impact on the qualifying features for the SAC (stag beetles and North Atlantic wet/European dry heaths) as it is unlikely to impact water levels or water availability to water dependant habitats and will be significantly below the depth of soil and deadwood habitats utilised by stag beetle. The site is underlain by London Clay (an aquiclude) through which the tunnel will be constructed so it is hydrologically isolated from the SAC. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. Operation of this water conveyance asset will have no likely adverse effects on the SAC.	In the absence of mitigation, a Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme
AR Merton (SLARS3) - 5 Ml/d	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the distance of the option element to the SAC (approximately 2.7km), significant air quality impacts are considered to be unlikely. The constituent SSSI (Wimbledon Common SSSI) is currently 100% unfavourable but the majority is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for	No

	female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option lies approximately 2.7km to the east of Wimbledon Common SAC. This is beyond the maximum ~1km dispersal distance for stag beetles (egg laying females) and as such the construction activities are not expected to have any impact on the population of this qualifying feature. The scheme would involve using surplus water supply capacity for recharge water for the confined chalk aquifer in south London. The SAC site is underlain by London Clay (i.e. it confines the Chalk aquifer and effectively separates the abstraction hydrogeologically from the local water table underlying the SAC); consequently, the water environment supporting the SAC features would not be affected by the abstraction or recharge activities. Therefore operation of the scheme is unlikely to have any significant effects on the site's water dependant qualifying features.	
AR Streatham (SLARS2) - 4 Ml/d	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the significant distance of the option element to the SAC (approximately 5.7km), significant air quality impacts can be excluded (assuming sensitive construction traffic routing). The constituent SSSI (Wimbledon Common SSSI) is currently 100% unfavourable but the majority is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option lies approximately 5.7km to the east of Wimbledon Common SAC. This is beyond the maximum ~1km dispersal distance for stag beetles (egg laying females) and as such the construction activities are not expected to have any impact on the population of this qualifying feature. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The scheme would involve using surplus water supply capacity for recharge water for the confined chalk aquifer in south London. The SAC site is underlain by London Clay (i.e. it confines the Chalk aquifer and effectively separates the abstraction hydrogeologically from the local water table underlying the SAC); consequently, the water environment supporting the SAC features would not be affected by the abstraction or recharge activities. Therefore operation of the scheme is unlikely to have any significant effects on the site's water dependant qualifying features.	No
Raw Water System – Increase capacity of Surbiton intake	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the significant distance of the option element to the SAC (approximately 5.5km), significant air quality impacts can be excluded (assuming sensitive construction traffic routing). The constituent SSSI (Wimbledon Common SSSI) is currently 100% unfavourable but the majority is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option element lies approximately 5.5km to the south west of Wimbledon Common SAC. This is beyond the maximum ~1km dispersal distance for stag beetles (egg laying females) and as such the construction works are not expected to have any impact on the population of this qualifying feature. No impacts to North Atlantic wet or European dry heaths are considered possible during construction or operation due to this distance and the lack of	No

	a source to receptor pathway. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	
Mogden to Teddington 300 Ml/d	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the distance of the option element to the SAC (4.5km), significant air quality impacts are considered to be unlikely. The constituent SSSI (Wimbledon Common SSSI) is currently 100% unfavourable but the majority is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option element lies approximately 4.5km to the west of Wimbledon Common SAC. This is beyond the maximum ~1km dispersal distance for stag beetles (egg laying females) and as such the construction works are not expected to have any impact on the population of this qualifying feature. No impacts to North Atlantic wet or European dry heaths are considered possible due to this distance and the lack of a source to receptor pathway, with the tunnelling at a depth of 30m to 70m in London Clay unlikely to disrupt local water levels and water availability to the water dependant features of the SAC. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No

Designated site name:	**Richmond Park**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• S1083. *Lucanus cervus*; Stag beetle Water Dependency:	Species not identified as water dependent
Current conservation status:	*Lucanus cervus*: Stag beetle: **Favourable** (range: favourable, population: favourable, habitat: unknown, future prospects: favourable. Main pressures Urbanised areas, human habitation: Forest and Plantation management & use. Main threats: As stated in pressures	
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. Supplementary advice provides further details in relation to these objectives.	
SSSI Condition assessment:	Richmond Park SSSI: 100% unfavourable recovering	
Site Improvement Plan:	No current issues affecting the Natura 2000 feature(s) have been identified on this site. The Richmond Park Management Plan should continue to be periodically reviewed to ensure the continuing availability of decaying wood habitat	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Kempton WTW expansion (100Ml/d)	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female	No

	dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. No Likely Significant Effects are anticipated due to the distance of Kempton WTW from Richmond Park SAC (approximately 7.8km for this option) and it is considered highly unlikely that any stag beetles found in the vicinity of the WTW site would form part of any population associated with the SAC due to the distances involved and the relatively poor flight capabilities of the adult stag beetle, limiting its dispersal ability. ~1km is considered to be the maximum dispersal distance for this species (egg laying females). No operational effects are anticipated from use of this water treatment works.	
Kempton WTW expansion (150Ml/d)	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. No Likely Significant Effects are anticipated due to the distance of Kempton WTW from Richmond Park SAC (approximately 7.5km for this option) and it is considered highly unlikely that any stag beetles found in the vicinity of the WTW site would form part of any population associated with the SAC due to the distances involved and the relatively poor flight capabilities of the adult stag beetle, limiting its dispersal ability. ~1km is considered to be the maximum dispersal distance for this species (egg laying females). No operational effects are anticipated from use of this water treatment works.	No
Kempton WTW expansion (300Ml/d)	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. No Likely Significant Effects are anticipated due to the distance of Kempton WTW from Richmond Park SAC (approximately 7.5km for this option) and it is considered highly unlikely that any stag beetles found in the vicinity of the WTW site would form part of any population associated with the SAC due to the distances involved and the relatively poor flight capabilities of the adult stag beetle, limiting its dispersal ability. ~1km is considered to be the maximum dispersal distance for this species (egg laying females). No operational effects are anticipated from use of this water treatment works.	No
NET-TWRM-KEM New Kempton Shaft	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives.	No

	Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. No Likely Significant Effects are anticipated due to the distance of Kempton WTW from Richmond Park SAC (approximately 7.5km for this option) and it is considered highly unlikely that any stag beetles found in the vicinity of the WTW site would form part of any population associated with the SAC due to the distances involved and the relatively poor flight capabilities of the adult stag beetle, limiting its dispersal ability. ~1km is considered to be the maximum dispersal distance for this species (egg laying females). No operational effects are anticipated from use of this asset.	
Direct River Abstraction Teddington to Thames Lee Valley Shaft 300 Ml/d	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. No SSSIs were identified within 1km of this option element. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The Thames Lee Valley Shaft 300 Ml/d lies approximately 1.4km to the west of Richmond Park SAC; this represents the closest part of this option element to the SAC. This is beyond the maximum dispersal distance for female stag beetles (~1km) and therefore significant impacts to members of the qualifying feature population are not expected to occur. No operational effects are anticipated from the use of this asset.	No
Hampton WTW to Battersea Extension	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. One intermediate tunnel shaft (no. 4) is located just within the boundary of Richmond Park SAC in the vicinity of Roehampton Gate near the park's northern boundary. This shaft will have a 10.5m internal diameter (ID). Consideration should be given to locating this shaft outside the boundary of Richmond Park if at all possible (and this is currently under review by Thames Water). Given the current shaft design shows the location within the SAC there is a possibility that stag beetles that form part of the population of the qualifying feature for the SAC could be directly fatally impacted by the works; as such, likely significant effects could occur as a result of this option element. However, the shaft has currently been located wholly within a car park devoid of vegetation and therefore no suitable stag beetle habitat (particularly egg-laying habitat) appears to be available. At this stage it is not possible to screen this option element out and a Stage 2 Appropriate Assessment may be required if the current scheme design cannot be modified and the option element is included in the preferred programme.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme

	The intermediate shafts are between 30 and 70m deep. At this depth, the associated tunnel that crosses beneath the park at its northern boundary should have no impact on the qualifying feature for the SAC (stag beetles) as it will be significantly below the depth of soil and deadwood habitats utilised by stag beetle. No operational effects are anticipated from this water conveyance asset.	
London confined Chalk north	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option element lies approximately 8.9km to the north of the SAC. ~1km is considered to be the maximum dispersal distance for stag beetles (egg laying females) and as such this qualifying feature would not be affected by construction at this distance. The SAC site is underlain by London Clay (i.e. it confines the Chalk aquifer and effectively separates the scheme hydrogeologically from the SAC) and so the water environment in the vicinity of the SAC would not be affected by the operational abstraction activities. Therefore, the scheme is unlikely to have significant effects on the site's qualifying features.	No
AR Merton (SLARS3) - 5 Ml/d	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option element lies approximately 5.3km to the south east of the SAC. 1km is considered to be the maximum ~1km dispersal distance for stag beetles (egg laying females) and as such this qualifying feature would not be affected by construction at this distance. The scheme would involve using surplus water supply capacity for recharge water for the confined chalk aquifer in south London. The SAC site is underlain by London Clay (i.e. it confines the Chalk aquifer and effectively separates the abstraction hydrogeologically from the local water table underlying the SAC); consequently, the water environment supporting the SAC features would not be affected by the abstraction or recharge activities. Therefore operation of the scheme is unlikely to have any significant effects on the site's water dependant qualifying features.	
AR Streatham (SLARS2) - 4 Ml/d	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population.	No

	The closest part of this option element lies approximately 8km to the east of Richmond Park SAC. This is beyond the maximum ~1km dispersal distance for this species (egg laying females) and as such the construction activities are not expected to have any impact on the population of this qualifying feature. The scheme would involve using surplus water supply capacity for recharge water for the confined chalk aquifer in south London. The SAC site is underlain by London Clay (i.e. it confines the Chalk aquifer and effectively separates the abstraction hydrogeologically from the local water table underlying the SAC); consequently, the water environment supporting the SAC features would not be affected by the abstraction or recharge activities. Therefore operation of the scheme is unlikely to have any significant effects on the site's water dependant qualifying features.	
Raw Water System – Increase capacity of Surbiton intake	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option lies approximately 3.5km to the south west of Richmond Park SAC. This is beyond the maximum ~1km dispersal distance for this species (egg laying females) and as such the construction activities will not have any impact on the population of this qualifying feature, particularly as the works are restricted to within the existing pumping station. Operation of the expanded intake will have no adverse effect on the qualifying features of the SAC due to the absence of a source to receptor pathway – operation of this option element would have minor effects on the Lower River Thames and Upper Thames Tideway, but this would not have any impact on the SAC.	No
Raw Water System – Queen Mary Reservoir to Kempton WTW site	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option element lies approximately 7.7km to the west of Richmond Park SAC. This is beyond the maximum ~1km dispersal distance for this species (egg laying females) and as such the construction activities are not expected to have any impact on the population of this qualifying feature. Operation of this water conveyance asset will have no adverse effects on the qualifying features of the SAC.	No
Mogden to Teddington 300 Ml/d	No SIP has been stated for this SAC given a lack of identified issues with the qualifying feature (stag beetles) and its habitat management at this site. The constituent SSSI (Richmond Park SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The intermediate shaft for this option is located approximately 1.2km to the west of Richmond Park SAC; this represents the closest part of this option element to the SAC. This is beyond the maximum dispersal distance for female stag beetles (~1km) and therefore significant impacts to members of the qualifying feature population are not expected to occur.	No

Designated site name:	**South West London Waterbodies**

Designation type: (SAC, SPA, Ramsar):	**SPA and Ramsar**		
Qualifying features:	• A051 *Anas strepera*; Gadwall (Non-breeding) • A056 *Anas clypeata*; Northern shoveler (Non-breeding)	**Ramsar criterion 6**: Species with peak counts in spring/autumn: Northern shoveler, *Anas clypeata*, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population Species with peak counts in winter: Gadwall, *Anas strepera strepera*, NW Europe. 487 individuals, representing an average of 2.8% of the GB population.	Water Dependency: SPA species identified as water dependent: • *Anas strepera*; Gadwall (Non-breeding) • *Anas clypeata*; Northern shoveler (Non-breeding) • The Ramsar Site and its qualifying criteria (by definition) are all water dependent.
Current conservation status (Article 12):	Gadwall: Population numbers: Sufficient, Range coverage: Sufficient, Ecological sufficiency: Sufficient Northern shoveler: Population numbers: Sufficient, Range coverage: Sufficient, Ecological sufficiency: Sufficient		
Conservation objectives (SPA):	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. Supplementary advice provides further details in relation to these objectives.		
SSSI Condition assessment:	Kempton Park Reservoirs SSSI: 100% unfavourable recovering Knight & Bessborough Reservoirs SSSI: 100% favourable Thorpe Park No. 1 Gravel Pit SSSI: 100% favourable Wraysbury No. 1 Gravel Pit SSSI: 100% favourable Wraysbury Reservoir SSSI: 100% favourable Wraysbury & Hythe End Gravel Pits SSSI: 100% favourable Staines Moor SSSI: 96.16% favourable, 2.13% unfavourable recovering, 1.71% unfavourable declining		
Site Improvement Plan:	1. Public Access/Disturbance - A051(NB) Gadwall, A056(NB) Shoveler – Produce written agreement with landowners and recreational users to reduce recreational disturbance 2. Changes in species distributions - A051(NB) Gadwall, A056(NB) Shoveler - In partnership with bird recorders/watchers, review existing data and secure fit for-purpose recording practices across the SPA and its surroundings 3. Invasive species - A051(NB) Gadwall, A056(NB) Shoveler - Manage *Crassula helmsii* and equip recreational users and landowners to monitor for the plant 4. Natural changes to site conditions - A051(NB) Gadwall, A056(NB) Shoveler - Carry out strategic habitat management, including management of bankside vegetation 5. Fisheries: Fish stocking - A051(NB) Gadwall, A056(NB) Shoveler - Secure appropriate fish stocking levels 6. Inappropriate weed Threat control A051(NB) Gadwall, A056(NB) Shoveler Clarify appropriate weed control with owners and tenants through consents, and carry out enforcement action where necessary 7. Invasive species051(NB) Gadwall, A056(NB) Shoveler Research Egyptian geese, and control if necessary		
Potential Effects			
Option Element:	Assessment:		Likely Significant Effects?
Kempton WTW expansion (100Ml/d)	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. The whole option element lies within the all planning applications and pipelines, pylons and overhead cables SSSI Impact Risk Zones. As the site is located within 1km of a SSSI that forms a constituent part of the South West London Waterbodies SPA and Ramsar Site (Kempton Park Reservoirs SSSI), there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site, namely over-wintering gadwall and shoveler (this 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. The closest part of the 100Ml/d works is approximately 520m from the SPA/Ramsar Site, which is well within the precautionary potential noise disturbance distance for birds cited above. Such a disturbance impact could occur as a result of works conducted during October-March inclusive. In addition, there is a non-designated waterbody at Kempton racecourse to the south that could be used as off-site functional habitat by the qualifying feature bird species of the SPA/Ramsar Site. As this lies approximately 240m to the south east of the 100Ml/d option element it could be subject to significant noise/visual disturbance as a result of works. No other potential functional habitat lies within 1km of the works and therefore no other noise/visual impacts to functional habitat are anticipated.		Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

	According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. Qualifying feature bird species utilising the potential functional habitat within 250m of this option element would therefore be vulnerable to visual disturbance as well as noise disturbance whereas those using the SPA/Ramsar Site itself would be vulnerable to noise disturbance only at this distance. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds and spread of invasive non-native species. The reservoirs that form a constituent part of the SSSIs are bunded and, as such, no impacts to water levels or quality are anticipated that could impact upon the European Sites or their qualifying features. No adverse effects are anticipated on the European Sites or their qualifying features during operation of the new water treatment works – the works will treat water from various new water sources rather than drawing additional supplies from existing water sources; there will be no adverse effects on water levels in the Thames Water open storage reservoirs that are in the vicinity of the Kempton Park site, some of which form habitat features of the SPA and Ramsar Site. Operational activities at the water treatment works will be of a similar nature to those already carried out by Thames Water at the existing water treatment works site and could cause disturbance to the designated bird populations in the absence of mitigation.	
Kempton WTW expansion (150Ml/d)	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. The whole option element lies within the all planning applications and pipelines, pylons and overhead cables SSSI Impact Risk Zones. As the site is located within 1km of a SSSI that forms a constituent part of the South West London Waterbodies SPA and Ramsar Site (Kempton Park Reservoirs SSSI), there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site, namely over-wintering gadwall and shoveler (this 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. The closest part of the 150Ml/d works is approximately 520m from the SPA/Ramsar Site, which is well within the precautionary potential noise disturbance distance for birds cited above. Such a disturbance impact could occur as a result of works conducted during October-March inclusive. In addition, there is a non-designated waterbody at Kempton racecourse to the south that could be used as off-site functional habitat by the qualifying feature bird species of the SPA/Ramsar Site. As this lies approximately 255m to the south east of the 150 Ml/d option element it could be subject to significant noise/visual disturbance as a result of works. No other potential functional habitat lies within 1km of the works and therefore no other noise/visual impacts to functional habitat are anticipated. According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. As the option element is greater than 250m from both the the SPA/Ramsar Site and the potential functional habitat at Kempton racecourse it is likely that any disturbance to the qualifying feature bird species would be noise rather than visual disturbance (although it is acknowledged in the case of the functional habitat that this is right on the threshold within which visual disturbance can be significant). In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds and spread of invasive non-native species. The reservoirs that form a constituent part of the SSSIs are bunded and, as such, no impacts to water levels or quality are anticipated that could impact upon the European Sites or their qualifying features. No adverse effects are anticipated on the European Sites or their qualifying features during operation of the new water treatment works – the works will treat water from various new water sources rather than drawing additional supplies from existing water sources; there will be no adverse effects on water levels in the Thames Water open storage reservoirs that are in the vicinity of the Kempton Park site, some of which form habitat features of the SPA and Ramsar Site. Operational activities at the water treatment works will be of a similar nature to those already carried out by Thames Water at the existing water treatment works site but could still cause disturbance to the designated bird populations in the absence of appropriate mitigation.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.
Kempton WTW expansion (300Ml/d)	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. The whole option element lies within the all planning applications and pipelines, pylons and overhead cables SSSI Impact Risk Zones. As the site is located within 1km of a SSSI that forms a constituent part of the South West London Waterbodies SPA and Ramsar Site (Kempton Park Reservoirs SSSI), there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site, namely over-wintering gadwall and shoveler (this 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report Environment Agency (2013) Bird Disturbance from Flood and Coastal Risk Management Construction Activities. Overarching Interpretive Summary	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

	Report. Prepared by Cascade Consulting and Institute of Estuarine and Coastal Studies, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. The closest part of the 300Ml/d works is approximately 520m from the SPA/Ramsar Site, which is well within the accepted potential noise disturbance distance for birds cited above. Such a disturbance impact could occur as a result of works conducted during October-March inclusive. In addition, there is a non-designated waterbody at Kempton racecourse to the south that could be used as off-site functional habitat by the qualifying feature bird species of the SPA/Ramsar Site. As this lies approximately 190m to the south east of the 300 Ml/d option element (temporary works) it could be subject to significant noise/visual disturbance as a result of works. No other potential functional habitat lies within 1km of the works and therefore no other noise/visual impacts to functional habitat are anticipated. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds and spread of invasive non-native species. The reservoirs that form a constituent part of the SSSIs are bunded and, as such, no impacts to water levels or quality are anticipated that could impact upon the European Sites or their qualifying features. No adverse effects on the European Sites or their qualifying features are anticipated during operation of the new water treatment works – the works will treat water from various new water sources rather than drawing additional supplies from existing water sources; there will be no adverse effects on water levels in the Thames Water open storage reservoirs that are in the vicinity of the Kempton Park site, some of which form habitat features of the SPA and Ramsar Site. Operational activities at the water treatment works will be of a similar nature to those already carried out by Thames Water at the existing water treatment works site and could still cause disturbance to the designated bird populations in the absence of appropriate mitigation.	
NET-TWRM-KEM New Kempton Shaft	The SIP elements of potential relevance to this proposed option element are mainly (1) disturbance (only) and to a much lesser extent (3) invasive species. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. The whole option element lies within the all planning applications and pipelines, pylons and overhead cables SSSI Impact Risk Zones. As the site is located within 1km of a SSSI that forms a constituent part of the South West London Waterbodies SPA and Ramsar Site (Kempton Park Reservoirs SSSI) there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site; namely over-wintering gadwall and shoveler (this 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. The proposed shaft location is located approximately 220m from the SPA/Ramsar Site, which is sufficiently close that a significant disturbance impact could reasonably be expected to occur to the qualifying features (based on the above citations). Such a disturbance impact could occur as a result of works conducted during October-March inclusive. In addition, there is a non-designated waterbody at Kempton racecourse to the south that could be used as off-site functional habitat by the qualifying feature bird species of the SPA/Ramsar Site. As this lies approximately 490m to the south of the shaft option element it could be subject to significant noise/visual disturbance as a result of works. No other potential functional habitat lies within 1km of the works and therefore no other noise/visual impacts to functional habitat are anticipated. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds and spread of invasive non-native species. The reservoirs that form a constituent part of the SSSIs are bunded and, as such, no impacts to water levels or quality are anticipated that could impact upon the European Sites or their qualifying features. No adverse effects on the European Sites or their qualifying features are anticipated during operation of this treated water network conveyance asset.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.
Direct River Abstraction Teddington to Thames Lee Valley Shaft 300 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species. Given the significant distance to the SPA/Ramsar Site (approximately 4.8km) from this option element and the nature of the works, no such impacts as a result of either works/operation are anticipated. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. No SSSIs were identified within 1km of this option element. The Teddington shaft lies approximately 4.8km to the east of the closest constituent part of the South West London Waterbodies SPA and Ramsar Site (Kempton Park Reservoirs SSSI) and sufficiently distant from the site such that noise disturbance from construction activities is unlikely to lead to adverse effects on the qualifying features of the SPA/Ramsar Site (overwintering shoveler or gadwall). No other potential impact pathways exist during construction. No potential functional habitat was identified within 1km of the option element and therefore there is no risk of noise or visual disturbance to members of the qualifying feature populations of the SPA/Ramsar Site. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. No adverse effects on the European Sites or their qualifying features are anticipated during operation of this water conveyance asset.	No

Direct River Abstraction - Teddington Weir (Mogden Effluent Transfer) - 300 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species. Given the significant distance to the SPA/Ramsar Site (approximately 4.8km) from this option element and the nature of the works, no such impacts as a result of either works/operation are anticipated. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. This option element lies approximately 4.8km to the east of the closest constituent part of the South West London Waterbodies SPA and Ramsar Site (Kempton Park Reservoirs SSSI) and sufficiently distant from the site such that noise disturbance from construction activities is unlikely to lead to adverse effects on the qualifying features of the SPA/Ramsar Site (overwintering shoveler or gadwall). No other potential impact pathways exist during construction. No potential functional habitat was identified within 1km of the option element and therefore there is no risk of noise or visual disturbance to members of the qualifying feature populations of the SPA/Ramsar Site. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. No adverse effects on the European Sites or their qualifying features are anticipated during operation of the scheme, with the effects of the discharge and abstraction activities confined to the lowest reach of the River Thames upstream of Teddington Weir and the Thames Tideway. Operation of the scheme will have no adverse effects on water levels or quality in the Thames Water open storage reservoirs within, or in the vicinity of, the SPA and Ramsar Site.	No
Hampton WTW to Battersea Extension	The SIP elements of potential relevance to this proposed option element are mainly (1) disturbance (only) and to a much lesser extent (3) invasive species. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. As the closest part of this option (Hampton Water Treatment Works) is over 1 kilometre from the closest constituent part of the South West London Waterbodies SPA (Kempton Park Reservoirs SSSI), no likely significant effects are anticipated due to construction of this tunnel since this is beyond the ~1 kilometre maximum distance at which disturbance impacts to birds (the qualifying feature of both the SPA and Ramsar Site) are considered likely to have an adverse effect. There is a relative paucity of potential functional habitat (large waterbodies) within 1km of the tunnel alignment given the long length of the scheme. None of those identified were within 250m of the route. Given the distance of the option element from any potential functional habitat coupled with their relatively small size and high existing disturbance baselines no significant impacts to members of the qualifying feature populations using functional habitat are anticipated. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. No adverse effects are anticipated on the European Sites or their qualifying features during operation of this water conveyance asset.	No
Thames Valley Central ASR	The SIP elements of potential relevance to this proposed option element are mainly (1) disturbance (only) and to a much lesser extent (3) invasive species. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. As the closest part of this option (Ashford Common Water Treatment Works) is over 1 kilometre from the closest constituent part of the South West London Waterbodies SPA (Kempton Park Reservoirs SSSI), no likely significant effects are anticipated due to construction of the boreholes and sewer connection since these are beyond the ~1 kilometre maximum distance at which disturbance impacts to birds (the qualifying feature) are considered likely to have an adverse effect. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. However, the adjacent Queen Mary Reservoir to the west is likely to be used as off-site functional habitat by members of the qualifying bird species populations and this would put them at risk of disturbance as a result of the works. This risk of disturbance is not thought to be significant though as the works are localised within the existing water treatment works, the 12m high reservoir embankments will act as a noise barrier and the surrounding residential and industrial land use means there is likely to be an existing high baseline of disturbance around the reservoir and, as such, any birds utilising any functional habitat nearby are expected to be habituated to disturbance and not experience a significant impact. Abstraction and artificial recharge will be from and to the confined Lower Greensand aquifer, which is at depth below the confined Chalk aquifer in this area. There is no hydrogeological connection with the surface water environment. The water being used for the recharge is surplus water that will be abstracted under existing abstraction licences. The proposed scheme will not require any land take from within the SPA/Ramsar Site boundary. Impacts on the qualifying features of the European Sites due to construction or operation are therefore considered unlikely to arise.	No

Datchet Groundwater	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species but both are considered to be of negligible likelihood given the scale, nature and location of the groundwater abstraction. The closest constituent SSSI (approximately 1.6km away: Wraysbury No. 1 Gravel Pit SSSI) is currently 100% favourable. Any potential significant impacts identified could lead to a decline in this good condition and affect the ability of the site to achieve its conservation objectives. Whilst all but two of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the SSSIs that are not currently favourable. There are no SSSIs or potential functional habitat within 1km of this option element. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. As the proposed scheme abstracts from the confined Chalk aquifer there is no direct hydrological impact of abstraction on the surface water features and habitats of the SPA/Ramsar Site. The proposed scheme will not require land take from within SPA/Ramsar Site boundaries, and construction activities are at sufficient distance from SPA/Ramsar Site (approximately 1.6km at the closest point) that no impacts on the qualifying features of the European Sites are anticipated during construction.	No
Eton removal of constraints to DO - 1.3 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species but both are considered to be of negligible likelihood given the small scale, nature and location of the groundwater abstraction. The closest constituent SSSI (Wraysbury No. 1 Gravel Pit SSSI) is currently 100% favourable. Any potential impacts identified could lead to a decline in this good condition and affect the ability of the site to achieve its conservation objectives. Whilst all but two of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the SSSIs that are not currently favourable. There are no SSSIs or potential functional habitat within 1km of this option element. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. The closest part of the works lies approximately 4.1km to the north west of the SPA/Ramsar. The works are highly localised within Eton WTW. As such, no impacts on the qualifying features of the SPA/Ramsar Site are anticipated during construction. During operation, abstraction from groundwater will not have any adverse effects on water levels or quality in the standing water bodies of the SPA/Ramsar Site which are underlain by London Clay. Impacts on standing water bodies in the vicinity of the SPA/Ramsar Site that are supported by river sands/gravels will equally not be adversely affected by this abstraction from the chalk aquifer with abstraction remaining within existing abstraction licence limits.	No
Raw Water System – Increase capacity of Surbiton intake	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species but both are considered to be of negligible likelihood given the small scale, nature and location of the groundwater abstraction. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. The closest part of this option element lies approximately 4.6km to the east of the SPA/Ramsar Site. The works are highly localised within the existing Surbiton Pumping Station site boundary within the existing pumping station. As such, no significant impacts on the qualifying features of the SPA/Ramsar Site are anticipated during construction. The closest potential off-site functional habitat for wintering birds is a lake 570m to the north within the Bushy Park Home Park SSSI but at this distance and considering the highly localised nature of the works, no disturbance impact would be experienced by members of the qualifying feature population (as confirmed by the research cited above). During operation, the abstraction from the Lower River Thames at Surbiton will remain within the existing overall abstraction licence limits for Thames Water's lower River Thames abstractions and there will be no hydrological effects on the standing water bodies within the SPA/Ramsar Site.	No
Raw Water System – Queen Mary Reservoir to Kempton WTW site	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species. Given the significant distance to the SPA/Ramsar Site from this option element and the nature of the works, no significant impacts as a result of either works/operation are anticipated. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. The Kempton end of the 3.5m diameter tunnel terminates approximately 470m to the west of the SPA/Ramsar Site. The reception shaft will have a diameter of 10.5m and an associated temporary construction compound of 0.25ha. Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (gadwall and shoveler) that form the qualifying features for the SPA and Ramsar Site. This 1km screening threshold for bird disturbance is a precautionary	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

	distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. In addition, there are three waterbodies within 1km of the option element that could offer off-site functional habitat to members of the qualifying feature populations and be subject to potential disturbance impacts. These are Queen Mary Reservoir (location of the intake structure and near to the drive shaft), a lake to the south of Charlton waterworks (near to the intermediate shaft) and a waterbody at Kempton racecourse, approximately 330m south of the reception shaft. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds and spread of invasive non-native species. The reservoirs that form a constituent part of the SSSIs are bunded and, as such, no impacts to water levels or quality are anticipated that could impact upon the Ramsar Site or its qualifying features. No adverse effects on the European Sites or their qualifying features are likely to arise from operation of this water conveyance asset.	
Mogden to Teddington 300 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species. Given the significant distance to the SPA/Ramsar Site from this option element and the nature of the works, no significant impacts as a result of either works/operation are anticipated. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. The Teddington shaft lies approximately 4.8km to the east of the closest constituent part of the South West London Waterbodies SPA and Ramsar Site (Kempton Park Reservoirs SSSI). This is the closest part of this option element to the designated sites. Significant noise disturbance to birds is thought possible to occur within only 1km. As such, no significant effects are anticipated on the qualifying features of the SPA/Ramsar Site (overwintering shoveler or gadwall) during construction. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. No other potential impact pathways to the European Sites exist in respect of the construction or operation of this water conveyance option element.	No
Raw Water System – Increase capacity of Littleton intake PS	The SIP elements of potential relevance to this proposed option element are mainly (1) disturbance (only) and to a much lesser extent (3) invasive species. The closest constituent SSSI (Kempton Park Reservoirs SSSI) is currently 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. Whilst all but one of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the small portion of Staines Moor SSSI that is not currently favourable. The proposed scheme will not require land take from within SPA/Ramsar Site boundaries, and construction activities are at sufficient distance from the SPA/Ramsar Site (1.9km at the closest point) that no impacts on the bird qualifying features when using the European Site are anticipated. The 1km screening threshold for bird disturbance used is a precautionary distance based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. However the open cut channel from the River Thames leads to Littleton pumping station which is adjacent to Queen Mary Reservoir. This large waterbody is likely to be used as functional habitat by members of the qualifying feature bird populations and, as such, a disturbance impact could occur during construction of the channel if the works at Littleton pumping station, were conducted during the winter period. No other potential impact pathways to the European Sites exist in respect of the construction or operation of this water conveyance option element.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.
Raw Water System - Datchet intake increase	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species. Given the connection to the SPA/Ramsar Site from this option element and the nature of the works, both of these impacts are feasible. The closest constituent SSSI (Wraysbury No. 1 Gravel Pit SSSI) is currently 100% favourable. Any potential significant impacts identified could lead to a decline in this good condition and affect the ability of the site to achieve its conservation objectives. Whilst all but two of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the SSSIs that are not currently favourable. The Datchet intake pumping station lies approximately 1.6km to the north-west of the closest constituent part of the South West London Waterbodies SPA and Ramsar Site (Wraysbury No. 1 Gravel Pit SSSI). Significant noise disturbance to birds is thought possible to occur only within 1km. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. However, a new raw water conveyance pipeline will be constructed to Wraysbury Reservoir SSSI (which forms a constituent part of the SPA/Ramsar Site) and this connection and any works within 1km of the reservoir has the potential to disturb the	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

	wintering bird qualifying features of the SPA/Ramsar Site (gadwall and shoveler). Such a disturbance impact could occur as a result of works conducted during October-March inclusive. According to areport from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. As the option element terminates at the SPA/Ramsar Site it is probable that any disturbance to the qualifying feature bird species would be both noise and visual. It should be noted, however, that this connection involves highly localised works compared to the overall size of Wraysbury Reservoir. In addition to impacts at the SPA/Ramsar Site, the pipeline route also connects to The Queen Mother Reservoir and passes in close proximity to other large waterbodies all of which have the potential to be used as off-site functional habitat by members of the qualifying feature populations and therefore could be subject to disturbance impacts. It is thought, however, that any such disturbance impact as a result of construction would be unlikely to be significant because of the existing relatively high baseline of disturbance as a result of the M4 and M25 motorways, residential and industrial developments and gravel extraction sites in the area meaning that birds using the SPA/Ramsar Site are likely to be sufficiently habituated to disturbance as for it not to have an effect on achieving the European Site's conservation objectives. In addition, the considerable number of waterbodies in the area builds in resilience in the fact that if birds were temporarily disturbed by construction activities in one area in the short term they can be displaced to another, less disturbed, waterbody without being likely to incur a significant impact. However, as a likely significant effect (i.e. a possible effect) has ben identified this will be explored further at Stage 2 Appropriate Assessment. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds and spread of invasive non-native species During operation, the abstraction from the Lower River Thames at Datchet will remain within the existing overall abstraction licence limits for Thames Water's lower River Thames abstractions and there will be no hydrological effects on the standing water bodies within the SPA/Ramsar Site.	

Designated site name:	**Thursley and Ockley Bogs**		
Designation type: (SAC, SPA, Ramsar):	**Ramsar**		
Qualifying features:	**Nationally important species occurring on the site.** Sand lizard, *Lacerta agilis* Common lizard, *Lacerta vivipara* Slow worm, *Anguis fragilis* Grass snake, *Natrix natrix* Smooth snake, *Coronella austriaca* Adder, *Vipera berus*	**Ramsar criterion 2** Supports a community of rare wetland invertebrate species including notable numbers of breeding dragonflies. **Ramsar criterion 3** It is one of few sites in Britain to support all six native reptile species. The site also supports nationally important breeding populations of European nightjar *Caprimulgus europaeus* and woodlark *Lullula arborea.*	**Water Dependency:** • Wetland invertebrate species • Grass snake • The Ramsar Site and its qualifying criteria (by definition) are all water dependent.
Current conservation status (Article 12):	N/A		
Conservation objectives (SPA):	Not available		
SSSI Condition assessment:	Thursley, Hankley & Frensham Commons SSSI – 81.78% Favourable, 18.11% unfavourable – recovering, 0.11% unfavourable no change		
Site Improvement Plan:	Not available		
Potential Effects			
Option element:	Assessment:		Likely Significant Effects?
SEW to GUI 10 Ml/d	Any potential significant impacts identified could negatively affect the favourable condition of the majority of Thursley, Hankley & Frensham Commons SSSI and also hinder the current recovery of the vast majority of the portion of the site currently deemed to be unfavourable. The closest part of this water transfer pipeline option element to the Thursley and Ockley Bogs Ramsar Site is approximately 6km to the north. These works are considered to be too distant from the Ramsar Site to result in any significant impacts to the qualifying features of the Ramsar Site during construction. Only one small area of functional habitat suitable for heathland specialist bird species (nightjar and woodlark) was identified within 1km of the route. This lies approximately 640m to the south of the pipeline at its western end. Given the relatively small size of the habitat, the significant distance to the option element, the noise generated by the intervening dual carriageway and the presence of existing screening vegetation, no significant disturbance impacts are expected to affect the qualifying features using this potential functional habitat. The 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. This report also states that if noise levels at the		No

	SPA (or off-site functional habitat in this case) can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. This study found that a 110dB(A) noise at source (louder than typical construction activity, including piling) would attenuate to 50dB(A) at 682m. The intervening vegetation would further attenuate any construction noise to ensure that it was below 50dB(A) by the time it reaches this potential off-site functional habitat. The absolute maximum disturbance distance cited in this study was 600m. No operational effects are anticipated on the European Site or its qualifying features from the use of this water conveyance asset.	

Designated site name:	**Windsor Forest and Great Park**	
Designation type: (SAC, SPA, Ramsar):	SAC	
Qualifying features:	• H9190 Old acidophilous oak woods with *Quercus robur* on sandy plains • H9120 Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) • S1079 Violet click beetle *Limoniscus violaceus*	**Water Dependency:** Habitat and species not identified as being water dependent, although important not to disturb rooting structures of the oak and beech tree features.
Current conservation status:	• H9190 Old acidophilous oak woods with *Quercus robur* on sandy plains - **Bad but improving** – (range: Favourable, area: favourable, structure and function: bad but improving, future prospects: favourable) - main pressures: inappropriate grazing, unsympathetic and insufficient management, fragmentation and isolation, development, agricultural practices, loss of veteran trees, invasion by non-native species, inappropriate expansion of woodland, and air pollution – main threats: inappropriate grazing, unsympathetic and insufficient management, fragmentation and isolation, development, agricultural practices, loss of veteran trees, invasion by non-native species, and air pollution. • H9120 Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) - **Bad but improving** – (range: favourable, area: inadequate but improving, structure and function: bad but improving, future prospects: favourable) – main pressures: deer browsing, grey squirrel debarking, habitat fragmentation and isolation, introduced plant species, insufficient or inappropriate woodland management, the predominance of older age classes, and air pollution. – threats: deer browsing, grey squirrel debarking, habitat fragmentation and isolation, insufficient or inappropriate woodland management, and air pollution. • S1079 Violet click beetle Limoniscus *violaceus* **Bad and deteriorating** (range: favourable, population: bad and deteriorating, habitat: inadequate and deteriorating, future prospects: bad. Main pressures: abiotic (slow) natural processes: Changes in abiotic conditions. Main threats: abiotic (slow) natural processes: Biocenotic evolution, succession: Interspecific floral relations.	
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:	Windsor Forest & Great Park SSSI - Favourable: 51.84%, unfavourable recovering: 48.16%	
Site Improvement Plan:	1. Forestry and woodland management - Pressure/ Threat - H9120 Beech forests on acid soils, S1079 Violet click beetle I - Investigate and implement management measures to promote veteran beech tree habitat 2. Forestry and woodland management - Pressure/ Threat - H9190 Dry oak-dominated woodland - Investigate and implement management measures to promote veteran oak habitat 3. Invasive species – Threat - H9190 Dry oak-dominated woodland, S1079 Violet click beetle - Maintain efforts to control known invasive/pest plant species. 4. Disease – Threat - H9190 Dry oak-dominated woodland - Survey for tree diseases 5. Air Pollution: impact of atmospheric nitrogen deposition - Pressure - H9120 Beech forests on acid soils, H9190 Dry oak-dominated woodland - Establish a Site Nitrogen Action Plan	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Datchet Groundwater	The only SIP element of potential relevance to this proposed option element is (5) air pollution but given the distance of the option element to the SAC (approximately 3.2km), significant air quality impacts are considered to be unlikely (assuming sensitive construction traffic routing). The constituent SSSI (Windsor	No.

	Forest & Great Park SSSI) is currently 48.16% unfavourable but that portion is recovering. Any potential impacts identified could hinder this current recovery, cause a decline in the 51.84% that is currently favourable and affect the ability of the site to achieve its conservation objectives. The SAC is underlain by the London Clay that confines the Chalk aquifer from which water would be abstracted at Datchet. As a consequence, the groundwater abstraction will not adversely affect the local water table underlying the SAC and there will be no adverse effects on the qualifying features. The proposed scheme will not require land take from within SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 3.2km at the closest point) that no significant impacts on qualifying features are anticipated. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	
Eton removal of constraints to DO - 1.3 Ml/d	The only SIP element of potential relevance to this proposed option element is (5) air pollution but given the distance of the option element to the SAC (approximately 2.5km), significant air quality impacts are considered to be unlikely (assuming sensitive construction traffic routing). The constituent SSSI (Windsor Forest & Great Park SSSI) is currently 48.16% unfavourable but that portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 51.84% that is currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of the works lies approximately 2.5km to the north of the SAC. The works are highly localised within Eton WTW. As such, no significant impacts on the qualifying features of the SAC are anticipated. Abstraction from the confined chalk aquifer groundwater at Eton will not adversely affect the local water table within the London Clay that supports the tree features of the SAC. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No
Raw Water System – Queen Mary Reservoir to Kempton WTW site	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the significant distance of the option element to the SAC (approximately 9.6km), significant air quality impacts can be excluded. The constituent SSSI (Windsor Forest & Great Park SSSI) is currently 48.16% unfavourable but that portion is recovering. Any potential impacts identified could hinder this current recovery, cause a decline in the 51.84% that is currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of the works lies approximately 9.6km to the south east of the SAC. As such, no significant impacts on the qualifying features of the SAC are anticipated during operation or construction.	No
Raw Water System – Increase capacity of Littleton intake PS	The only SIP element of potential relevance to this proposed option element is 4 air pollution but given the significant distance of the option element to the SAC (approximately 7.1km), significant air quality impacts can be excluded (assuming sensitive construction traffic routing). The constituent SSSI (Windsor Forest & Great Park SSSI) is currently 48.16% unfavourable but that portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 51.84% that is currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of the works lies approximately 7.1km to the south east of the SAC. As such, no significant impacts on the qualifying features of the SAC are anticipated during operation or construction. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded (12,344 HGV movemements are required for construction but over a 44 month construction period).	No
Raw Water System - Datchet intake increase	The only SIP element of potential relevance to this proposed option element is 5 air pollution but given the distance of the option element to the SAC (approximately 3.1km) air quality impacts are considered to be unlikely. The constituent SSSI (Windsor Forest & Great Park SSSI) is currently 48.16% unfavourable but that portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the 51.84% that is currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of the works lies approximately 3.1km to the north east of the SAC. As such, no significant impacts on the qualifying features of the SAC are anticipated during construction of this expansion to the river intake on the Lower River Thames at Datchet. During operation, the abstraction from the Lower River Thames at Datchet will remain within the existing overall abstraction licence limits for Thames Water's lower River Thames abstractions and there will be no hydrological effects on this SAC. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No

Designated site name:	**Chilterns Beechwoods**
Designation type: (SAC, SPA, Ramsar):	**SAC**

Qualifying features:	• S1083 *Lucanus cervus*: Stag beetle • H6210 Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) • H9130 *Asperulo-Fagetum* beech forests	**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.
Current conservation status:	H6210 Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) – **Bad but improving** (range: favourable area: inadequate but improving, structure and function: Bad but improving, Future prospects: favourable) Main pressures – Grazing, Air pollution, Biocenotic evolution, Modification of cultivation practices, Fertilisation, Artificial planting, Abandonment of pastoral systems, Invasion by a species - Threats as stated in pressures H9130 *Asperulo-Fagetum* beech forests – **Bad but improving** (range: favourable area: inadequate but improving, structure and function: Bad but improving, Future prospects: favourable) *Lucanus cervus*: Stag beetle: **Favourable** (range: favourable, population: favourable, habitat: unknown, future prospects: favourable. Main pressures Urbanised areas, human habitation: Forest and Plantation management & use. Main threats: As stated in pressures	
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:	Naphill Common SSSI – 100% favourable Bisham Woods SSSI – 97.37% favourable, 2.63% unfavourable recovering Windsor Hill SSSI – 26.56% favourable, 73.44% unfavourable recovering Tring Woodlands SSSI – 100% unfavourable recovering Hollowhill & Pullingshill Woods SSSI – 100% favourable Ellesborough & Kimble Warrens SSSI – 10.75% favourable, 89.25% unfavourable recovering Bradenham Woods, Park Wood & The Coppice SSSI – 94.52% favourable, 5.48% unfavourable recovering Ashridge Commons & Woods SSSI – 86.33% favourable, 13.67% unfavourable recovering Aston Rowant Woods SSSI – 100% favourable	
Site Improvement Plan:	1. Forestry and woodland management – pressure/threat – H9130 Beech forests on neutral to rich soils Secure appropriate woodland management 2. Deer – pressure/threat - H9130 Beech forests on neutral to rich soils Improve deer management 3. Changes in species distributions – threat - S1083 Stag beetle Monitor stag beetle population 4. Invasive species – pressure/threat - H9130 Beech forests on neutral to rich soils Investigate the impacts of Grey squirrel 5. Disease – threat – H9130 Beech forests on neutral to rich soils Address box blight, and other diseases 6. Public Access/disturbance – threat – S1083 Stag beetle Reduce visitor impact on dead wood 7. Air Pollution: impact of atmospheric nitrogen deposition – pressure - H6210 Dry grasslands and scrublands on chalk or limestone (important orchid sites), H9130 Beech forests on neutral to rich soils, S1083 Stag beetle Establish a Site Nitrogen Action Plan	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Henley to SWOX 2.37 Ml/d	The only SIP element of potential relevance to this proposed option element is (7) air pollution but given the significant distance of the option element to the SAC (approximately 9.1km), significant air quality impacts can be excluded. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable these are all recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population.	No

	This is beyond the maximum dispersal distance for female stag beetles (~1km) and therefore significant impacts to members of the qualifying feature population are not expected to occur. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 9.1km to the west at the closest point) that no significant impacts on the qualifying features are anticipated during construction or operation of this inter-zonal water conveyance transfer asset. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	
Henley to SWOX 5 Ml/d	The only SIP element of potential relevance to this proposed option element is (7) air pollution but given the significant distance of the option element to the SAC (approximately 9.1km), significant air quality impacts can be excluded. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable these are all recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 9.1km to the west at the closest point) that no impacts on the qualifying features are anticipated during construction or operation of this inter-zonal water conveyance transfer asset. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No
Henley to SWA 5 Ml/d	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the distance of the option element to the SAC (approximately 2.7km), significant air quality impacts are considered to be unlikely. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable these are all recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 2.7km to the west at the closest point) that no significant impacts on the grassland, scrubland, beech forest or stag beetle qualifying features are anticipated during construction or operation of this inter-zonal water conveyance transfer asset. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No

Henley to SWA 2.37 Ml/d	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the distance of the option element to the SAC (approximately 2.7km), significant air quality impacts are considered to be unlikely. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable these are all recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 2.7km to the west at the closest point) that no significant impacts on the grassland, scrubland, beech forest or stag beetle qualifying features are anticipated during construction or operation of this inter-zonal water conveyance transfer asset. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No
River abstraction in South SWA	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the distance of the option element to the SAC (approximately 2.3km), significant air quality impacts are considered to be unlikely. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable these are all recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 2.3km to the south west at the closest point) that no significant impacts on the qualifying features are anticipated during construction or operation of this river abstraction pipeline and associated infrastructure. No potential functional habitat for stag beetles is expected to be impacted as a result of this option element. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No
SWA south: Medmenham Raw water intake and transfer	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the distance of the option element to the SAC (approximately 3.3km), significant air quality impacts are considered to be unlikely. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable these are all recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites	No

	depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 3.3km to the south west at the closest point) that no significant impacts on the qualifying features are anticipated during construction or operation of this river intake, pumping station and raw water transfer infrastructure. No potential functional habitat for stag beetles is expected to be impacted as a result of this option element. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	
Medmenham WTW (24Ml/d)	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the distance of the option element to the SAC (approximately 2.1km), significant air quality impacts are considered to be unlikely (assuming sensitive construction traffic routing). The constituent SSSIs vary in their condition but of those that have portions that are unfavourable these are all recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. *Journal of Zoology*, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at sufficient distance from the SAC (the pipeline is located approximately 2.1km to the west at the closest point) that no significant impacts on the qualifying features are anticipated during construction or operation of this WTW and water transfer/storage infrastructure. No potential functional habitat for stag beetles is expected to be impacted as a result of this option element. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No

Designated site name:	**Burnham Beeches**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H9120 Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*)	**Water Dependency:** Habitat not identified as water dependent but it will be important to protect the rooting structure of the qualifying features.
Current conservation status:	• H9120 Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) - **Bad but improving –** (range: Favourable, area: Inadequate but improving, structure and function: bad but improving, future prospects: favourable) – main pressures: Deer browsing, grey squirrels and (in the Chilterns) edible dormouse, Habitat fragmentation and isolation, Introduced plant species, Insufficient or inappropriate woodland management, predominance of older age classes, air pollution - main threats: Deer browsing, grey squirrels and (in the Chilterns) edible dormouse, habitat fragmentation and isolation, insufficient or inappropriate woodland management, air pollution -	
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:	Burnham Beeches SSSI – Favourable: 62.63%, unfavourable recovering: 37.37 %	

Site Improvement Plan:	1. Air Pollution: risk of atmospheric nitrogen deposition – Threat - H9120 Beech forests on acid soils - Implementation of nutrient management strategy 2. Public Access/Disturbance – Pressures/Threat - H9120 Beech forests on acid soils - Continuation of the access management strategy in the National Nature Reserve (NNR) 3. Habitat fragmentation – Pressure - H9120 Beech forests on acid soils - Provision of clear advice to local planning authorities 4. Deer – Pressure/Threat - H9120 Beech forests on acid soils - Provision of advice to landowner on deer management 5. Species decline - Pressure/Threat - H9120 Beech forests on acid soils Implementation of specific management to promote future veteran trees 6. Invasive species – Threat - H9120 Beech forests on acid soils Develop a survey and monitoring strategy, and implement control measures as necessary	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Datchet Groundwater	The only SIP element of potential relevance to this proposed option element is (1) air pollution but given the significant distance of the option element to the SAC (approximately 6.6km), significant air quality impacts can be excluded. The constituent SSSI (Burnham Beeches SSSI) is currently 37.37% unfavourable but this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The SAC is underlain, at least partially, by the Reading Beds that confine the Chalk aquifer from which the groundwater will be abstracted at Datchet. The SAC will therefore be unaffected by changes in the confined chalk groundwater level. The proposed scheme will not require land take from within SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 6.6km at the closest point) that no significant impacts on qualifying features are anticipated. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No
Eton removal of constraints to DO - 1.3 Ml/d	The closest part of the works lies approximately 6.7km to the south of the SAC. The works are highly localised within Eton WTW. As such, no significant impacts on the qualifying features of the SAC are anticipated during construction. The abstraction at Eton will be within existing abstraction licence limits and no adverse effects on the local water table are likely within the SAC as a consequence of the abstraction. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No
Raw Water System - Datchet intake increase	The only SIP element of potential relevance to this proposed option element is 1 air pollution but given the significant distance of the option element to the SAC (6.5km), significant air quality impacts can be excluded. The constituent SSSI (Burnham Beeches SSSI) is currently 37.37% unfavourable but this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within SAC boundaries, and construction activities are at sufficient distance from SAC (approximately 6.5km at the closest point) that no significant impacts on qualifying features are anticipated. During operation, the abstraction from the Lower River Thames at Datchet will remain within the existing overall abstraction licence limits for Thames Water's lower River Thames abstractions and there will be no hydrological effects on this SAC. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No

Designated site name:	**Thames Basin Heaths**	
Designation type: (SAC, SPA, Ramsar):	**SPA**	
Qualifying features:	• A224 *Caprimulgus europaeus*; European nightjar (Breeding) • A246 *Lullula arborea*; Woodlark (Breeding) • A302 *Sylvia undata*; Dartford warbler (Breeding)	**Water Dependency:** Species identified as water dependent: • *Caprimulgus europaeus*; European nightjar (Breeding) • *Lullula arborea*; Woodlark (Breeding) • *Sylvia undata*; Dartford warbler (Breeding)
Current conservation status:	• A224 *Caprimulgus europaeus*; European nightjar (Breeding) - Population numbers: Sufficient; Range coverage: Insufficient, especially in northern parts of the range; Ecological sufficiency: Sufficient • A246 *Lullula arborea*; Woodlark (Breeding) - Population numbers: Sufficient; Range coverage: Insufficient; Ecological sufficiency: Insufficient • A302 *Sylvia undata*; Dartford warbler (Breeding) - Population numbers: Sufficient; Range coverage: Insufficient in the north of the expanding range; Ecological sufficiency: Sufficient	
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:	Chobham Common SSSI: 31.15% favourable, 68.85% unfavourable recovering Eelmoor Marsh SSSI: 100% favourable Horsell Common SSSI: 16.6% favourable, 83.4% unfavourable recovering Hazeley Heath SSSI: 96.11% unfavourable recovering, 3.89% unfavourable declining Ockham & Wisley Commons SSSI: 34.82% favourable, 65.18% unfavourable recovering Whitmoor Common SSSI: 29.4% favourable, 69.28% unfavourable recovering, 1.33% unfavourable no change Colony Bog & Bagshot Heath SSSI: 77.58% favourable, 21.76% unfavourable recovering, 0.67%% unfavourable declining Bramshill SSSI: 99.94% unfavourable recovering, 0.06% unfavourable no change Ash to Brookwood Heaths SSSI: 45.66% favourable, 53.37% unfavourable no change, 0.97% unfavourable declining Broadmoor to Bagshot Woods & Heaths SSSI: 65.61% favourable, 34.39% unfavourable recovering Basingstoke Canal SSSI: 16.63% favourable, 10.4% unfavourable recovering, 45.39% unfavourable no change, 27.58% unfavourable declining Bourley & Long Valley SSSI: 0.86% favourable, 95.25% unfavourable recovering, 3.9% unfavourable declining Castle Bottom to Yateley and Hawley Commons SSSI: 26.67% favourable, 69.69% unfavourable recovering, 0.81% unfavourable no change, 2.82% unfavourable declining Sandhurst to Owlsmoor Bogs & Heaths SSSI: 100% unfavourable recovering
Site Improvement Plan:	1. Public Access/Disturbance – pressure/threat – A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler - Agree and implement an over-arching access management strategy 2. Under grazing – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement an over-arching habitat management strategy 3. Forestry and woodland management – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Review and agree forestry plans/policies to ensure compatibility with objectives 4. Hydrological changes – threat – H4010 Wet heathland with cross-leaved heath, H7150 Depressions on peat substrates Hydrological investigations 5. Inappropriate scrub control – pressure- A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Agree habitat management strategies for all sites 6. Invasive species – pressure/threat - H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Agree and implement invasive control strategies at all relevant sites 7. Wildlife/arson – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement fire risk reduction strategies at all sites 8. Air Pollution: impact of atmospheric nitrogen deposition – pressure/threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates Agree and implement Nitrogen management/mitigation strategies at all sites 9. Feature location/ extent/ condition unknown – Threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler Develop and implement improved bird monitoring strategy 10. Military – threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement integrated management plans for military sites 11. Habitat fragmentation – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Commission study to identify habitat management priorities to reduce fragmentation

Potential Effects

Option Element:	Assessment:	Likely Significant Effects?
Dapdune Licence Disaggregation	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for hydrological impacts and disturbance as these are the most feasible. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. Only minor construction activity is required in relation to this option element, with local changes to the operational capacity at Ladymead Water Treatment Works and installation of new pumps at the Dapdune borehole. The closest part of this option lies approximately 2km to the south of the SPA. Significant noise disturbance to birds is thought possible to occur within only 1km. There is no suitable functional habitat for heathland specialist bird species within 1km and therefore there will be no disturbance impacts to qualifying features using functional habitat. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. Given the distance and the minor scale of the construction activities, no significant disturbance effects are anticipated on the qualifying features of the SPA during construction.	No

	Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The SAC lies on impermeable lithologies (London Clay formation) so it is highly unlikely that there are any groundwater connections with the surface features and supporting habitats of the SPA.	
Mortimer Recommissioning	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution but given the significant distance of the option element to the SPA (approximately 7.1km), disturbance and air quality impacts can be excluded. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. There will be only very minor construction activities associated with the recommissioning of this source. No adverse impacts from groundwater abstraction are considered likely as the Chalk aquifer is confined beneath the London Clay which underlies the SPA habitats, so there is no hydrogeological connection with the surface environment. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The proposed scheme will not require land take from within SPA boundaries, and construction activities are at a sufficient distance from SPA (approximately 7.1km at the closest point) that no significant impacts on qualifying features are anticipated. There is no suitable functional habitat for heathland specialist bird species within 1km and therefore there will be no disturbance impacts to qualifying features using functional habitat. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull.	No
Dapdune removal of constraints	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for hydrological impacts and disturbance as these are the most feasible. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. No significant adverse impacts from groundwater abstraction are considered likely as the Chalk aquifer is confined beneath the London Clay which underlies the SPA habitats, so there is no hydrogeological connection with the surface environment. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The proposed scheme will not require land take from within SPA boundaries, and construction activities are at a sufficient distance from SPA (approximately 2km at the closest point) that no significant impacts on qualifying features are anticipated. There is no suitable functional habitat for heathland specialist bird species within 1km and therefore there will be no disturbance impacts to qualifying features using functional habitat. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull.	No
Ladymead WTW removal of constraints to DO - 7.8 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for hydrological impacts and disturbance as these are the most feasible. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. No significant adverse impacts from groundwater abstraction are considered likely as the Chalk aquifer is confined beneath the London Clay which underlies the SPA habitats, so there is no hydrogeological connection with the surface environment. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The proposed scheme will not require land take from within SPA boundaries, and construction activities are at a sufficient distance from SPA (approximately 2km at the closest point) so that no significant impacts on qualifying features are anticipated. There is no suitable functional habitat for heathland specialist bird species within 1km and therefore there will be no disturbance impacts to qualifying features using functional habitat. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull.	No
SEW to GUI 10 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for hydrological impacts and disturbance as these are the most feasible. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. This option element will not require land take from within SPA boundaries, and construction activities are at a sufficient distance from the SPA (approximately 3.2km at the closest point) that no significant impacts on qualifying features are anticipated. Only one small area of functional habitat suitable for heathland specialist bird	Stage 2 Appropriate Assessment is required if the option element is included in the

	species was identified within 1km of the route. This lies approximately 640m to the south of the pipeline at its western end. Given the relatively small size of the habitat, the significant distance to the option element, the noise generated by the intervening dual carriageway and the presence of existing screening vegetation, no disturbance impacts are expected to occur to qualifying features using this potential functional habitat. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. This paper advocates a usable threshold for bird disturbance of only 250m (the more precautionary threshold of 1km is used here as an intial screening toolonly) and therefore supports the absence of disturbance effects at 640m from the source. Significant air quality impacts are possible during construction because the number of vehicle movements and traffic routes are currently not known and therefore it is possible that the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) could be exceeded. As such, it is not possible to conclude no likely significant effects. No adverse effects will arise from the operational use of this inter-company water transfer conveyance asset.	preferred programme.
Raw Water System – Queen Mary Reservoir to Kempton WTW site	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution but given the significant distance of the option element to the SPA (approximately 9.4km), disturbance and air quality impacts can be excluded with confidence.. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within SPA boundaries, and construction activities are at a sufficient distance from the SPA (approximately 9.4km at the closest point) that no significant impacts on qualifying features are anticipated. No functional habitat suitable for heathland specialist bird species was identified within 1km of the route and, as such, no disturbance impacts could occur to qualifying features using functional habitat. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. No adverse effects will arise from the operational use of this water conveyance asset.	No
Raw Water System – Increase capacity of Littleton intake PS	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution but given the significant distance of the option element to the SPA, disturbance and air quality impacts can be immediately excluded. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within SPA boundaries, and construction activities are at a sufficient distance from the SPA (approximately 8.8km at the closest point) that no significant impacts on qualifying features are anticipated. No functional habitat suitable for heathland specialist bird species was identified within 1km of the route and, as such, no disturbance impacts could occur to qualifying features using functional habitat. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. The increased abstraction capacity will be operated within the existing abstraction licence conditions for Thames Water's Lower River Thames abstraction licences and this will have no adverse effects on the SPA.	No

Designated site name:	**Thursley Hankley Frensham Common**	
Designation type: (SAC, SPA, Ramsar):	**SPA**	
Qualifying features:	• A224 *Caprimulgus europaeus*; European nightjar (Breeding) • A246 *Lullula arborea*; Woodlark (Breeding) • A302 *Sylvia undata*; Dartford warbler (Breeding)	**Water Dependency:** Species identified as water dependent: • *Caprimulgus europaeus*; European nightjar (Breeding) • *Lullula arborea*; Woodlark (Breeding) • *Sylvia undata*; Dartford warbler (Breeding)
Current conservation status:	• A224 *Caprimulgus europaeus*; European nightjar (Breeding) - Population numbers: Sufficient; Range coverage: Insufficient, especially in northern parts of the range; Ecological sufficiency: Sufficient • A246 *Lullula arborea*; Woodlark (Breeding) - Population numbers: Sufficient; Range coverage: Insufficient; Ecological sufficiency: Insufficient • A302 *Sylvia undata*; Dartford warbler (Breeding) - Population numbers: Sufficient; Range coverage: Insufficient in the north of the expanding range; Ecological sufficiency: Sufficient	
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:	Thursley, Hankley & Frensham Commons SSSI: 81.78%, 18.11% unfavourable recovering, 0.11% unfavourable-no change
Site Improvement Plan:	1. Public Access/Disturbance – pressure/threat – A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler - Agree and implement an over-arching access management strategy 2. Under grazing – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement an over-arching habitat management strategy 3. Forestry and woodland management – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Review and agree forestry plans/policies to ensure compatibility with objectives 4. Hydrological changes – threat – H4010 Wet heathland with cross-leaved heath, H7150 Depressions on peat substrates Hydrological investigations 5. Inappropriate scrub control – pressure- A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Agree habitat management strategies for all sites 6. Invasive species – pressure/threat - H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Agree and implement invasive control strategies at all relevant sites 7. Wildlife/arson – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement fire risk reduction strategies at all sites 8. Air Pollution: impact of atmospheric nitrogen deposition – pressure/threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates Agree and implement Nitrogen management/mitigation strategies at all sites 9. Feature location/ extent/ condition unknown – Threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler Develop and implement improved bird monitoring strategy 10. Military – threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement integrated management plans for military sites 11. Habitat fragmentation – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Commission study to identify habitat management priorities to reduce fragmentation

Potential Effects

Option Element:	Assessment:	Likely Significant Effects?
Dapdune Licence Disaggregation	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution but given the significant distance of the option element to the SPA (approximately 9.8km), disturbance and air quality impacts can be excluded. The constituent SSSI (Thursley, Hankley & Frensham Commons SSSI) is currently 18.22% unfavourable but the majority of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 81.78% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of this option lies approximately 9.8km to the north east of the SPA. Significant noise disturbance to birds is thought possible to occur within only 1km. There is no suitable functional habitat for heathland specialist bird species within 1km and therefore there will be no disturbance impacts to qualifying features using functional habitat. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. As such, no significant effects are anticipated on the qualifying features of the SPA during construction. The groundwater abstraction is from the confined chalk aquifer and will not have significant impact on the key SPA habitats (wet and dry heaths).	No
Dapdune removal of constraints	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution but given the significant distance of the option element to the SPA (approximately 9.8km), disturbance and air quality impacts can be excluded. The constituent SSSI (Thursley, Hankley & Frensham Commons SSSI) is currently 18.22% unfavourable but the majority of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 81.78% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of this option lies approximately 9.8km to the north east of the SPA. Significant noise disturbance to birds is thought possible to occur within only 1km. There is no suitable functional habitat for heathland specialist bird species within 1km and therefore there will be no disturbance impacts to qualifying features using functional habitat. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull.	No

	Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. As such, no significant effects are anticipated on the qualifying features of the SPA during construction. The groundwater abstraction is from the confined chalk aquifer and will not have a significant impact on the key SPA habitats (wet and dry heaths).	
SEW to GUI 10 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution but given the significant distance of the option element to the SPA (approximately 5km), disturbance and air quality impacts can be excluded. The constituent SSSI (Thursley, Hankley & Frensham Commons SSSI) is currently 18.22% unfavourable but the majority of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 81.78% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of this option lies approximately 5km to the north of the SPA. Significant noise disturbance to birds is thought possible to occur within only 1km. Only one small area of functional habitat suitable for heathland specialist bird species was identified within 1km of the route. This lies approximately 640m to the south of the pipeline at its western end. Given the relatively small size of the habitat, the significant distance to the option element, the noise generated by the intervening dual carriageway and the presence of existing screening vegetation, no significant disturbance impacts are expected to occur to qualifying features using this potential functional habitat. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. This paper advocates a usable threshold for bird disturbance of only 250m (the more precautionary threshold of 1km is used here as an intial screening tool only) and therefore supports the absence of disturbance effects at 640m from the source. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. As such, no significant effects are anticipated on the qualifying features of the SPA during either construction or operation.	No

Designated site name:	**Thursley, Ash, Pirbright and Chobham**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H4010 Northern Atlantic wet heaths with *Erica tetralix* • H4030 European dry heaths • H7150 Depressions on peat substrates of the Rhynchosporion	**Water Dependency:** Habitats identified as water dependent: • H4010 Northern Atlantic wet heaths with *Erica tetralix* • H4030 European dry heaths • H7150 Depressions on peat substrates of the Rhynchosporion
Current conservation status:	• H4010 Northern Atlantic wet heaths with *Erica tetralix* - **Bad and deteriorating** – range: favourable; area: favourable; structure and function: bad and deteriorating; future prospects: bad but improving – main pressures: over-grazing; Under-grazing/lack of management; Invasive species; Development; Burning; Water management; Air pollution – Main threats: over-grazing; under-grazing/lack of management; invasive species; development; burning; water management; air pollution; climate change. • H4030 European dry heaths – **Bad and deteriorating** – range: favourable; area: favourable; structure and function: bad and deteriorating; future prospects: bad but improving – Main pressures: grazing; abandonment of pastoral systems; burning; urbanised areas, human habitation; continuous urbanisation; discontinuous urbanisation; communication networks; energy transport; other forms of transportation and communication; air pollution; invasion by a species. Main threats: grazing; abandonment of pastoral systems; burning; discontinuous urbanisation; other pollution or human impacts/activities; invasion by a species. • H7150 Depressions on peat substrates of the Rhynchosporion – **Bad but improving** – range: favourable; area: unknown; structure and function: bad but improving; future prospects: inadequate but improving – main pressures: Drainage, Grazing, Absence of or inappropriate management, Forestry operations, Fragmentation, Air pollution – main threats: Drainage, Grazing, Burning, Absence of or inappropriate management, Forestry operations, Fragmentation/ isolation, Climate change, Air pollution	
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:	Ash to Brookwood Heaths SSSI – favourable: 45.66% - unfavourable-recovering: 53.37% Colony Bog & Bagshot Heath SSSI – favourable: 77.58% - unfavourable-recovering: 21.76% Chobham Common SSSI – favourable: 31.15% - unfavourable-recovering: 68.85% Thursley, Hankley & Frensham Commons SSSI – favourable: 81.78% - unfavourable-recovering: 18.11% - unfavourable-no change: 0.11% Basingstoke Canal SSSI – favourable: 100%	
Site Improvement Plan:	1. Public Access/Disturbance – pressure/threat – A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler - Agree and implement an over-arching access management strategy	

	2. Under grazing – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement an over-arching habitat management strategy 3. Forestry and woodland management – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Review and agree forestry plans/policies to ensure compatibility with objectives 4. Hydrological changes – threat – H4010 Wet heathland with cross-leaved heath, H7150 Depressions on peat substrates Hydrological investigations 5. Inappropriate scrub control – pressure- A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Agree habitat management strategies for all sites 6. Invasive species – pressure/threat - H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths - Agree and implement invasive control strategies at all relevant sites 7. Wildlife/arson – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement fire risk reduction strategies at all sites 8. Air Pollution: impact of atmospheric nitrogen deposition – pressure/threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates Agree and implement Nitrogen management/mitigation strategies at all sites 9. Feature location/ extent/ condition unknown – Threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler Develop and implement improved bird monitoring strategy 10. Military – threat - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Agree and implement integrated management plans for military sites 11. Habitat fragmentation – pressure - A224(B) European nightjar, A246(B) Woodlark, A302(B) Dartford Warbler, H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H7150 Depressions on peat substrates - Commission study to identify habitat management priorities to reduce fragmentation	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Dapdune Licence Disaggregation	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution but given the significant distance of the option element to the SAC (4.9km), disturbance and air quality impacts can be excluded. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the vast majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of this option element to Thursley, Ash, Pirbright and Chobham SAC is 4.9km to the south-east so no construction effects will arise. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The groundwater abstraction is from the confined chalk aquifer and will not have any impact on the designated SAC features.	No
Dapdune removal of constraints	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution but given the significant distance of the option element to the SAC (4.9km), disturbance and air quality impacts can be excluded. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the vast majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of this option element to Thursley, Ash, Pirbright and Chobham SAC is 4.9km to the south-east so no construction effects will arise. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The groundwater abstraction is from the confined chalk aquifer and will not have any impact on the designated SAC features.	No
Ladymead WTW removal of constraints to DO - 7.8 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution but given the significant distance of the option element to the SAC (5km), disturbance and air quality impacts can be excluded. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the vast majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of this option to Thursley Ash, Pirbright and Chobham SAC is 5km to the south-east. These minor works are considered to be too distant from the SAC to result in any significant impacts to the qualifying features during construction. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The groundwater abstraction is from the confined chalk aquifer and will not have any impact on the designated SAC features.	No
SEW to GUI 10 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for hydrological impacts and disturbance as these are the most feasible. The closest part of this option to Thursley Ash, Pirbright and Chobham SAC is 3.2km to the south. These works are considered to be too distant from the SAC to result in any significant impacts to the qualifying features during construction. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. No operational effects are likely from the use this inter-company water transfer conveyance asset.	No
SEW to Guildford	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution. Whilst all of these elements are considered in this assessment the focus is on the potential for hydrological impacts and disturbance as these are the most feasible. The	No

	constituent SSSIs vary in their condition but of those that have portions that are unfavourable the vast majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of this option to Thursley Ash, Pirbright and Chobham SAC is 3.2km to the south. These works are considered to be too distant from the SAC to result in any impacts to the qualifying features during construction. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. No operational effects are likely from the use this inter-company water transfer conveyance asset.	
Raw Water System – Queen Mary Reservoir to Kempton WTW site	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution but given the significant distance of the option element to the SAC (approximately 9.8km), disturbance and air quality impacts can be excluded. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the vast majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of this option to Thursley Ash, Pirbright and Chobham SAC is approximately 9.8km to the north east. These works are considered to be too distant from the SAC to result in any impacts to the qualifying features during construction. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded (a total of 12,344 HGV movements will be required for construction but over a 44 month construction period). No operational effects are likely from the use this water conveyance asset.	No
Raw Water System – Increase capacity of Littleton intake PS	The SIP elements of potential relevance to this proposed option element are (1) disturbance (only), (4) hydrological changes and (8) air pollution but given the significant distance of the option element to the SAC (approximately 7.3km), disturbance and air quality impacts can be excluded. The constituent SSSIs vary in their condition but of those that have portions that are unfavourable the vast majority are recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of this option to Thursley Ash, Pirbright and Chobham SAC is approximately 7.3km to the north east. These works are considered to be too distant from the SAC to result in any impacts to the qualifying features during construction. The increased abstraction capacity will be operated within the existing abstraction licence conditions for Thames Water's Lower River Thames abstraction licences and this will have no adverse effects on the SAC.	No

Designated site name:	**Aston Rowant**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H5130. *Juniperus communis* formations on heaths or calcareous grasslands; Juniper on heaths or calcareous grasslands • H9130. *Asperulo-Fagetum* beech forests; Beech forests on neutral to rich soils	**Water Dependency:** Habitats not identified as water dependent but it will be important to protect the rooting structure of the qualifying features.
Current conservation status:	H9130 *Asperulo-Fagetum* beech forests – **Bad but improving** (range: favourable area: inadequate but improving, structure and function: Bad but improving, Future prospects: favourable) - Main pressures: deer browsing, grey squirrel debarking, habitat fragmentation and isolation, introduced plant species, insufficient or inappropriate woodland management, the predominance of older age classes, and air pollution – Main threats: deer browsing, grey squirrel debarking, habitat fragmentation and isolation, insufficient or inappropriate woodland management, and air pollution. H5130. *Juniperus communis* formations on heaths or calcareous grasslands; Juniper on heaths or calcareous grasslands - **Bad but improving** (range: unknown, area: inadequate and deteriorating, structure and function: bad but improving, future prospects: inadequate) – Main Pressures - Grazing; Abandonment of pastoral systems; Artificial planting; Outdoor sports and leisure activities; air pollution; fire; Biocenotic evolution; Main threats – as stated in pressures	
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:	Aston Rowant SSSI: 100% favourable	
Site Improvement Plan:	1. Unsustainable on-site population or habitat – pressure/threat - H5130 Juniper on heaths or calcareous grasslands Trialling of innovative techniques to manage juniper 2. Changes in species distributions – pressure - H5130 Juniper on heaths or calcareous grasslands Improve the coordination of efforts to conserve juniper in the Chilterns 3. Deer – pressure/threat - H9130 Beech forests on neutral to rich soils Provide advice and support to the landowner 4. Conflicting conservation objectives – pressure/threat - H5130 Juniper on heaths or calcareous grasslands Develop a revised management strategy for juniper 5. Disease – pressure/threat - H5130 Juniper on heaths or calcareous grasslands Prevent the introduction of *Phytophthora austrocedrae*	

	6. Air pollution: risk of atmospheric nitrogen deposition – threat - H5130 Juniper on heaths or calcareous grasslands, H9130 Beech forests on neutral to rich soils Investigate the potential impact of air pollution	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Henley to SWOX 2.37 Ml/d	The only SIP element of potential relevance to this proposed option element is (6) air pollution but given the significant distance of the option element to the SAC (approximately 8.3km), significant air quality impacts can be excluded. The constituent SSSI (Ashton Rowant SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 8.3km to the south at the closest point) that no significant impacts on the qualifying features are anticipated. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. No operational effects are likely from the use of this inter-zonal water conveyance asset.	No
Henley to SWOX 5 Ml/d	The only SIP element of potential relevance to this proposed option element is (6) air pollution but given the significant distance of the option element to the SAC (approximately 8.3km), significant air quality impacts can be excluded. The constituent SSSI (Ashton Rowant SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 8.3km to the south at the closest point) that no significant impacts on the qualifying features are anticipated. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. No operational effects are likely from the use of this inter-zonal water conveyance asset.	No
River abstraction in South SWA	The only SIP element of potential relevance to this proposed option element is (6) air pollution but given the significant distance of the option element to the SAC (approximately 8.1km), significant air quality impacts can be excluded. The constituent SSSI (Ashton Rowant SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 8.1km to the south east at the closest point) that no significant impacts on the qualifying features are anticipated during construction or operation of this river abstraction pipeline and associated infrastructure. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	No

Designated site name:	**Hartslock Wood**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H91J0 *Taxus baccata* woods of the British Isles • H6210 Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*)	**Water Dependency:** Habitats not identified as water dependent but it will be important to protect the rooting structure of the qualifying features.
Current conservation status:	H6210 Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) - – **Bad but improving** (range: favourable area: inadequate but improving, structure and function: Bad but improving, Future prospects: favourable) Main pressures – Grazing, Air pollution, Biocenotic evolution, Modification of cultivation practices, Fertilisation, Artificial planting, Abandonment of pastoral systems, Invasion by a species - Threats as stated in pressures H91J0 *Taxus baccata* woods of the British Isles - **Bad but improving** (range: favourable area: favourable, structure and function: Bad but improving, Future prospects: inadequate but improving) Main pressures - deer browsing, lack of diversity of stand structure, air pollution – Threats as stated in pressures	
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 qualifying natural habitats • The structure and function (including typical species) of the qualifying natural habitats, and, • The supporting processes on which the qualifying natural habitats rely	
SSSI Condition assessment:	Hartslock SSSI: 88.08% favourable, 11.92% unfavourable recovering	
Site Improvement Plan:	1. Air Pollution: risk of atmospheric nitrogen deposition – threat - H6210 Dry grasslands and scrublands on chalk or limestone (important orchid sites), H91J0 Yew-dominated woodland Further investigate impacts of atmospheric nitrogen deposition	
Potential Effects		

Option Element:	Assessment:	Likely Significant Effects?
Moulsford Groundwater	The only SIP for this SAC relates to the potential for air quality impacts. The constituent SSSI (Hartslock SSSI) is currently 11.92% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 88.08% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within SAC boundaries, and construction activities are at a sufficient distance from SAC (approximately 2.9km at the closest point) that no significant impacts on the qualifying features are anticipated. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. Abstraction at Moulsford is unlikely to affect the qualifying features of the SAC which are not water dependent and impacts of abstraction from the unconfined chalk will be controlled by abstraction licence conditions.	No
Kennet Valley to SWOX 2.3 Ml/d	The only SIP for this SAC relates to the potential for air quality impacts. The constituent SSSI (Hartslock SSSI) is currently 11.92% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 88.08% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within SAC boundaries. Construction activities are however close enough to the SAC boundary (approximately 175m at the closest point) that dust impacts could occur. The HGV movements required for construction are associated with the two WTW sites that are some distance from the SAC (approximately 2.5km distant) and it is only part of the pipeline route that runs within 200m of the designated site, vehicle movements of which would be considered de minimus and thus are not likely to breach the 1,000 vehicle / 200 HGV limits that are considered to be the threshold for leading to an air quality impact. In the absence of mitigation, likely significant effects cannot be discounted for impacts to designated flora. No operational effects are considered likely from the use of this water conveyance asset.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.
Kennet Valley to SWOX 6.7 Ml/d	The only SIP for this SAC relates to the potential for air quality impacts. The constituent SSSI (Hartslock SSSI) is currently 11.92% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 88.08% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within SAC boundaries. Construction activities are however close enough to the SAC boundary (approximately 175m at the closest point) that dust impacts could occur. The HGV movements required for construction are associated with the two WTW sites that are some distance from the SAC (approximately 2.5km distant) and it is only part of the pipeline route that runs within 200m of the designated site, vehicle movements of which would be considered de minimus and thus are not likely to breach the 1,000 vehicle / 200 HGV limits that are considered to be the threshold for leading to an air quality impact. In the absence of mitigation, likely significant effects cannot be discounted for impacts to designated flora. No operational effects are considered likely from the use of this water conveyance asset.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

Designated site name:	**Little Wittenham**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• S1166. *Triturus cristatus*; Great crested newt	**Water Dependency:** Species identified as water dependent: • *Triturus cristatus*; Great crested newt
Current conservation status:	Great Crested Newt: **Inadequate** (range: Favourable, population: Inadequate and deteriorating, Habitat: unknown, future prospects: favourable) **Main Pressures**: Modification of cultivation practices; fertilisation; urbanised areas, human habitation; pollution to surface waters (limnic & terrestrial, marine & brackish); Biocenotic evolution, succession; use of biocides, hormones and chemicals: Restructuring agricultural land holding: Mining and quarrying: Roads, paths and railroads: Industrial or commercial areas: Other human intrusions and disturbances: invasive non-native species: human induced changes in hydraulic conditions: Other ecosystem modifications: Interspecific faunal relations: forest planting on open ground: Marine and Freshwater Aquaculture: Pollution to groundwater (point sources and diffuse sources). **Main threats**: modification of cultivation practices: use of biocides, hormones and chemicals: Fertilisation: Mining and quarrying: Roads, paths and railroads: Restructuring agricultural land holding: forest planting on open ground: Urbanised areas, human habitation: Industrial or commercial areas: Other human intrusions and disturbances: Pollution to surface waters (limnic & terrestrial, marine & brackish): invasive non-native species: human induced changes in hydraulic conditions: Other ecosystem modifications: Biocenotic evolution, succession: Interspecific faunal relations: Changes in abiotic conditions: Changes in biotic conditions: Marine and Freshwater Aquaculture.	
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:	Little Wittenham SSSI 100% Favourable	
Site Improvement Plan:	1. Invasive Species - S1166 Great crested newt - Remove fish from breeding ponds 2. Invasive Species - S1166 Great crested newt - Construct further ponds in the SAC to provide additional fish-free breeding habitat 3. Public Access/Disturbance - S1166 Great crested newt - Conduct audits to determine the best locations for signed access routes, and construct new access routes	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Abingdon WTW new 24 Ml/d (SWOX)	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 9.8km) that no significant impacts on the qualifying features are anticipated. Operation of this water treatment works will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 150Mm3	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 125Mm3	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 100Mm3	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 75Mm3	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 30+100Mm3 Phase 1	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 30+100Mm3 Phase 1	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No

South East Strategic Reservoir 80+42Mm3 Phase 1	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 80+42Mm3 Phase 2	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
Raw Water Transfer Deerhurst to Culham 300 Ml/d	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 7km to the west at the closest point) that no significant impacts on the qualifying features are anticipated. Operation of the raw water transfer scheme will not have any adverse effects on the qualifying features.	No
Raw Water Transfer Deerhurst to Culham 400 Ml/d	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 7km to the west at the closest point) that no significant impacts on the qualifying features are anticipated. Operation of the raw water transfer scheme will not have any adverse effects on the qualifying features.	No
Raw Water Transfer Deerhurst to Culham 500 Ml/d	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 7km to the west at the closest point) that no significant impacts on the qualifying features are anticipated. Operation of the raw water transfer scheme will not have any adverse effects on the qualifying features.	No
Treated transfer to North SWA (SWOX to SWA)	None of the SIP elements are relevant to this option element. The constituent SSSI (Little Wittenham SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 9.8km to the west at the closest point) that no significant impacts on the qualifying features are anticipated. Operation of the treated water transfer scheme will not have any adverse effects on the qualifying features.	No

Designated site name:	**Oxford Meadows**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H6510. Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) • S1614. *Apium repens*; Creeping marshwort	**Water Dependency:** Habitat and species identified as water dependent: • H6510. Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) • *Apium repens*; Creeping marshwort
Current conservation status:	Lowland hay meadows: **Bad but improving** (range: favourable, area: inadequate and deteriorating, structure and function: bad but improving, future prospects: bad but improving) Main pressures: Fertilisation: Air pollution, air-borne pollutants: mowing / cutting of grassland: grazing: use of biocides, hormones and chemicals: inundation (natural processes): Changes in abiotic conditions: Cultivation: Mining and quarrying: Pollution to surface waters (limnic & terrestrial, marine & brackish): problematic native species: human induced changes in hydraulic conditions: Other ecosystem modifications: Changes in biotic conditions. Main threats: As stated in pressures. *Apium repens*; Creeping marshwort: **Bad but improving** (range: bad but improving, population: bad but improving, habitat: inadequate, future prospects: inadequate). Main pressures: grazing: human induced changes in hydraulic conditions: invasive non-native species. Main threats: grazing: human induced changes in hydraulic conditions: Urbanised areas, human habitation: Pollution to surface waters (limnic & terrestrial, marine & brackish): invasive non-native species.	

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:	Cassington Meadows SSSI: 100% favourable Wolvercote Meadows SSSI: 100% favourable Port Meadow with Wolvercote Common & Green SSSI: 98.71% favourable, 1.29% Unfavourable recovering Pixey & Yarnton Meads SSSI: 100% favourable	
Site Improvement Plan:	1. Hydrological Changes - S1614 Creeping marshwort Improve the knowledge and understanding of the hydrological conditions on the site 2. Invasive Species - S1614 Creeping marshwort Eliminate/control the *Crassula* populations on the site	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Abingdon WTW new 24 Ml/d (SWOX)	Neither of the SIP elements for this SAC are considered relevant to this option element. The majority of the constituent SSSIs are in a wholly favourable condition. The exception is Port Meadow with Wolvercote Common and Green SSSI which is currently 1.29% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the SSSIs that are currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of this option to the SAC (the treated water pipeline connection at the Beacon Hill service reservoir) is approximately 2.3km to the south west of the designated site. This is considered a sufficient distance from the SAC that no significant impacts on the qualifying features are anticipated. Operation of this water treatment works will not have any adverse effects on the qualifying features.	No
Treated transfer to North SWA (SWOX to SWA)	Both of the SIP elements for this SAC are considered relevant to this option element: (1) hydrological changes and (2) invasive species, with the former considered more feasible. The majority of the constituent SSSIs are in a wholly favourable condition. The exception is Port Meadow with Wolvercote Common and Green SSSI which is currently 1.29% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the SSSIs that are currently favourable and affect the ability of the site to achieve its conservation objectives. The closest part of the option element to Oxford Meadows SAC is the pipeline which runs approximately 135m to the east of the site at the closest point. The pipeline also encircles the northern part of this SAC to the north and west. Short term impacts could occur due to dust emissions from pipeline construction. The relatively shallow depth of the pipeline construction is such that it is not thought it would significantly impede ground water flows to or from the site but this would need to be explored further in the Appropriate Assessment. In the absence of mitigation, likely significant effects cannot be discounted for invasive non-native species. Once constructed, the pipeline component of this option element is therefore not considered likely to present a material obstruction to either infiltration or groundwater flow to Oxford Meadows. Construction and operation of the service reservoirs and water treatment works will not have any significant adverse effects on the designated site.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

Designated site name:	**Cothill Fen**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H7230 Alkaline fens • H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	**Water Dependency:** Habitat identified as water dependent: • H7230 Alkaline fens • H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)
Current conservation status:	Alkaline Fens: **Bad** (range: favourable, area: unknown, structure and function: bad, future prospects: bad but improving) Main pressures:: Pollution to surface waters (limnic & terrestrial, marine & brackish): Pollution to groundwater (point sources and diffuse sources): Air pollution, air-borne pollutants: human induced changes in hydraulic conditions: Cultivation: forest planting on open ground: Outdoor sports and leisure activities, recreational activities: Biocenotic evolution, succession: reduced fecundity/ genetic depression: modification of cultivation practices: mowing / cutting of grassland: Fertilisation: Forest and Plantation management & use: Mining and quarrying: Roads, paths and railroads: Utility and service lines: Structures, buildings in the landscape: Other ecosystem modifications: Changes in abiotic conditions. Main Threats: As stated in pressures Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*: **Bad but improving** (range: favourable, area: inadequate, structure and function: bad but improving, future prospects: inadequate but improving). Main Pressures: invasive non-native species: Other ecosystem modifications: Cultivation: Forest and Plantation management & use: forest exploitation without replanting or natural regrowth: grazing in forests/ woodland: Pollution to surface waters (limnic & terrestrial, marine & brackish): Air pollution, air-borne pollutants: human induced changes in hydraulic condition: Interspecific faunal relations: Interspecific floral relations: Changes in biotic conditions: grazing: Mining and quarrying: deer grazing/ browsing/ trampling: Outdoor	

	sports and leisure activities, recreational activities: Pollution to groundwater (point sources and diffuse sources): Soil pollution and solid waste: Changes in abiotic conditions. Main threats: As stated in pressures and Changes in abiotic conditions.	
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:	Cothill Fen SSSI 65.22%, 34.78% Unfavourable recovering	
Site Improvement Plan:	1. Water Pollution - H7230 Calcium-rich springwater-fed fens - Investigate the impact, pathways and sources of water pollution. Draw up and implement a Diffuse Water Pollution Plan (DWPP) 2. Hydrological Changes - H7230 Calcium-rich springwater-fed fens - Investigate the hydrology of the site 3. Air Pollution: impact of atmospheric nitrogen deposition - H7230 Calcium-rich springwater-fed fens - Reduce the impacts of atmospheric nitrogen	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Abingdon WTW new 24 Ml/d (SWOX)	All of the SIP elements for this SAC are considered relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. The pipeline runs to the west of the groundwater divide near to the SAC, approximately 500m of the SAC to the west at its closest point. At this distance, no significant water pollution or dust pollution impacts are likely from construction. Short term impacts could occur due to dust emissions from pipeline construction. The majority of the HGV movements required for construction are associated with the WTW site that is some distance from the SAC (approximately 4.6km). Vehicle movements associated with construction of the part of the pipeline route that runs within 200m of the designated site would be considered de minimus and thus would not breach the 1,000 vehicle / 200 HGV limits that are considered to be the threshold for leading to an air quality impact. As such no significant air quality impacts on the SAC are anticipated. The pipeline has been re-routed since the draft WRMP19 so that it runs to the west of the groundwater divide near to the SAC, from which the groundwater flows east and west (east towards Cothill Fen). Existing boreholes adjacent to the proposed pipeline route have recorded the groundwater level at 4.5m below ground level. In the absence of mitigation, likely significant effects cannot be discounted for hydrological changes. There is a risk that during construction of the pipeline groundwater could be intercepted in the excavation and there would be a need for local dewatering. This pumping of groundwater may impact on the groundwater flow regime beneath the western end of Cothill Fen. However due to the temporary nature of the works and the small drawdown required this would not result in a significant adverse impact on the SAC.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.
South East Strategic Reservoir 150Mm3	All of the SIP elements for this SAC are considered potentially relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution but hydrological impacts are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. Construction of the reservoir embankments will not affect groundwater levels in the unconfined Corallian aquifer in the vicinity of the SAC. The groundwater catchment in the confined Corallian aquifer beneath the reservoir site is separated hydrogeologically from the unconfined Corallian aquifer north of the River Ock. Any increased groundwater head in the confined Corallian aquifer beneath the reservoir footprint would be dissipated through increased baseflow in the River Ock. There would be no pathway for effects on the SAC which lies beyond the River Ock either during construction or operation. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 2.7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 125Mm3	All of the SIP elements for this SAC are considered potentially relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution but hydrological impacts are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. Construction of the reservoir embankments will not affect groundwater levels in the unconfined Corallian aquifer in the vicinity of the SAC. The groundwater catchment in the confined Corallian aquifer beneath the reservoir site is separated hydrogeologically from the unconfined Corallian aquifer north of the River Ock. Any increased groundwater head in the confined Corallian aquifer beneath the reservoir footprint would be dissipated through increased baseflow in the River Ock. There would be no pathway for effects on the SAC which lies beyond the River Ock either during construction or operation.	No

	The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 2.7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	
South East Strategic Reservoir 100Mm3	All of the SIP elements for this SAC are considered potentially relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution but hydrological impacts are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. Construction of the reservoir embankments will not affect groundwater levels in the unconfined Corallian aquifer in the vicinity of the SAC. The groundwater catchment in the confined Corallian aquifer beneath the reservoir site is separated hydrogeologically from the unconfined Corallian aquifer north of the River Ock. Any increased groundwater head in the confined Corallian aquifer beneath the reservoir footprint would be dissipated through increased baseflow in the River Ock. There would be no pathway for effects on the SAC which lies beyond the River Ock either during construction or operation. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 2.7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 75Mm3	All of the SIP elements for this SAC are considered potentially relevant to this option element: 1 water pollution, 2 hydrological changes and 3 air pollution but hydrological impacts are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. Construction of the reservoir embankments will not affect groundwater levels in the unconfined Corallian aquifer in the vicinity of the SAC. The groundwater catchment in the confined Corallian aquifer beneath the reservoir site is separated hydrogeologically from the unconfined Corallian aquifer north of the River Ock. Any increased groundwater head in the confined Corallian aquifer beneath the reservoir footprint would be dissipated through increased baseflow in the River Ock. There would be no pathway for effects on the SAC which lies beyond the River Ock either during construction or operation. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 2.7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 30+100Mm3 Phase 1	All of the SIP elements for this SAC are considered potentially relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution but hydrological impacts are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. Construction of the reservoir embankments will not affect groundwater levels in the unconfined Corallian aquifer in the vicinity of the SAC. The groundwater catchment in the confined Corallian aquifer beneath the reservoir site is separated hydrogeologically from the unconfined Corallian aquifer north of the River Ock. Any increased groundwater head in the confined Corallian aquifer beneath the reservoir footprint would be dissipated through increased baseflow in the River Ock. There would be no pathway for effects on the SAC which lies beyond the River Ock either during construction or operation. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 2.7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 30+100Mm3 Phase 2	All of the SIP elements for this SAC are considered potentially relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution but hydrological impacts are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. Construction of the reservoir embankments will not affect groundwater levels in the unconfined Corallian aquifer in the vicinity of the SAC. The groundwater catchment in the confined Corallian aquifer beneath the reservoir site is separated hydrogeologically from the unconfined Corallian aquifer north of the River Ock. Any increased groundwater head in the confined Corallian aquifer beneath the reservoir footprint would be dissipated through increased baseflow in the River Ock. There would be no pathway for effects on the SAC which lies beyond the River Ock either during construction or operation. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 2.7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No

South East Strategic Reservoir 80+42Mm3 Phase 1	All of the SIP elements for this SAC are considered potentially relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution but hydrological impacts are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. Construction of the reservoir embankments will not affect groundwater levels in the unconfined Corallian aquifer in the vicinity of the SAC. The groundwater catchment in the confined Corallian aquifer beneath the reservoir site is separated hydrogeologically from the unconfined Corallian aquifer north of the River Ock. Any increased groundwater head in the confined Corallian aquifer beneath the reservoir footprint would be dissipated through increased baseflow in the River Ock. There would be no pathway for effects on the SAC which lies beyond the River Ock either during construction or operation The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 2.7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
South East Strategic Reservoir 80+42Mm3 Phase 2	All of the SIP elements for this SAC are considered potentially relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution but hydrological impacts are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. Construction of the reservoir embankments will not affect groundwater levels in the unconfined Corallian aquifer in the vicinity of the SAC. The groundwater catchment in the confined Corallian aquifer beneath the reservoir site is separated hydrogeologically from the unconfined Corallian aquifer north of the River Ock. Any increased groundwater head in the confined Corallian aquifer beneath the reservoir footprint would be dissipated through increased baseflow in the River Ock. There would be no pathway for effects on the SAC which lies beyond the River Ock either during construction or operation. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (the closest point of the option lies approximately 2.7km to the west) that no significant impacts on the qualifying features are anticipated. Operation of the reservoir will not have any adverse effects on the qualifying features.	No
Raw Water Transfer Deerhurst to Culham 300 Ml/d	All of the SIP elements for this SAC are considered potentially relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution but hydrological impacts are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. Construction of the pipeline is unlikely to affect groundwater levels in the unconfined Corallian aquifer in the vicinity of the SAC as the pipeline is on different geological strata. Construction activities are at a sufficient distance from the SAC (approximately 3.9km to the south at the closest point) that no significant adverse impacts on the qualifying features are anticipated. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. No operational effects arising from this option element are anticipated.	No
Raw Water Transfer Deerhurst to Culham 400 Ml/d	All of the SIP elements for this SAC are considered potentially relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution but hydrological impacts are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. Construction of the pipeline is unlikely to affect groundwater levels in the unconfined Corallian aquifer in the vicinity of the SAC as the pipeline is on different geological strata. Construction activities are at a sufficient distance from the SAC (approximately 3.9km to the south at the closest point) that no significant adverse impacts on the qualifying features are anticipated. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. No operational effects arising from this option element are anticipated.	No
Raw Water Transfer Deerhurst to Culham 500 Ml/d	All of the SIP elements for this SAC are considered potentially relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution but hydrological impacts are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. Construction of the pipeline is unlikely to affect groundwater levels in the unconfined Corallian aquifer in the vicinity of the SAC as the pipeline is on different geological strata. Construction activities are at a sufficient distance from the SAC (approximately 3.9km to the south at the closest point) that no significant adverse impacts on the qualifying features are anticipated. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. No operational effects arising from this option element are anticipated.	No

Treated transfer to North SWA (SWOX to SWA)	All of the SIP elements for this SAC are considered potentially relevant to this option element: (1) water pollution, (2) hydrological changes and (3) air pollution but hydrological impacts air pollution are considered to be the most feasible. The constituent SSSI (Cothill Fen SSSI) is currently 34.78% unfavourable but all of this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of the 65.22% of the SSSI that is currently favourable and affect the ability of the site to achieve its conservation objectives. The pipeline runs to the west of the groundwater divide near to the SAC, approximately 500m of the SAC to the west at its closest point. At this distance, no significant water pollution or dust pollution impacts are likely from construction. Short term impacts could occur due to dust emissions from pipeline construction. The majority of the HGV movements required for construction are associated with the WTW site that is some distance from the SAC (approximately 4.6km). Vehicle movements associated with construction of the part of the pipeline route that runs within 200m of the designated site, would be considered de minimus and thus would not breach the 1,000 vehicle / 200 HGV limits that are considered to be the threshold for leading to an air quality impact. As such no significant air quality impacts on the SAC are anticipated. The pipeline has been re-routed since the draft WRMP19 so that it runs to the west of the groundwater divide near to the SAC, from which the groundwater flows east and west (east towards Cothill Fen). Existing boreholes adjacent to the proposed pipeline route have recorded the groundwater level at 4.5m below ground level. The proposed pipeline would be constructed at a depth less than 2.5m below ground level (possibly only to 1.5m deep) and is therefore unlikely to interfere with groundwater levels or movement towards Cothill Fen. However, in the absence of mitigation, likely significant effects cannot be discounted for hydrological changes. There is a risk that during construction of the pipeline groundwater could be intercepted in the excavation and there would be a need for local dewatering. This pumping of groundwater may impact on groundwater flow regime beneath the western end of Cothill Fen. However due to the temporary nature of the works and the small drawdown required this would not result in a significant adverse impact on the SAC.	Stage 2 Appropriate Assessment is required if the option element is included in the preferred programme.

Designated site name:	**Kennet Valley Alderwoods**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	**Water Dependency:** Habitat identified as water dependent: • H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)
Current conservation status:	• H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) - **Bad but improving** – range: favourable, area: inadequate, structure and function: bad but improving, future prospects: inadequate but improving – main pressures: water management, cessation of traditional management, inappropriate grazing regimes, invasive species, clearance and conversion, constraints on expansion, disease and air pollution – main threats: water management, cessation of traditional management, inappropriate grazing, invasive species, constraints on expansion, disease, and air pollution.	
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 qualifying natural habitats -The structure and function (including typical species) of the qualifying natural habitats, and, -The supporting processes on which the qualifying natural habitats rely	
SSSI Condition assessment:	River Kennet SSSI - unfavourable, no change: 100% Kennet Valley Alderwoods SSSI – favourable: 100%	
Site Improvement Plan:	1. Inappropriate water levels – Threat - H91E0 Alder woodland on floodplains - Investigate and implement water channel and structure management 2. Game management: other – Threat - H91E0 Alder woodland on floodplains - Review and issue new consents for game management practices.	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
East Woodhay borehole pumps	One of the SIP elements for this SAC is considered relevant to this option element: (1) inappropriate water levels. Of the two constituent SSSIs (River Kennet SSSI and Kennet Valley Alderwoods SSSI) one has a wholly unfavourable condition whereas the other is wholly favourable. Any potential significant impacts identified could hinder the potential recovery of River Kennet SSSI and cause a decline in the good condition of the Kennet Valley Alderwoods SSSI and, as a result, affect the ability of the site to achieve its conservation objectives. This option element scheme is located within a separate catchment to the designated site and therefore is not hydrogeologically connected (the Kennet and Avon Canal separates the SAC from the borehole site). Additionally, the proposed abstraction is from the confined chalk aquifer and will not interact with any surface water features or terrestrial ecosystems. The designated site is also at a sufficient distance (approximately 3.2km to the south at the closest point) so as not to be significantly affected by construction or operational activities. It is therefore unlikely that the option element will have any significant effects on the site's qualifying features.	No

Designated site name:	**River Lambourn**

Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation • S1163 Bullhead *Cottus gobio* • S1096 Brook lamprey *Lampetra planeri*	**Water Dependency:** Habitats and species identified as water dependent: • H3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation • Bullhead *Cottus gobio* • Brook lamprey *Lampetra planeri*
Current conservation status:	• **H3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation- Bad and deteriorating** – (range: favourable, area: inadequate, structure and function: bad and deteriorating, future prospects: bad and deteriorating) – main pressures: pollution, hydrological interventions, physical interventions, biological interventions – main threats: pollution, hydrological interventions, physical interventions, biological interventions, climate change. • **S1163 Bullhead *Cottus gobio* – Unknown – (range: favourable, population: unknown, habitat: unknown, future prospects: unknown) - main pressures:** Fish and Shellfish Aquaculture; Sand and gravel extraction; water pollution; management of aquatic and bank vegetation for drainage purposes; Canalisation; Modification of hydrographic functioning, general; modifying structures of inland water courses; management of water levels; Erosion; Silting up; predation; competition. Main threats: same as pressures. • **S1096 Brook lamprey *Lampetra planeri* - Inadequate but improving – (range: favourable, population: unknown, habitat: inadequate but improving, future prospects: favourable) - main pressures:** bait digging; Sand and gravel extraction; water pollution; management of aquatic and bank vegetation for drainage purposes; Removal of sediments (mud...); Canalisation; Modification of hydrographic functioning, general; modifying structures of inland water courses; management of water levels; drying out / accumulation of organic material; eutrophication; acidification; invasion by a species; competition; introduction of disease – main threats: : bait digging; Sand and gravel extraction; water pollution; management of aquatic and bank vegetation for drainage purposes; Removal of sediments (mud...); Canalisation; Modification of hydrographic functioning, general; modifying structures of inland water courses; management of water levels; drying out / accumulation of organic material; eutrophication; acidification; invasion by a species; competition; introduction of disease.	
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:	River Lambourn SSSI – unfavourable, no change: 100% Kennet & Lambourn Floodplain SSSI – favourable: 68.39%; unfavourable – recovering: 14.50%; unfavourable – no change: 1.10%; unfavourable – declining: 16.01% Boxford Water Meadows SSSI – unfavourable, recovering: 100%	
Site Improvement Plan:	1. Siltation - Pressure - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1096 Brook lamprey, S1163 Bullhead - Review and update and deliver the river restoration plan and the Diffuse Water Pollution plan 2. Water Pollution – Pressure - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1016 Desmoulin`s whorl snail, S1096 Brook lamprey, S1163 Bullhead - Review, update and deliver the diffuse water pollution plan; Develop and deliver an Infiltration Reduction Plan; Continue and develop Catchment Sensitive Farming activities. 3. Invasive species – Pressure - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1096 Brook lamprey, S1163 Bullhead - Investigate impacts of signal crayfish, review potential control/mitigation 4. Hydrological changes – Threat - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1016 Desmoulin`s whorl snail, S1096 Brook lamprey, S1163 Bullhead - Investigate impacts of climate change on river ecology 5. Inland flood defence works - Threat - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1096 Brook lamprey, S1163 Bullhead - Review and update flood defence plan 6. Inappropriate cutting/mowing - Threat - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1096 Brook lamprey, S1163 Bullhead - Produce and disseminate good practice guidance 7. Change in land management – Threat - S1016 Desmoulin`s whorl snail - Agree sustainable habitat management strategy 8. Inappropriate water levels - Pressure - S1016 Desmoulin`s whorl snail - Review Water Level Management Plan in key areas 9. Hydrological changes – Threat - S1016 Desmoulin`s whorl snail - Investigate causes of decline of *Vertigo moulinsiana* 10. Water Pollution – Threat - S1016 Desmoulin`s whorl snail - Commission research into effects of mollucicides	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
East Woodhay borehole pumps	The SIP elements of potential relevance to this proposed option element are (2) water pollution, (4) hydrological changes, (8) inappropriate water levels and (9) hydrological changes. The three constituent SSSIs vary in their condition with two out of the three sites being 100% unfavourable (one recovering, one not) and 68.39% of the Kennet and Lambourn Floodplain SSSI being in favourable condition. Any potential significant impacts identified could hinder current recovery or prevent future recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. This option element abstracts water from the confined aquifer and is not located within the same catchment as the SAC and is therefore not hydrogeologically connected (the Kennet and Avon Canal separates the SAC from the borehole site). In addition, the proposed scheme will not exceed the peak value permitted by the Environment Agency abstraction licence. The proposed scheme will not require land take from the SAC and the option element location is at a sufficient distance (approximately 5.4km to the south west at the closest point) so as not to be significantly affected by construction or operational activities. Therefore, the option element is unlikely to have any significant effects on the site's qualifying features.	No

Designated site name:	**Hackpen Hill**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H6210. Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco Brometalia*); Dry grasslands and scrublands on chalk or limestone • S1654. *Gentianella anglica*; Early gentian	**Water Dependency:** Habitats and species not identified as water dependent
Current conservation status:	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*): **Bad but improving** (range: favourable, area: inadequate and deteriorating, structure and function: bad but improving, future prospects: favourable. Main pressures: grazing: Air pollution, air-borne pollutants: modification of cultivation practices: livestock farming and animal breeding (without grazing): Fertilisation: forest planting on open ground: Mining and quarrying: Urbanised areas, human habitation: deer grazing/ browsing/ trampling: Outdoor sports and leisure activities, recreational activities: Other human intrusions and disturbances: Soil pollution and solid waste (excluding discharges): invasive non-native species: problematic native species: fire and fire suppression: Other ecosystem modifications: Biocenotic evolution, succession: Changes in abiotic conditions: Changes in biotic conditions. Main threats: As stated in pressures Early gentian (*Gentianella anglica*): **Inadequate** (range; favourable, population; inadequate, habitat: inadequate, future prospects: inadequate). Main pressures: grazing: Biocenotic evolution, succession: Air pollution, air-borne pollutants. Main threats: As stated in pressures and Fertilisation: forest planting on open ground.	
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:	Hackpen, Warren & Gramp's Hill Downs SSSI: 100% favourable	
Site Improvement Plan:	No current issues affecting the Natura 2000 feature(s) have been identified on this site. No measures are required.	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
South East Strategic Reservoir 150Mm3	No SIP has been stated for this SAC given a lack of identified issues with the qualifying features at this site. The constituent SSSI (Hackpen, Warren & Gramp's Hill Downs SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed option element will not require land take from the SAC and the option element location is at a sufficient distance (approximately 9.2km to the north east) so as not to be significantly affected by construction or operational activities.	No
South East Strategic Reservoir 125Mm3	No SIP has been stated for this SAC given a lack of identified issues with the qualifying features at this site. The constituent SSSI (Hackpen, Warren & Gramp's Hill Downs SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed option element will not require land take from the SAC and the option element location is at a sufficient distance (approximately 9.2km to the north east) so as not to be significantly affected by construction or operational activities.	No
South East Strategic Reservoir 100Mm3	No SIP has been stated for this SAC given a lack of identified issues with the qualifying features at this site. The constituent SSSI (Hackpen, Warren & Gramp's Hill Downs SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed option element will not require land take from the SAC and the option element location is at a sufficient distance (approximately 9.2km to the north east) so as not to be significantly affected by construction or operational activities.	No
South East Strategic Reservoir 75Mm3	No SIP has been stated for this SAC given a lack of identified issues with the qualifying features at this site. The constituent SSSI (Hackpen, Warren & Gramp's Hill Downs SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives.	No

	The proposed option element will not require land take from the SAC and the option element location is at a sufficient distance (approximately 9.2km to the north east) so as not to be significantly affected by construction or operational activities.	
South East Strategic Reservoir 30+100Mm3 Phase 1	No SIP has been stated for this SAC given a lack of identified issues with the qualifying features at this site. The constituent SSSI (Hackpen, Warren & Gramp's Hill Downs SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed option element will not require land take from the SAC and the option element location is at a sufficient distance (approximately 9.2km to the north east) so as not to be significantly affected by construction or operational activities.	No
South East Strategic Reservoir 30+100Mm3 Phase 2	No SIP has been stated for this SAC given a lack of identified issues with the qualifying features at this site. The constituent SSSI (Hackpen, Warren & Gramp's Hill Downs SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed option element will not require land take from the SAC and the option element location is at a sufficient distance (approximately 9.2km to the north east) so as not to be significantly affected by construction or operational activities.	No
South East Strategic Reservoir 80+42Mm3 Phase 1	No SIP has been stated for this SAC given a lack of identified issues with the qualifying features at this site. The constituent SSSI (Hackpen, Warren & Gramp's Hill Downs SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed option element will not require land take from the SAC and the option element location is at a sufficient distance (approximately 9.2km to the north east) so as not to be significantly affected by construction or operational activities.	No
South East Strategic Reservoir 80+42Mm3 Phase 2	No SIP has been stated for this SAC given a lack of identified issues with the qualifying features at this site. The constituent SSSI (Hackpen, Warren & Gramp's Hill Downs SSSI) is currently 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The proposed option element will not require land take from the SAC and the option element location is at a sufficient distance (approximately 9.2km to the north east) so as not to be significantly affected by construction or operational activities.	No

Designated site name:	**Kennet-Lambourn Floodplain**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• S1016 Desmoulin`s whorl snail *Vertigo moulinsiana*	**Water Dependency:** Species identified as water dependent: • Desmoulin`s whorl snail *Vertigo moulinsiana*
Current conservation status:	• S1016 Desmoulin`s whorl snail *Vertigo moulinsiana* – **Unknown** – range: favourable, population: unknown, habitat: unknown, future prospects: favourable – main pressures: routes, autoroutes; Landfill, land reclamation and drying out, general; Modification of hydrographic functioning, general; management of water levels; Silting up; Drying out; Submersion; Biocenotic evolution – main threats: routes, auto routes; Landfill, land reclamation and drying out, general; Modification of hydrographic functioning, general; management of water levels; Silting up; Drying out; Submersion; Biocenotic evolution	
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:	River Kennet SSSI – unfavourable, no change: 100% River Lambourn SSSI – unfavourable, no change: 100% Kennet & Lambourn Floodplain SSSI – favourable: 68.39%; unfavourable – recovering: 14.50%; unfavourable – no change: 1.10%; unfavourable – declining: 16.01% Thatcham Reed Beds SSSI – favourable: 44.47%; unfavourable – recovering: 55.53% Chilton Foliat Meadows SSSI – favourable: 17.25%; unfavourable – recovering: 79.02%, unfavourable – no change: 3.73% Boxford Water Meadows SSSI – unfavourable, recovering: 100%	

Site Improvement Plan:	1. Siltation - Pressure - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1096 Brook lamprey, S1163 Bullhead - Review and update and deliver the river restoration plan and the Diffuse Water Pollution plan 2. Water Pollution – Pressure - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1016 Desmoulin`s whorl snail, S1096 Brook lamprey, S1163 Bullhead - Review, update and deliver the diffuse water pollution plan; Develop and deliver an Infiltration Reduction Plan; Continue and develop Catchment Sensitive Farming activities. 3. Invasive species – Pressure - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1096 Brook lamprey, S1163 Bullhead - Investigate impacts of signal crayfish, review potential control/mitigation 4. Hydrological changes – Threat - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1016 Desmoulin`s whorl snail, S1096 Brook lamprey, S1163 Bullhead - Investigate impacts of climate change on river ecology 5. Inland flood defence works - Threat - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1096 Brook lamprey, S1163 Bullhead - Review and update flood defence plan 6. Inappropriate cutting/mowing - Threat - H3260 Rivers with floating vegetation often dominated by water-crowfoot, S1096 Brook lamprey, S1163 Bullhead - Produce and disseminate good practice guidance 7. Change in land management – Threat - S1016 Desmoulin`s whorl snail - Agree sustainable habitat management strategy 8. Inappropriate water levels - Pressure - S1016 Desmoulin`s whorl snail - Review Water Level Management Plan in key areas 9. Hydrological changes – Threat - S1016 Desmoulin`s whorl snail - Investigate causes of decline of *Vertigo moulinsiana* 10. Water Pollution – Threat - S1016 Desmoulin`s whorl snail - Commission research into effects of mollucicides	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
East Woodhay borehole pumps	The SIP elements of potential relevance to this proposed option element are (2) water pollution, (4) hydrological changes, (8) inappropriate water levels and (9) hydrological changes. The six constituent SSSIs vary in their condition with three out of the six sites being 100% unfavourable and the remaining three having varying portions of favourable condition. Any potential significant impacts identified could hinder current recovery or prevent future recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. This option element is located within a separate catchment to the SAC and therefore is not hydrogeologically connected (the Kennet and Avon Canal separates the SAC from the borehole site). The proposed abstraction is from the confined chalk aquifer and will not interact with any surface water features or terrestrial ecosystems. The site is also at a sufficient distance (approximately 3.8km to the south at the closest point) so as not to be significantly affected by construction or operational activities. It is therefore unlikely that the option element will have significant adverse effects on the site's qualifying features.	No

Designated site name:	**North Meadow and Clattinger Farm**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features: Water Dependency:	• H6510. Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)	**Water Dependency:** Habitat identified as water dependent: • H6510. Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)
Current conservation status:	Lowland hay meadows: **Bad but improving** (range: favourable, area: inadequate and deteriorating, structure and function: bad but improving, future prospects: bad but improving) Main pressures: Fertilisation: Air pollution, air-borne pollutants: mowing / cutting of grassland: grazing: use of biocides, hormones and chemicals: inundation (natural processes): Changes in abiotic conditions: Cultivation: Mining and quarrying: Pollution to surface waters (limnic & terrestrial, marine & brackish): problematic native species: human induced changes in hydraulic conditions: Other ecosystem modifications: Changes in biotic conditions. Main threats: As stated in pressures.	
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:	Clattinger Farm SSSI: 100% favourable North Meadow, Cricklade SSSI: 100% favourable	
Site Improvement Plan:	1. Inappropriate water levels - H6510 Lowland hay meadows - Review and update Water Level Management Plan 2. Habitat fragmentation - H6510 Lowland hay meadows - Habitat restoration to improve the site's resilience 3. Commons management - H6510 Lowland hay meadows - Landowner agreement for livestock fencing 4. Public access/disturbance - H6510 Lowland hay meadows - Manage and mitigate the effects of public access 5. Water Pollution - H6510 Lowland hay meadows - Investigate the risks from diffuse pollution carried in floodwaters	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Radcot WTW new 24 Ml/d (SWOX)	The SIP elements of potential relevance to this proposed option element are (1) inappropriate water levels and (5) water pollution although neither are particularly feasible. The two constituent SSSIs (Clattinger Farm SSSI and North Meadow, Cricklade SSSI) are both 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives.	No

	The SAC is located approximately 6.2km to the north-west of the pipeline between the new water treatment works at Little Farringdon and its termination at the service reservoir at Broad Blunsden. At this distance from the SAC, no likely significant effects are anticipated as no hydrological effects that could adversely affect the water levels or quality experienced on this lowland meadow site would occur.	
RC Ashton Keynes borehole pumps - 2.5 Ml/d	The SIP elements of potential relevance to this proposed option element are (1) inappropriate water levels and (5) water pollution although neither are particularly feasible. The two constituent SSSIs (Clattinger Farm SSSI and North Meadow, Cricklade SSSI) are both 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. The western part of the SAC is located approximately 2.4km from the closest borehole (ABH5) associated with this option element. The eastern part of the SAC is located approximately 4.4km from the closest borehole (ABH4). The only potential likely significant effect at this distance would be changes to existing water levels that would cause a drying out of the sward and potentially the decline or loss of certain species dependent on wetter conditions. As both the eastern and western parts of the SAC lie on impermeable geology (Oxford Clay formation), they are not connected to the aquifer from which the abstraction occurs and therefore no significant adverse impacts are anticipated. Given the distance from the SAC and the minor nature of the construction activities, no significant adverse effects on the site are anticipated during the construction phase.	No
Wessex to SWOX (Flaxlands)	The SIP elements of potential relevance to this proposed option element are (1) inappropriate water levels and (5) water pollution although neither are particularly feasible. The two constituent SSSIs (Clattinger Farm SSSI and North Meadow, Cricklade SSSI) are both 100% favourable. Any potential significant impacts identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. This option element will not require any land take from within SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 4.3km to the south at the closest point and 9.4km to Flaxlands SR) that no significant impacts on qualifying features are anticipated. No significant adverse effects are anticipated from the operational use of this inter-company water conveyance asset.	No

Designated site name:	**Dixton Wood**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• S1079. *Limoniscus violaceus*; Violet click beetle	**Water Dependency**: Species not identified as water dependent
Current conservation status:	*Limoniscus violaceus*; Violet click beetle: **Bad and deteriorating** (range: favourable, population: bad and deteriorating, habitat: inadequate and deteriorating, future prospects: bad. Main pressures: abiotic (slow) natural processes: Changes in abiotic conditions. Main threats: abiotic (slow) natural processes: Biocenotic evolution, succession: Interspecific floral relations.	
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 - S1079 Violet click beetle - Carry out survey and monitoring work to inform advice to landowner 2. Forestry and woodland management - S1079 Violet click beetle - Formulate and implement a wood mould continuity strategy for the Violet click beetle population 3. Disease - S1079 Violet click beetle - Monitor for Chalara and take appropriate action	
Potential Effects		
Option Element:	Assessment:	Likely Significant Effects?
Raw Water Transfer Deerhurst to Culham 300 Ml/d	None of the SIP elements for this SAC are considered relevant to this option element. The constituent SSSI (Dixton Wood SSSI) is 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries. Short term air quality impacts (dust and vehicle emissions) could potentially occur given the relatively close distance to the works (approximately 840m to the south), however the qualifying feature is not identified as being sensitive to air quality impacts at this site so no likely significant effect is anticipated. The operation of the water abstraction and transfer scheme will not have significant adverse effects on the SAC.	No

Raw Water Transfer Deerhurst to Culham 400 Ml/d	None of the SIP elements for this SAC are considered relevant to this option element. The constituent SSSI (Dixton Wood SSSI) is 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries. Short term air quality impacts (dust and vehicle emissions) could potentially occur given the relatively close distance to the works (approximately 840m to the south), however the qualifying feature is not identified as being sensitive to air quality impacts at this site so no likely significant effect is anticipated. The operation of the water abstraction and transfer scheme will not have significant adverse effects on the SAC.	No
Raw Water Transfer Deerhurst to Culham 500 Ml/d	None of the SIP elements for this SAC are considered relevant to this option element. The constituent SSSI (Dixton Wood SSSI) is 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries. Short term air quality impacts (dust and vehicle emissions) could potentially occur given the relatively close distance to the works (approximately 840m to the south), however the qualifying feature is not identified as being sensitive to air quality impacts at this site so no likely significant effect is anticipated. The operation of the water abstraction and transfer scheme will not have significant adverse effects on the SAC.	No
Mythe WTW	None of the SIP elements for this SAC are considered relevant to this option element. The constituent SSSI (Dixton Wood SSSI) is 100% unfavourable but is recovering. Any potential significant impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (8.6km at the closest point) that no significant impacts on qualifying features are anticipated. The operation of the water abstraction and transfer scheme will not have significant adverse effects on the SAC.	No

Designated site name:	**Bredon Hill**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• S1079. *Limoniscus violaceus*; Violet click beetle	**Water Dependency:** Species not identified as water dependent
Current conservation status:	*Limoniscus violaceus*; Violet click beetle: **Bad and deteriorating** (range: favourable, population: bad and deteriorating, habitat: inadequate and deteriorating, future prospects: bad. Main pressures: abiotic (slow) natural processes: Changes in abiotic conditions. Main threats: abiotic (slow) natural processes: Biocenotic evolution, succession: Interspecific floral relations.	
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:	Bredon Hill SSSI: 95.45% Favourable, 4.55% Unfavourable recovering	
Site Improvement Plan:	1. Forestry and woodland management - S1079 Violet click beetle - Formulate and implement a wood mould continuity strategy for the Violet click beetle population 2. Feature location/ extent/ condition unknown - S1079 Violet click beetle - Survey of Violet click beetle, to identify site distribution 3. Disease - S1079 Violet click beetle - Monitor for the impact of Ash dieback, and investigate the effect of tree death on the wood mould persistence and continuity 4. Air Pollution: impact of atmospheric nitrogen deposition - S1079 Violet click beetle - Reduce the impact of atmospheric nitrogen deposition 5. Climate Change - S1079 Violet click beetle - Monitor and plan for the effect of increased losses due to storms and changed environment	
Potential Effects		
Scheme:	Assessment:	Likely Significant Effects?
Raw Water Transfer Deerhurst to Culham 300 Ml/d	The only SIP element of potential relevance to this proposed option element (4) air pollution. Given the distance of the option element to the SAC (8.5km), significant air quality impacts can be excluded. The vast majority of the constituent SSSI (Bredon Hill SSSI) is in a favourable condition and the unfavourable portion is recovering. Any potential significant impacts identified could hinder current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The proposed option element will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 8.5km to the south at the closest point) that no significant impacts on the qualifying features are anticipated. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The operation of the water abstraction and transfer option element will not have a significant adverse effect on this SAC.	No

Raw Water Transfer Deerhurst to Culham 400 Ml/d	The only SIP element of potential relevance to this proposed option element (4) air pollution. Given the distance of the option element to the SAC (8.5km), significant air quality impacts can be excluded. The vast majority of the constituent SSSI (Bredon Hill SSSI) is in a favourable condition and the unfavourable portion is recovering. Any potential significant impacts identified could hinder current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The proposed option element will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 8.5km to the south at the closest point) that no significant impacts on the qualifying features are anticipated. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The operation of the water abstraction and transfer option element will not have any significant adverse effect on this SAC.	No
Raw Water Transfer Deerhurst to Culham 500 Ml/d	The only SIP element of potential relevance to this proposed option element (4) air pollution. Given the distance of the option element to the SAC (8.5km), significant air quality impacts can be excluded. The vast majority of the constituent SSSI (Bredon Hill SSSI) is in a favourable condition and the unfavourable portion is recovering. Any potential significant impacts identified could hinder current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The proposed option element will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 8.5km to the south at the closest point) that no significant impacts on the qualifying features are anticipated. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. The operation of the water abstraction and transfer option element will not have a significant adverse effect on this SAC.	No
Mythe WTW	The only SIP element of potential relevance to this proposed option element (4) air pollution. Given the distance of the option element to the SAC (6.8km), significant air quality impacts can be excluded. The vast majority of the constituent SSSI (Bredon Hill SSSI) is in a favourable condition and the unfavourable portion is recovering. Any potential significant impacts identified could hinder current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives. The proposed option element will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (6.8km at the closest point) that no significant impacts on qualifying features are anticipated. The operation of the water abstraction and transfer option element will not have a significant adverse effect on this SAC.	No

Designated site name:	**Severn Estuary**		
Designation type: (SAC, SPA, Ramsar):	**SAC, SPA and Ramsar (European Marine Site)**		
Qualifying features:	See Appendix A for details	**Water Dependency:** • All of the qualifying features of the Severn Estuary European Marine Site are water dependant, although the designated fish species are more dependent on the freshwater flow to the estuary than the other designated features. The Ramsar Site and its qualifying criteria (by definition) are all water dependent.	
Current conservation status:	See Appendix A for details		
Conservation objectives:	See Appendix A for details, including the Regulation 33 Advice summary		
SSSI Condition assessment:	See Appendix A for details		
Site Improvement Plan:	See Appendix A for details		
Potential Effects			
Option Element:	Assessment:		Likely Significant Effects?
Raw Water Transfer Deerhurst to Culham 300 Ml/d	The SIP elements of potential relevance to this proposed option are (2) physical modification threat, (3) impacts of development, (7) water pollution, (8) air pollution and (12) invasive non-native species. Given the significant distance of the option element to the European Marine Site, air quality impacts can be excluded. Physical modification threat, impacts of development, water pollution and the spread of invasive non-native species are considered more feasible, particularly within any potential off-site functional habitat. There are a total of 15 constituent SSSIs, which vary considerably in their current degree of favourability. Any potential significant impacts identified could hinder any current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site as a whole to achieve its conservation objectives. The proposed scheme will not require land take from within the European Marine Site boundaries, and construction activities are at a sufficient distance from the European Site (approximately 23.9km at the closest point) that no significant impacts on the qualifying features are anticipated as a result of construction.		Stage 2 Appropriate Assessment required if option included in the Preferred Programme.

	During operation, abstraction from the river could affect the flow of water into the Severn Estuary European Marine Site although the volumes would be small in comparison to flows in the estuary (the Severn Estuary has a very large tidal range) such that it is not anticipated that the upstream abstraction would have any significant adverse impact on the qualifying features of the site, which would be well habituated to fluctuating water levels and flows. (Off-site) functional habitat for the three anadromous fish species (river lamprey, sea lamprey and twaite shad) that form qualifying features of the SAC could potentially be affected along the Severn between the river intake at Deerhurst and the European Marine Site by both construction and operation. The impact on downstream river levels is not expected to be enough to impede upstream passage of these species to a significant extent (due to the use of hands-off flow conditions, see below for further detail). In the absence of mitigation, likely significant effects cannot be discounted for designated fish species, water pollution and invasive non-native species. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded. Given the significant distance of the construction works to the site and the relatively specialist habitat requirements of the qualifying wildfowl and wader bird species of the SPA/Ramsar Site element of the European Marine Site no disturbance impacts of these species are anticipated either within the site or or whilst utilising off-site functional habitat. An Appropriate Assessment (Stage 2 AA) was previously undertaken in 2014 for this option element which, together with detailed ecology and water quality studies reported in 2016/2017, concluded that the freshwater flow requirements to the estuary to protect the designated species and features would be achieved through the inclusion of hands-off flow conditions (as provided to Thames Water by the Environment Agency) in the abstraction licence. This would govern when water can be abstracted by Thames Water from the freshwater Lower River Severn at Deerhurst – the hands-off flow conditions have been determined to protect, in particular, the migration of the designated fish species. With these hands-off flow conditions in place to limit abstraction at moderately low flows and prohibit any abstraction at low flows (unless it is fully supported by upstream flow augmentation releases, for example from Lake Vyrnwy Reservoir), the proposed scheme is unlikely to have a significant adverse impact on the Severn Estuary European Marine Site. The evidence underpinning this screening assessment can be found in the accompanying Thames Water report that has been issued to the Environment Agency and Natural England: Thames Water (2016), Severn Thames Transfer: Water Quality and Ecology Assessment - Phase 2: Main Project Report (issued October 2016). Report by Cascade Consulting and HR Wallingford on behalf of Thames Water. The previous Appropriate Assessment had one unconfirmed effect in it - the migration of adult river lamprey immigration with supported transfers. This was considered as part of the Severn Thames Transfer Phase 2 Water Quality and Ecology Assessment (as cited above) and concluded to be a negligible impact at that time. Supported and phased pipeline transfers carry a minor risk of temporarily disrupting sea lamprey migration in April to May during low flow condition by causing additional flow to pass over Upper Lode Weir on the River Severn, which may affect the ability of sea lamprey to pass the weir for short infrequent periods. As with the pipeline transfer, supported and phased canal transfers carry a minor risk of temporarily disrupting sea lamprey migration during low flow conditions by causing additional flow to pass over Upper Lode Weir on the River Severn, which may affect the ability of sea lamprey to pass the weir for short infrequent periods. Effects of supported flows on the upstream migration of sea lamprey is considered to be negligible or minor for all of the scheme variants. However, given the history of this option element (previous Stage 2 AA required), coupled with its large scale, relative complexity and Natural England's consultation comments on this Stage 1 screening, it is appropriate to revisit the evidence and conclusions in full as part of an updated Stage 2 Appropriate Assessment if this option element is included within the WRMP19 programme.	
Raw Water Transfer Deerhurst to Culham 400 Ml/d	As above.	As above
Raw Water Transfer Deerhurst to Culham 500 Ml/d	As above.	As above

Designated site name:	**Berwyn**	
Designation type: (SAC, SPA, Ramsar):	**SPA**	
Qualifying features:	• Hen Harrier *Circus cyaneus*, 14 pairs representing at least 2.8% of the breeding population in Great Britain (5 year mean, 1991-1995) • Merlin *Falco columbarius*, 14 pairs representing at least 1.1% of the breeding population in Great Britain (5 year mean, 1991-1995) • Peregrine *Falco peregrinus*, 18 pairs representing at least 1.5% of the breeding population in Great Britain (5 year mean, 1991-1995)	Water Dependency: Species identified as water dependent: • Hen Harrier *Circus cyaneus*

		• Merlin *Falco columbarius* • Peregrine *Falco peregrinus*
Current conservation status:	• *Circus cyaneus*: Hen harrier - population numbers: insufficient, range coverage: insufficient, ecological sufficiency: insufficient • Merlin *Falco columbarius* - population numbers: insufficient, range coverage: insufficient, ecological sufficiency: insufficient • Peregrine *Falco peregrinus* - population numbers: insufficient, range coverage: insufficient, ecological sufficiency: sufficient	
Conservation objectives:	Information not currently available	
SSSI Condition assessment:	Information not currently available	
Site Improvement Plan:	Information not currently available	
Potential Effects		
Scheme:		Likely Significant Effects?
Lake Vyrnwy - 180 Ml/d	The closest part of this option lies approximately 300m to the west of the SPA. No construction works are currently assumed to be required at Lake Vyrnwy Reservoir as this option element involves the release of water from the existing dam into the downstream River Vyrnwy using existing facilities. As such no disturbance to the breeding bird species (hen harrier, merlin and peregrine) that form the qualifying features for the SPA would arise. However, there are a number of different potential construction options that would need to be assessed if any of these are progressed. Currently the detail does not exist in order to do this. The release of water from Lake Vyrnwy Reservoir to the Afon Vyrnwy will not have a significant adverse effect on the qualifying features of the SPA.	No, assuming no new draw off options or pipeline routes are required.

Designated site name:	**Berwyn and South Clwyd Mountains**	
Designation type: (SAC, SPA, Ramsar):	**SAC**	
Qualifying features:	• H4030 European dry heaths • H7130 Blanket bogs (* if active bog) • H6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) • H7140 Transition mires and quaking bogs • H8120 Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) • H8210 Calcareous rocky slopes with chasmophytic vegetation	Water Dependency: Habitats identified as water dependent: • H4030 European dry heaths • H7130 Blanket bogs • H7140 Transition mires and quaking bogs • H8120 Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) • H8210 Calcareous rocky slopes with chasmophytic vegetation
Current conservation status:	H4030 European dry heaths: **Bad and deteriorating** (range: favourable, area: favourable, structure and function: bad and deteriorating, future prospects: bad but improving). Main pressures: grazing; abandonment of pastoral systems; burning; urbanised areas, human habitation; continuous urbanisation; discontinuous urbanisation; communication networks; energy transport; other forms of transportation and communication; air pollution; invasion by a species. Main threats: grazing; abandonment of pastoral systems; burning; discontinuous urbanisation; other pollution or human impacts/activities; invasion by a species H7130 Blanket bogs (* if active bog) **– Bad but improving** (range: favourable, area: inadequate and deteriorating, structure and function: bad but improving, future prospects: bad but improving H6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia): **Bad but improving** (range: favourable, area: inadequate and deteriorating, structure and function: bad but improving, future prospects: favourable. Main pressures: grazing: Air pollution, air-borne pollutants: modification of cultivation practices: livestock farming and animal breeding (without grazing): Fertilisation: forest planting on open ground: Mining and quarrying: Urbanised areas, human habitation: deer grazing/ browsing/ trampling: Outdoor sports and leisure activities, recreational activities: Other human intrusions and disturbances: Soil pollution and solid waste (excluding discharges): invasive non-native species:	

	problematic native species: fire and fire suppression: Other ecosystem modifications: Biocenotic evolution, succession: Changes in abiotic conditions: Changes in biotic conditions. Main threats: As stated in pressures H7140 Transition mires and quaking bogs; Very wet mires often identified by an unstable `quaking` surface - **Bad and deteriorating –** Main pressures: Water abstraction, Grazing, Fragmentation, Absence of or inappropriate management, Pollution, Air pollution – Main threats: Water abstraction, Grazing, Fragmentation, Absence of or inappropriate management, Pollution, Air pollution, climate change. H8120 Calcareous and calcshist screes of the montane to alpine levels - **Bad but improving** (range: favourable, area: favourable, structure and function: bad but improving, future prospects: favourable H8210 Calcareous rocky slopes with chasmophytic vegetation **Bad but improving** (range: favourable, area: favourable, structure and function: bad but improving, future prospects: bad but improving	
Conservation objectives:	Information not currently available	
SSSI Condition assessment:	Information not currently available	
Site Improvement Plan:	Information not currently available	
Potential Effects		
Option Element:		Likely Significant Effects?
Raw Water Transfer Upper Severn Vyrnwy 180 Ml/d (Lon only)	This option lies approximately 1.9km to the east of the SAC. Some of the qualifying features are water dependant – blanket bogs and mires – but these are not hydrologically connected to the effects of releasing water from Lake Vyrnwy Reservoir to the Afon Vyrnwy. Significant air quality impacts are not anticipated as de minimus operational vehicle movements would not exceed the commonly applied threshold of 1000 AADT or 200 HGV movements per day that would otherwise lead to significant emissions impacts (within 200m). No material construction activity is required at Lake Vyrnwy Reservoir that would give rise to any disturbance to designated features and no significant operational effects are considered likely on this SAC as a result of this proposed element.	No

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Final Water Resources Management Plan 2019 Appendix C: Habitats Regulations Assessment – April 2020: Appendix B

Appendix B: HRA methodology consultation comments and responses

Report for: Thames Water Utilities Limited

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Customer:

Thames Water Utilities Ltd

Customer reference:

ED10169

Contact:

Ben Stansfield
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Miriam Westbrook

Approved By:

Ben Stansfield

Date:

20 April 2020

Ricardo Energy & Environment reference:

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Appendix B

HRA methodology consultation comments and responses

Below are the comments on the proposed HRA methodology received from Natural England on 26th June 2017 and the Thames Water responses to these comments.

Comment (Natural England)	Thames Water Response
This advice is being provided as part of Natural England's Discretionary Advice Service. Thames Water has asked Natural England to advise upon the constrained options list development taking into consideration the following excel spreadsheets (versions as available on 26th May 2017) and other documents: • TWUL Water Resources Management Plan 2019 HRA Stage 1 Screening of Option Elements DAS/2597/217329 • Reuse at Deephams SEA matrices DAS/2597/216772 • Deephams Water Reuse Conceptual Design Report DAS/2597/216772 • Reuse at Beckton SEA Matrices DAS/2597/216658 • Beckton Water Reuse Conceptual Design Report (CDR) DAS/2597/216658 • King George V Reservoirs intake SEA Matrices DAS/2597/216134	No action was required.
Annex 1 **European Protected Species** A licence is required in order to carry out any works that involve certain activities such as capturing the animals, disturbance, or damaging or destroying their resting or breeding places. Note that damage or destruction of a breeding site or resting place is an absolute offence and unless the offences can be avoided (e.g. by timing the works appropriately), it should be licensed. In the first instance it is for the developer to decide whether a species licence will be needed. The developer may need to engage specialist advice in making this decision. A licence may be needed to carry out mitigation work as well as for impacts directly connected with a development. Further information can be found in Natural England's 'How to get a licence' publication. If the application requires planning permission, it is for the local planning authority to consider whether the permission would offend against Article 12(1) of the Habitats Directive, and if so, whether the application would be likely to receive a licence. This should be based on the advice Natural England provides at formal	Noted – this was standard advice and not directly relevant to the HRA screening.

consultation on the likely impacts on favourable conservation status and Natural England's guidance on how the three tests (no alternative solutions, imperative reasons of overriding public interest and maintenance of favourable conservation status) are applied when considering licence applications. Natural England's pre-submission Screening Service can screen application drafts prior to formal submission, whether or not the relevant planning permission is already in place. Screening will help applicants by making an assessment of whether the draft application is likely to meet licensing requirements, and, if necessary, provide specific guidance on how to address any shortfalls. The advice should help developers and ecological consultants to better manage the risks or costs they may face in having to wait until the formal submission stage after planning permission is secured, or in responding to requests for further information following an initial formal application. The service will be available for new applications, resubmissions or modifications – depending on customer requirements. More information can be found on Natural England's website.	
1) TWUL HRA Stage 1 Screening of option Elements (TWUL dWRMP19) Please note that due to the high volume of consultations and the constrained timetable I have been unable to obtain comments from the responsible officers so all comments should be treated as provisional at this stage. I welcome the inclusion of pressures and threats from the Site Improvement Plans (SIPS) in your HRA screen, however it is not clear how this has been used to inform your screening assessment if at all. I welcome the reference to baseline condition of the underpinning Sites of Special Scientific Interest (SSSI) but it is not clear how this information has been used to inform your screening assessment if at all .	We have made clear which elements (if any) of the SIPS are potentially relevant to the proposed option and how we've considered these in our assessment. We have made clear which elements (if any) of the condition assessments for the underpinning SSSI are relevant to the European Site qualifying features potentially impacted by the option.
1a) General point – Offsite use by Birds (Functional Habitat) Mobile species such as bats and in particular Special Protection Area (SPA) and Ramsar site bird features use habitat for feeding and other activities that is often outside the European site boundary. The generic term for this land is functional habitat. In many cases this functional habitat has been mapped. The Habitats Regulation Assessment (HRA) should be amended to include assessment of options likely to have effects on functional habitat. I note consideration of off-site use by stag beetles is included within the HRA for relevant sites.	We have reviewed potential impacts to mapped functional habitats for mobile species and amended the HRA accordingly.
1b) General point - Construction Traffic	

The recent Wealden District Council judgement on air quality has resulted in a review of the way in-combination air quality impacts on European sites are assessed. I recommend that you review your assessment of the options with significant construction traffic in the light of this case and assess if they are likely to generate traffic within 200m of a European site. Habitats on low nutrient soils such as chalk grassland, some woodlands, acid grassland, in particular lowland heathland, are susceptible to impacts from air pollution the latter two including acidification impacts.	We have undertaken air quality assessments for all elements associated with European Sites with qualifying habitat features susceptible to airborne nutrients or acidification.
1c) General point – Opportunities There is no mention of whether there are any opportunities for enhancements related to SPA, Ramsar or SAC features within the HRA screening process. Though not the main focus of an HRA it is entirely appropriate to note if a site may provide opportunities for enhancements; for example for creation of habitats for stag beetle within the likely dispersion distance of existing sites.	Enhancement is not required under HRA, further consideration of opportunities to be considered by TW as a separate undertaking.
1d) General point – Ramsar features Non-bird Ramsar features are often missing from the list of site features. Where they are included they are missing from the list of water dependant features. Ramsar site features are all water dependant .	Comment noted - We have reviewed and included screening assessments of such features for Ramsar sites.
1e) Medway Estuary and Marshes Special Protection Area (SPA) and Ramsar Site See General point 1a on offsite (functional habitat) use by birds which applies to this screening site. The non-bird Ramsar site features are missing from the list of Ramsar site features. As well as its assemblage of water birds the Ramsar site is listed for its diverse assemblage of wetlands plants and invertebrates. The underpinning habitat of saltmarsh and grazing marsh are also features. The listed features are included on the Ramsar Site Information sheet. These species and habitats should be added for completion. Given the distance from the sites and the small scale of the abstraction I do not believe that adding these features will materially alter the conclusions of the screening tables. Please note that there is a Marine Conservation Zone that overlaps with the Medway Estuary and Marshes (Medway MCZ). This should be listed in the overarching European sites screening for the SEA (as opposed to HRA) for completeness. There does not appear to be a pathway for the small groundwater abstraction at Southfleet/ Greenhithe to impact the MCZ . I will shortly be sending a separate note on the assessment of your statutory plan impacts on marine sites focussing on Marine Conservation Zones .	Ramsar features and functional habitats have been addressed as per comment above.
1f) Lee Valley SPA and Ramsar Site	

General points 1a and 1d apply to this site. The underpinning valley bottom wetland habitat is a feature of the site as are rare plant and invertebrates. The listed features are included on the Ramsar Site Information Sheet. A number of options have potential to impact this site. Several of them are mutually exclusive as they are different versions of the same scheme but there is potential for cumulative and in-combination impacts. The conclusions of no likely significant effect for most options rely heavily on the mitigation proposed . However the mitigation must be able to remove significant disturbance affects from all the activities in combination and cumulatively**. I recommend** that it would be helpful if clarification can be provided on the noise of operation as well as construction and further details on the proposed mitigation measures to fully understand the conclusions reached. Much further information on the construction and the use function of the intermediate and end shafts is required in order for the conclusions to be supported (see below) for the effluent reuse schemes . Consideration could be given to the phasing of different options that could affect the site by, for example, staggering construction over consecutive years in addition to the mitigation proposed. The multiple options that could come forward close to this site make it particularly important that impacts on any functional habitat are also assessed. The Coppermills WTW extension options suggest further mitigation is required . I concur with this conclusion and **I recommend** that more extensive and detailed mitigation is required than that which is currently proposed.	Ramsar features have been addressed as per comments above. Further discussion between TW and regulators will be undertaken to further develop mitigation measures related to potential disturbance impacts. Mitigation measures have been discussed and a mitigation plan has been developed to include: avoiding construction within 1km of SPA/Ramsar or functional habitat during winter period (October-March inclusive) or using a plant with a noise rating <50dB(A)[1], visual screening, and Environmental Clerk of Works (EnvCoW) to ensure compliance. Recreational disturbance impact will be reduced by sensitive routing of footpath diversions, screening and explanatory boards to explain risk of noise disturbance and how to prevent it. Functional offsite habitat has been addressed as per comments above. Additional mitigation has been advocated following consultation that, once implemented, would remove any identified likely significant effects associated with these options.
1g) Epping Forest Special Area of Conservation (SAC) Generic point 1c applies to all options affecting this site with respect to creating habitat for stag beetle .	Enhancement is not required under HRA, further consideration of opportunities will be considered by TW as part of any detailed design.
1h) Richmond Park SAC I note there is the potential for an appropriate assessment to be required for the TWRM extension Hampton to Battersea link as one intermediate tunnel shaft is within the boundary of the SAC. I note this is proposed to be sited in the car park. I would like to see further information on this option including any appropriate assessment. **I recommend** you provide further information on the option and mitigation proposed including any appropriate assessment . General point 1c applies to this option.	The mitigation/avoidance advocated (subsequent to receipt of this comment) is considered sufficient to offset the identified impact. Further discussion between TW and regulators will be undertaken as part of the further development of the scheme. The mitigation advocated is sufficient to prevent any LSEs and therefore no appropriate assessment is required. The following mitigation will be implemented: - Prevent damage to sensitive vegetation where possible, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). - Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area.

[1] 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.

	- Liaise with Richmond Park SAC's ecology team to ensure they are satisfied with the mitigation proposed and whether they wish to supervise it. Enhancement is not required under HRA, further consideration of measures to be considered by TW as part of a separate undertaking.
1i) South West London Waterbodies SPA and Ramsar See General point 1a on offsite use by birds which applies to the screening of the site. I note the various Kempton WTW options are all either requiring additional mitigation or/and an appropriate assessment. I concur with this conclusion and I would like to see further details on this option with any appropriate assessment. **I recommend** that more extensive and detailed mitigation is required than that which is currently proposed. General point 1c also applies to this option.	Offsite functional habitat impacts have been considered as per the comments above. Additional mitigation has been advocated for this European Site to remove any LSEs. Enhancement is not required under HRA, further consideration of opportunities to be considered by TW as part of a separate undertaking.
1j) Hartslock Wood SAC The Kennet valley to SWoX option is comparatively close to this site (175m) and crucially within the 200m zone of influence where air quality impacts are considered likely to occur. The site SIP already notes that air pollution is an issue for the site. This site should be rescreened with regards to construction traffic, see general point 1 b above .	We have re-screened with consideration of air quality impacts, being cognisant of any construction traffic within 200m.
1k) Oxford Meadows SAC Confirmation that the nearest construction traffic location for the very large reservoir is further than 200m (or considerably further) from this European site is required to support the conclusions for Abingdon WTW (part of Abingdon Reservoir option).	Comment noted and assessment updated with a consideration of the potential for air quality impacts.
1l) Cothill Fen SAC The pipeline for the new WTW associated with the Abingdon reservoir is within 50m of this site. Groundwater is described as flowing towards the SAC but the proposal is to backfill around the pipe with gravel. This is assumed within the HRA not to affect the inflow towards the site. **I recommend** that further information to confirm this assumption is required. I also recommend that further information on the effects of the large bunds of the proposed reservoir on the aquifer is required to confirm the draft conclusions. In addition **I recommend** that further information on the in combination impacts of various schemes on the aquifer is required to support the conclusions for this site (e.g. reservoir bunds and pipeline for raw water transfer, local gravel abstraction pressure). Confirmation that the nearest construction traffic location for the very large reservoir is further than 200m (or considerably further) from this European site is required to support the conclusions.	Comment noted and a further review was undertaken and the assessment updated accordingly. This included an assessment of the potential for air quality impacts. .
1m) Severn Estuary SAC, SPA and Ramsar Site (European Marine Site)	

I refer you to the comments of my colleague Russ Money dated 30 September 2016 which noted a number of recommendations. Note that this response was limited to the water quality and ecology assessment and does not make reference to an appropriate assessment nor is it referred to as an HRA screening assessment. In addition there does not appear to be sufficient assessment of the Minworth scheme impacts of the discharge in the River Severn. I am not aware that the HRA screen has looked at the supplementary advice tables (being renamed the supplementary advice to the Conservation Objectives) for the European sites on flows and water quality. I recommend that, as presented, there is insufficient information to concur with the HRA assessment for the transfer option. **I recommend** that significant further information is provided on the transfer options and that the screening of all relevant sites with respect to these options is repeated on the scheme as a whole as opposed to the options elements. Screening of options elements for the transfer scheme is particularly disjointed more so than for any other option. I note that the options for discharge and abstraction into the River Severn have significantly changed since the appropriate assessment referred to in table 2-1. I recommend that all the screening is redone on the combined options elements. I recommend if the transfer option progresses to the final plan that all the information from relevant documents is pulled together in a HRA screening and appropriate assessment report to make the impacts of the scheme as a whole clear and transparent. This further information is necessary to support the screening of the transfer scheme as a whole.	- The Severn Thames Transfer option is not included in the preferred programme, although it forms part of the WRSE FP high resilience programme and the WRSE_Multi-obj_ENVC environmentally driven programme. It has been assessed and found to have no LSEs subject to appropriate mitigation (see **Error! Reference source not found.**). - - Mitigations required should this option form part of the final WRMP include: - Best practice construction measures will guard against pollution and erosion that could otherwise adversely affect these species whilst utilising off-site functional habitat. - Inclusion of hands-off flow conditions in the abstraction licence to protect the migration of designated fish species. - Mitigation in the form of intake screens will guard against potential mortality of fish through abstraction - The EA abstraction licence will be established in full knowledge of the flow requirements of the various habitats and species in the lower Severn, which will therefore deal with the potential flow issues regarding lamprey and their passage over weirs. The detailed design of abstractions will ensure that they do not act as attractant flows for salmonids (this approach is now widespread). For these reasons there are not likely to be significant effects at the abstraction point on the European Site's integrity.
1n) I refer Thames Water to Natural Resources Wales for their view on the screening assessment against the following sites: Berwyn SPA, Berwyn and South Clwyd Mountains SAC	Regard has been given to the comments from NRW in the SEA assessment and further information and assessments have been included in the HRA and WFD reports in response.

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

Ricardo Energy & Environment

Final Water Resources Management Plan 2019 Appendix C: Habitats Regulations Assessment – April 2020: Appendix C

Appendix C: HRA screening assessment of alternative programmes in the WRMP19

Report for: Thames Water Utilities Limited

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Customer:

Thames Water Utilities Ltd

Customer reference:

ED10169

Contact:

Ben Stansfield
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Miriam Westbrook

Approved By:

Ben Stansfield

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Appendix C

HRA screening assessment of alternative programmes in the WRMP19

The following options do not appear in the preferred programme but were contained in one or more of the six alternative programmes that were subject to HRA screening as part of the development of the WRMP19:

- AR Streatham (SLARS2) 5 Ml/d
- ASR South East London (Addington) 1 Ml/d
- Beckton Desalination 150
- Beckton Reuse 200 Ml/d (phased 100)
- Beckton Reuse 300 Ml/d (phased 150)
- Groundwater London confined Chalk (north) 2 Ml/d
- Groundwater Moulsford 1 - 3.5 Ml/d
- Henley to SWA 5 Ml/d
- Honor Oak
- RC Ashton Keynes borehole pumps 2.5 Ml/d
- RC Britwell 1.31 Ml/d
- Severn-Thames Transfer
- Severn-Thames Transfer 2
- Severn-Thames Transfer 3
- South East Strategic Reservoir Option 125Mm3
- Wessex to SWOX (Flaxlands)

The screening assessments are presented in Table C.1 below. LSEs cannot be ruled out for any of options in the absence of mitigation, and therefore all options would require a Stage 2 Appropriate Assessment should they be included in the final WRMP19 preferred programme.

Table C.1 HRA screening assessment of options included in the six alternative programmes (and which have not been also included in the preferred programme)

Option name	European sites assessed	Key impacts	In-combination effects?	Stage 1 assessment
AR Streatham (SLARS2) 5 Ml/d	Richmond Park SAC Wimbledon Common SAC	No impacts identified	No	No LSEs
ASR South East London (Addington) 1 Ml/d	*No sites affected*	No impacts identified	No	No LSEs
Beckton Desalination (150)	**Lee Valley SPA/Ramsar (LSE)** Epping Forest SAC	The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar Site. It is also only approximately 80m away from Walthamstow Marshes SSSI, which forms the other constituent part of the SPA/Ramsar Site. As such, the proposals carry a risk of impacting upon the European sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Sites. There are discernible air quality impacts on Epping Forest SAC related to emissions from construction and operation traffic, however these are not expected to cause significant effects.	No	**LSE cannot be ruled out for Lee Valley SPA/Ramsar** **Stage 2 Appropriate Assessment is required** **No LSEs on any other European sites**
Beckton Reuse 200 Ml/d (phased 100)	**Lee Valley SPA/Ramsar (LSE)** Epping Forest SAC Wormley and Hoddesdon Park Woods SAC	The 4.4m diameter water conveyance tunnel passes directly beneath the Lee Valley SPA/Ramsar Site and it also terminates within a 10x 20m reception shaft located within the SPA/Ramsar Site. The underground pipeline runs alongside the eastern perimeter of the European Site and there is also an intermediate shaft located approximately 122m to the north of the European Site. As such, the proposals carry a risk of impacting upon the European sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could	No	**LSE cannot be ruled out for Lee Valley SPA/Ramsar** **Stage 2 Appropriate Assessment is required** **No LSEs on any other European sites**

		potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Sites. The spine 2 pipeline route will be constructed immediately adjacent to William Girling and the southern tip of King Georges Reservoir which collectively form the Chingford Reservoirs SSSI. These are in part designated for their importance to overwintering wildfowl. As such, these reservoirs have clear potential to be used as off-site functional habitat for the bird qualifying features of the SPA/Ramsar Site. The close proximity of this option element to the reservoirs means that construction could lead to disturbance of the bird qualifying features of the European Sites. Similarly, the pipeline route passes close to the western edge of Banbury reservoir which is equidistant between the SPA/Ramsar Site and Chingford Reservoirs SSSI and could equally be used as off-site functional habitat by members of the qualifying feature bird populations. This fact increases the possibility of significant disturbance being experienced by the bird qualifying features as a result of construction.		
		There are discernible air quality impacts on Epping Forest SAC related to emissions from construction and operation traffic, however these are not expected to cause significant effects.		
Beckton Reuse 300 Ml/d (phased 150)	**Lee Valley SPA/Ramsar (LSE)** Epping Forest SAC Wormley and Hoddesdon Park Woods SAC	The 4.4m diameter water conveyance tunnel passes directly beneath the Lee Valley SPA/Ramsar Site and it also terminates within a 10x 20m reception shaft located within the SPA/Ramsar Site. The underground pipeline runs alongside the eastern perimeter of the European Site and there is also an intermediate shaft located approximately 122m to the north of the European Site. As such, the proposals carry a risk of impacting upon the European sites and/or their qualifying features (particularly wintering birds). Any construction works that take	No	**LSE cannot be ruled out for Lee Valley SPA/Ramsar** **Stage 2 Appropriate Assessment is required** **.** **No LSEs on any other European sites**

		place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Sites. The spine 2 pipeline route will be constructed immediately adjacent to William Girling and the southern tip of King Georges Reservoir which collectively form the Chingford Reservoirs SSSI. These are in part designated for their importance to overwintering wildfowl. As such, these reservoirs have clear potential to be used as off-site functional habitat for the bird qualifying features of the SPA/Ramsar Site. The close proximity of this option element to the reservoirs means that construction could lead to disturbance of the bird qualifying features of the European Sites. Similarly, the pipeline route passes close to the western edge of Banbury reservoir which is equidistant between the SPA/Ramsar Site and Chingford Reservoirs SSSI and could equally be used as off-site functional habitat by members of the qualifying feature bird populations. This fact increases the possibility of significant disturbance being experienced by the bird qualifying features as a result of construction.		
		There are discernible air quality impacts on Epping Forest SAC related to emissions from construction and operation traffic, however these are not expected to cause significant effects.		
Groundwater London confined Chalk (north) 2 Ml/d	Richmond Park SAC	No impacts identified	No	No LSEs
Groundwater Moulsford 1 - 3.5 Ml/d	Hartslock Wood SAC	No impacts identified	No	No LSEs
Henley to SWA 5 Ml/d	Chilterns Beechwood SAC	No impacts identified	No	No LSEs
Honor Oak	*No sites affected*	No impacts identified	No	No LSEs
RC Ashton Keynes borehole	North Meadow and Clattinger Farm SAC	No impacts identified	No	No LSEs

pumps 2.5 Ml/d				
RC Britwell 1.31 Ml/d	Aston Rowant SAC Little Wittenham SAC	No impacts identified	No	No LSEs
Severn-Thames Transfer	Cothill Fen SAC Little Wittenham SAC Bredon Hill SAC Dixton Wood SAC Cotswolds Beechwoods SAC Walmore Common SPA & Ramsar **Severn Estuary SAC, SPA & Ramsar (LSE)** Berwyn and South Clywd Mountains SAC Berwyn SAC	Off-site functional habitat for the three anadromous fish species (river lamprey, sea lamprey and twaite shad) that form qualifying features of the Severn Estuary SAC could potentially be affected along the Severn between the river intake at Deerhurst and the European Marine Site by both construction and operation. Inclusion of hands-off flow conditions is required to prevent operation of the option from impeding upstream passage of these species to a significant extent. There is also potential for impacts related to water pollution and invasive non-native species as a result of construction activities.	No	**LSE cannot be ruled out for Severn Estuary SAC, SPA & Ramsar** **Stage 2 Appropriate Assessment is required** **No LSEs on any other European sites**
Severn-Thames Transfer 2	Cothill Fen SAC Little Wittenham SAC Bredon Hill SAC Dixton Wood SAC Cotswolds Beechwoods SAC Walmore Common SPA & Ramsar Severn Estuary SAC,	Off-site functional habitat for the three anadromous fish species (river lamprey, sea lamprey and twaite shad) that form qualifying features of the Severn Estuary SAC could potentially be affected along the Severn between the river intake at Deerhurst and the European Marine Site by both construction and operation. Inclusion of hands-off flow conditions is required to prevent operation of the option from impeding upstream passage of these species to a significant extent. There is also potential for impacts related to water pollution and invasive non-native species as a result of construction activities.	No	**LSE cannot be ruled out for Severn Estuary SAC, SPA & Ramsar** **Stage 2 Appropriate Assessment is required** **No LSEs on any other European sites**

	SPA & Ramsar Berwyn and South Clywd Mountains SAC Berwyn SAC			
Severn-Thames Transfer 3	Cothill Fen SAC Little Wittenham SAC Bredon Hill SAC Dixton Wood SAC Cotswolds Beechwoods SAC Walmore Common SPA & Ramsar **Severn Estuary SAC, SPA & Ramsar** Berwyn and South Clywd Mountains SAC Berwyn SAC	Off-site functional habitat for the three anadromous fish species (river lamprey, sea lamprey and twaite shad) that form qualifying features of the Severn Estuary SAC could potentially be affected along the Severn between the river intake at Deerhurst and the European Marine Site by both construction and operation. Inclusion of hands-off flow conditions is required to prevent operation of the option from impeding upstream passage of these species to a significant extent. There is also potential for impacts related to water pollution and invasive non-native species as a result of construction activities.	No	**LSE cannot be ruled out for Severn Estuary SAC, SPA & Ramsar** **Stage 2 Appropriate Assessment is required** **No LSEs on any other European sites**
South East Strategic Reservoir Option 125Mm3	Cothill Fen SAC Hackpen Hill SAC Little Wittenham SAC	No impacts identified	No	No LSEs
Wessex to SWOX (Flaxlands)	North Meadow and Clattinger Farm SAC	The SIP elements of potential relevance to this proposed option element are (1) inappropriate water levels and (5) water pollution although neither are particularly feasible. The two constituent SSSIs (Clattinger Farm SSSI and North Meadow, Cricklade SSSI) are both 100% favourable. Any potential significant impacts	No	No LSEs

		identified could cause a decline in this good condition and affect the ability of the site to achieve its conservation objectives. This option element will not require any land take from within SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 4.3km to the south at the closest point and 9.4km to Flaxlands SR) that no significant impacts on qualifying features are anticipated. No significant adverse effects are anticipated from the operational use of this inter-company water conveyance asset.		

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

Ricardo
Energy & Environment

Habitats Regulations Assessment

Appendix D: HRA screening assessment of new option elements in the WRMP19

Report for: Thames Water Utilities Limited

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Customer:

Thames Water Utilities Ltd

Customer reference:

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Contact:

Ben Stansfield
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Miriam Westbrook

Approved By:

Ben Stansfield

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Option name	Designated sites assessed	Assessment	Likely Significant Effects?
Culham to Farmoor 180 Ml/d (chalk streams) CON-RWS-CUL-FMR-180	Cothill Fen Special Area of Conservation (SAC)	All of the Site Improvement Plan (SIP) elements for this SAC are considered relevant to this option element: water pollution, hydrological changes and air pollution. The pipeline runs to the west of the groundwater divide near to the SAC, approximately 500m of the SAC to the west at its closest point. At this distance, no significant water pollution or dust pollution impacts are likely from construction. No significant air quality impacts are anticipated as the option element is a significant distance from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). The pipeline route would run to the west of the groundwater divide near to the SAC, from which the groundwater flows east and west (east towards Cothill Fen). Existing boreholes adjacent to the proposed pipeline route have recorded the groundwater level at 4.5m below ground level. In the absence of mitigation, likely significant effects cannot be discounted for hydrological changes. The following text is taken from the original assessment for option element reference WTW-SWOX-ABI as the pipeline for Abingdon to Farmoor is understood to be identical. As mitigation cannot be considered as part of stage 1 screening it is necessary for this option element to be subject to a Stage 2 Appropriate Assessment if it forms part of the preferred programme. *The pipeline has been re-routed since the draft WRMP19 so that it runs to the west of the groundwater divide near to the SAC, from which the groundwater flows east and west (east towards Cothill Fen). Existing boreholes adjacent to the proposed pipeline route have recorded the groundwater level at 4.5m below ground level. The proposed pipeline would be constructed at a depth less than 2.5m below ground level (possibly only to 1.5m deep) and is therefore unlikely to interfere with groundwater levels or movement towards Cothill Fen. However, in the absence of mitigation, likely significant effects cannot be discounted for hydrological changes. There is a risk that during construction of the pipeline groundwater could be intercepted in the excavation and there would be a need for local dewatering. This pumping of groundwater may impact on groundwater flow regime beneath the western end of Cothill Fen. However due to the temporary nature of the works and the small drawdown required this would not result in a significant adverse impact on the SAC.*	LSEs to/from groundwater flows, dust and physical damage. Stage 2 Appropriate Assessment required to address previous Natural England concerns for a similar option element.
Merton Recommissioning RES-RC-MTN	Little Wittenham SAC	No construction or operation impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (9.8km) from the site that there is no likely impact pathway.	No LSEs
	Oxford Meadows SAC	No construction or operation impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (4.8km) from the site that there is no likely impact pathway.	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
	Wimbledon Common SAC	The only SIP element of potential relevance to this proposed option element is (4) air pollution but given the significant distance of the option element to the SAC (approximately 3.2km), significant air quality impacts can be excluded. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. No impacts to North Atlantic wet or European dry heaths or stag beetles are considered possible during construction due to the distance between the option element and the SAC, and the lack of a source to receptor pathway. No significant air quality impacts are anticipated as the option element is a significant distance from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). The scheme would involve using surplus water supply capacity for recharge water for the confined chalk aquifer in south London. The SAC site is underlain by London Clay (i.e. it confines the Chalk aquifer and effectively separates the abstraction hydrogeologically from the local water table underlying the SAC); consequently, the water environment supporting the SAC features would not be affected by the abstraction or recharge activities. Therefore, operation of the scheme is unlikely to have any significant effects on the site's water dependant qualifying features.	No LSEs
Raw Water Purchase Chingford RES-RWP-CHD	Lee Valley SPA & Ramsar	As no construction or increased abstraction is required and this option only involves a continuation of the reduction in water sent to Essex and Suffolk Water from Thames Water's Lee Valley reservoirs, no impacts on any designated sites are expected.	No LSEs
	Epping Forest SAC	As no construction or increased abstraction is required and this option only involves a continuation of the reduction in water sent to Essex and Suffolk Water from Thames	

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		Water's Lee Valley reservoirs, no impacts on any designated sites are expected.	
	Wormley and Hoddesdon Park Wood SAC	As no construction or increased abstraction is required and this option only involves a continuation of the reduction in water sent to Essex and Suffolk Water from Thames Water's Lee Valley reservoirs, no impacts on any designated sites are expected.	
Didcot RES-RWP-DID	Cothill Fen SAC	The proposed scheme will not require land take from within the SAC boundaries, and no construction is required, as such no significant adverse impacts on the qualifying features are anticipated. This option involves a licence transfer requiring 23Ml/d water to not be abstracted at Didcot and be left in the River Thames for abstraction further downstream at Thames Water' intakes. However, the water is not currently being abstracted for use at Didcot so there is likely to be no change in flow in the River Thames. Operation of this element will therefore not have significant adverse effects on the site's qualifying features.	No LSEs
	Little Wittenham SAC	The proposed scheme will not require land take from within the SAC boundaries, and no construction is required, as such no significant adverse impacts on the qualifying features are anticipated. This option involves a licence transfer requiring 23Ml/d water to not be abstracted at Didcot and be left in the River Thames for abstraction further downstream at Thames Water intakes. However, the water is not currently being abstracted for use at Didcot so there is likely to be no change in flow in the River Thames. Operation of this element will therefore not have significant adverse effects on the site's qualifying features.	No LSEs
Raw Water Systems Medmenham Raw water intake and transfer (80 Ml/d) CON-RWS-MMM-80	Chilterns Beechwoods SAC	Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of the option element to Chilterns Beechwood SAC is approximately 2.5 km to the south west of the site at the closest point. 2.5km is beyond the	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		maximum dispersal distance for female stag beetles (~1km) and, as such there should be no mating or egg laying by members of the qualifying feature population in any construction areas. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 3.3km to the south west at the closest point) that no significant impacts on the qualifying features are anticipated during construction or operation of this river intake, pumping station and raw water transfer infrastructure. No potential functional habitat for stag beetles is expected to be impacted as a result of this option element. Significant air quality impacts are not anticipated for this option element because the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded.	
Lake Vyrnwy 148 Ml/d RES-RWTS-VYR-148	Berwyn and South Clywd Mountains SAC	This option lies approximately 1.9km to the east of the SAC. Some of the qualifying features are water dependant – blanket bogs and mires – but these are not hydrologically connected to the effects of releasing water from Lake Vyrnwy Reservoir to the Afon Vyrnwy. Significant air quality impacts are not anticipated as de minimus operational vehicle movements would not exceed the commonly applied threshold of 1000 AADT or 200 HGV movements per day that would otherwise lead to significant emissions impacts (within 200m). No material construction activity is required at Lake Vyrnwy Reservoir that would give rise to any effects on the SAC features and no significant operational effects are considered likely on this SAC as a result of this proposed element.	No
Lake Vyrnwy 60 Ml/d RES-RWTS-VYR-60	Berwyn and South Clywd Mountains SAC	This option lies approximately 1.9km to the east of the SAC. Some of the qualifying features are water dependant – blanket bogs and mires – but these are not hydrologically connected to the effects of releasing water from Lake Vyrnwy Reservoir to the Afon Vyrnwy. Significant air quality impacts are not anticipated as de minimus operational vehicle movements would not exceed the commonly applied threshold of 1000 AADT or 200 HGV movements per day that would otherwise lead to significant emissions impacts (within 200m). No material construction activity is required at Lake Vyrnwy Reservoir that would give rise to any effects on the SAC features and no significant operational effects are considered likely on this SAC as a result of this proposed element.	No
	Berwyn SPA	The closest part of this option lies approximately 300m to the west of the SPA. No material construction works are required at Lake Vyrnwy Reservoir that would give rise to any disturbance to the breeding bird species (hen harrier, merlin and peregrine) that form the qualifying features for the SPA. The release of water from Lake Vyrnwy Reservoir to the Afon Vyrnwy will not have any likely significant effects on the qualifying features of the SPA.	No
Vyrnwy Transfer to Severn Trent Water 12Ml/d	Berwyn and South Clywd Mountains SAC	This option lies approximately 1.4km to the east of the SAC at the closest point. Some of the qualifying features are water dependant – blanket bogs and mires – but these are not hydrologically connected to the effects of this option. No construction is required near to this SAC and therefore	No

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
CON-TWT-VYR-SWY		no significant operational effects are considered likely on this SAC as a result of this proposed element. No significant air quality impacts are anticipated during operation as de minimus operational vehicle movements would not exceed the commonly applied threshold of 1000 AADT or 200 HGV movements per day that would otherwise lead to significant emissions impacts (within 200m). Operation of this option will not have any likely significant adverse effect on the qualifying features of the SPA as it will not lead to any changes to the water environment in the vicinity of the SPA.	
	Berwyn SPA	The closest part of this option lies approximately 850m to the west of the SPA. No construction works are required near to this SPA and as such no disturbance to the breeding bird species (hen harrier, merlin and peregrine) that form the qualifying features for the SPA would arise. No significant air quality impacts are anticipated during operation as de minimus operational vehicle movements would not exceed the commonly applied threshold of 1000 AADT or 200 HGV movements per day that would otherwise lead to significant emissions impacts (within 200m). Operation of this option will not have any likely significant adverse effect on the qualifying features of the SPA as it will not lead to any changes to the water environment in the vicinity of the SPA.	No
Vyrnwy Transfer to Severn Trent Water 30Ml/d CON-TWT-VYR-SWY	Berwyn and South Clywd Mountains SAC	This option lies approximately 1.4km to the east of the SAC at the closest point. Some of the qualifying features are water dependant – blanket bogs and mires – but these are not hydrologically connected to the effects of this option. No construction is required near to this SAC and therefore no significant operational effects are considered likely on this SAC as a result of this proposed element. No significant air quality impacts are anticipated during operation as de minimus operational vehicle movements would not exceed the commonly applied threshold of 1000 AADT or 200 HGV movements per day that would otherwise lead to significant emissions impacts (within 200m). Operation of this option will not have any likely significant adverse effect on the qualifying features of the SPA as it will not lead to any changes to the water environment in the vicinity of the SPA.	No
	Berwyn SPA	The closest part of this option lies approximately 850m to the west of the SPA. No construction works are required near to this SPA and as such no disturbance to the breeding bird species (hen harrier, merlin and peregrine) that form the qualifying features for the SPA would arise. No significant air quality impacts are anticipated during operation as de minimus operational vehicle movements would not exceed the commonly applied threshold of 1000 AADT or 200 HGV movements per day that would otherwise lead to significant emissions impacts (within 200m). Operation of this option will not have any likely significant adverse effect on the qualifying features of the SPA as it	No

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		will not lead to any changes to the water environment in the vicinity of the SPA.	
Raw Water Systems Oxford Canal – Duke's Cut to Farmoor 15ML/d CON-RWS-OXC-FRM	Oxford Meadows SAC	The closest part of the option element to Oxford Meadows SAC is approximately 900m to the north of the site at the closest point. The assumed shallow depth of the pipeline construction is such that it is not thought it would significantly impede ground water flows to or from the site. In the absence of mitigation, likely significant effects cannot be discounted for invasive species. Once constructed, the pipeline component of this option element is therefore not considered likely to present a material obstruction to either infiltration or groundwater flow to Oxford Meadows SAC.	LSEs Stage 2 Appropriate Assessment required
	Cothill Fen SAC	The SIP elements of potential relevance to this proposed option element are air pollution, hydrological changes and water pollution. Given the distance of the option element to the SAC (approximately 3.5km), no likely significant effects are anticipated.	No LSEs
Oxford Canal to Cropredy Resource 15 Ml/d RES-RWTS-OXC-CRP-15	Ensor's Pool SAC	The SIP is not considered relevant to this option element. The constituent SSSI (Ensors Pool SSSI) is currently 100% unfavourable. Any potential significant impacts identified could cause a further decline in this unfavourable condition and affect the ability of the site to achieve its conservation objectives. The closest part of this option element requiring construction is the Hawkesbury pumping station, which lies approximately 5.7km to the south of the SAC. At this distance construction and operation of this new pumping station on the Oxford Canal is not anticipated to have a significant impact on the qualifying features of this SAC. The SAC is fed by groundwater and therefore the white-clawed crayfish within it are isolated from the canal. As such, no off-site functional habitat would be impacted.	No LSEs
	Fens Pool SAC	The closest part of this option element is approximately 4km to the south west of the SAC. The option element involves the transfer of 15ml/d of water down the existing Oxford Canal, therefore no construction is required within 10km of the SAC. Due to distance from the qualifying feature population, the operation of the element is not anticipated to have a significant impact on the qualifying features of this SAC (Great Crested Newt). The only construction element is two new pumping stations, the closest of which is approximately 35.5km from the SAC. At this extreme distance construction and operation of this new pumping station on the Oxford Canal is highly unlikely to have any impact on the qualifying features of this SAC.	No LSEs
	Cannock Extension Canal SAC	The SIPs of potential relevance to this option element are (1) water pollution and (3) invasive species. The constituent SSSI (Cannock Extension Canal SSSI) is currently 41.1% favourable and 58.9% unfavourable (recovering). Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The option element does not involve any change to the abstraction regime for the sources that supply the canal,	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		and as such no impacts to water quality or potential for INNS transfer are anticipated. The closest part of this option element requiring construction is the Glascote pumping station, which lies approximately 20km to the east of the SAC (downstream). At this distance construction and operation of this new pumping station on the Oxford Canal is not anticipated to have any significant impact on the qualifying features of the SAC..	
	River Mease SAC	None of the SIPs are considered to be particularly relevant to this SAC as they all relate to the river itself and therefore, given the distance between the canal and the river (7.5km), should be isolated from the Oxford Canal. The constituent SSSI (River Mease SSSI) is currently 100% unfavourable. Any potential significant impacts identified could cause a further decline in this unfavourable condition and affect the ability of the site to achieve its conservation objectives. The closest part of this option element requiring construction is the Glascote pumping station, which lies approximately 7.5km to the south of the SAC. At this distance construction and operation of this new pumping station on the Oxford Canal is not anticipated to have any significant impact on the qualifying features of the SAC. The absence of a direct connection between the River Mease and the canal, the significant distance between them and the intervening residential, industrial and intensive arable land use mean that no functional habitat for this SAC will be impacted as a result of this option element.	No LSEs
	Cannock Chase SAC	The only SIP element of potential relevance to this proposed option element is air pollution but given the significant distance of the construction element of this option to the SAC (approximately 24.4km from Glascote pumping station), significant air quality impacts can be excluded. The closest part of the option element is approximately 7.6km to the south of the site. Due to this distance and the lack of hydrological connectivity between the canal and the site, construction and operation of the scheme is unlikely to have any impact on the qualifying features of this SAC.	No LSEs
Oxford Canal to Dukes Cut Resource 15 Ml/d RES-RWTS-OXC-DKC-15	Oxford Meadows SAC	The closest part of this option element is 400m to the north east of the SAC. However, the closest construction activity is approximately 73km to the north west (Hawksbury pumping station). At this extreme distance construction and operation of this new pumping station on the Oxford Canal is not anticipated to have a significant impact on the qualifying features of this SAC. Operation of this element will not have significant adverse effects on the site's qualifying features as the canal is hydrologically isolated from the SAC.	No LSEs
	Cothill Fen SAC	The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at a sufficient distance from the SAC (approximately 82km from Hawkesbury pumping station) that no significant adverse impacts on the qualifying features are anticipated. Operation of this element will not have significant adverse effects on the site's qualifying features as the canal is hydrologically isolated from the SAC.	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
	Ensor's Pool SAC	The SIP is not considered relevant to this option element. The constituent SSSI (Ensors Pool SSSI) is currently 100% unfavourable. Any potential significant impacts identified could cause a further decline in this unfavourable condition and affect the ability of the site to achieve its conservation objectives. The closest part of this option element requiring construction is the Hawkesbury pumping station, which lies approximately 5.7km to the south of the SAC. At this distance construction and operation of this new pumping station on the Oxford Canal is not anticipated to have a significant impact on the qualifying features of this SAC. The SAC is fed by groundwater and therefore the white-clawed crayfish within it are isolated from the canal. As such, no off-site functional habitat would be impacted.	No LSEs
	Fens Pool SAC	The closest part of this option element is approximately 4km to the south west of the SAC. The option element involves the transfer of 15ml/d of water down the existing Oxford Canal, therefore no construction is required within 10km of the SAC. Due to distance from the qualifying feature population, the operation of the element is not anticipated to have a significant impact on the qualifying features of this SAC (Great Crested Newt). The only construction element is two new pumping stations, the closest of which is approximately 35.5km from the SAC. At this extreme distance construction and operation of this new pumping station on the Oxford Canal is highly unlikely to have any impact on the qualifying features of this SAC.	No LSEs
	Cannock Extension Canal SAC	The SIPs of potential relevance to this option element are (1) water pollution and (3) invasive species. The constituent SSSI (Cannock Extension Canal SSSI) is currently 41.1% favourable and 58.9% unfavourable (recovering). Any potential impacts identified could hinder this current recovery and the ability of the site to achieve its conservation objectives. The option element does not involve any change to the abstraction regime for the sources that supply the canal, and as such no impacts to water quality or potential for INNS transfer are anticipated. The closest part of this option element requiring construction is the Glascote pumping station, which lies approximately 20km to the east of the SAC (downstream). At this distance construction and operation of this new pumping station on the Oxford Canal is not anticipated to have any significant impact on the qualifying features of the SAC.	No LSEs
	River Mease SAC	None of the SIPs are considered to be particularly relevant to this SAC as they all relate to the river itself and therefore, given the distance between the canal and the river (7.5km), should be isolated from the Oxford Canal. The constituent SSSI (River Mease SSSI) is currently 100% unfavourable. Any potential significant impacts identified could cause a further decline in this unfavourable condition and affect the ability of the site to achieve its conservation objectives. The closest part of this option element requiring construction is the Glascote pumping station, which lies approximately 7.5km to the south of the SAC. At this distance construction and operation of this new pumping	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		station on the Oxford Canal is not anticipated to have any significant impact on the qualifying features of the SAC. The absence of a direct connection between the River Mease and the canal, the significant distance between them and the intervening residential, industrial and intensive arable land use mean that no off-site functional habitat for this SAC will be impacted as a result of this option element.	
	Cannock Chase SAC	The only SIP element of potential relevance to this proposed option element is air pollution but given the significant distance of the construction element of this option to the SAC (approximately 24.4km from Glascote pumping station), significant air quality impacts can be excluded. The closest part of the option element is approximately 7.6km to the south of the site. Due to this distance and the lack of hydrological connectivity between the canal and the site, construction and operation of the scheme is unlikely to have any impact on the qualifying features of this SAC.	No LSEs
River Wye to Deerhurst 60.3 Ml/d CON-RWT-ROW-DEH-60.3	River Wye SAC	The most relevant SIP elements are physical modifications, hydrological changes, water abstraction, disturbance and air pollution. Construction and operation of a new abstraction directly within the River Wye SAC is likely to impact on a number of qualifying feature species including migratory fish, white-clawed crayfish and otters. Considering the option element is adjacent to the designated site, there are possible air quality impacts associated with construction on sensitive qualifying feature habitats.	LSEs Stage 2 Appropriate Assessment required if this option element is included in the Preferred Programme.
	Wye Valley & Forest of Dean Bat Sites SAC	The most relevant SIP elements are physical modification, disturbance and habitat connectivity. The qualifying features (lesser horseshoe bat and greater horseshoe bat) are at risk of disturbance to off-site functional habitat connectivity associated with construction of the proposed option element and potentially direct impacts to sensitive roost sites outside of the SAC.	LSEs Stage 2 Appropriate Assessment required if this option element is included in the Preferred Programme.
	Wye Valley Woodlands SAC	The most relevant SIP elements are habitat connectivity, air pollution and disturbance. One of the qualifying features (lesser horseshoe bat) are at risk of disturbance to off-site functional habitat connectivity associated with construction of the proposed option element and potentially direct impacts to sensitive roost sites outside of the SAC. Given the distance of the option element to the SAC (approximately 9km), significant air quality impacts are considered to be unlikely.	LSEs Stage 2 Appropriate Assessment required if this option element is included in the Preferred Programme.
Minworth STW to River Avon 115 Ml/d RES-RWTS-MIN	None within 10km (or 20km downstream)	No relevant European sites	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
Netheridge STW to River Severn 35 Ml/d RES-RWTS-NTH	Cotswolds Beechwoods SAC	The only SIP element of potential relevance to this proposed option element is air pollution. No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). Given the distance of the option element to the SAC (approximately 8.4km), significant air quality impacts are considered to be unlikely.	No LSEs
	Dixton Wood SAC	No construction or operation impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (9.2km) from the site.	No LSEs
	Walmore Common SPA and Ramsar	Given the distance of the construction activities (6km), no significant disturbance of Bewick's swans or hydrological changes are anticipated on the qualifying features of the SPA/Ramsar site during construction (or operation).	No LSEs
	Severn Estuary SPA and Ramsar	The most relevant SIP elements are physical modification, impacts of development, water pollution and air pollution. In the absence of mitigation, significant effects on fish migration may be experienced and as such this option element should be subject to Stage 2 Appropriate Assessment if it forms part of the preferred programme. At this distance (10.6km) and with dilution by the main river it is unlikely that discharge of final effluent will impact water quality or migratory fish species. No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site).	LSEs on fish migration Stage 2 Appropriate Assessment required if this option element is included in the Preferred Programme.
Hayden STW to River Severn 20 Ml/d RES-RWTS-HDN	Cotswolds Beechwoods SAC	The only SIP element of potential relevance to this proposed option element is air pollution. No significant air quality impacts are anticipated as the option element is sufficiently distant from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). Given the distance of the option element to the SAC (approximately 8.4km), significant air quality impacts are considered to be unlikely.	No LSEs
	Dixton Wood SAC	No construction impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (9.6km) from the site.	No LSEs
	Walmore Common SPA and Ramsar	Given the distance of the construction activities (17.6km), no significant disturbance of Bewick's swans or hydrological changes are anticipated on the qualifying features of the SPA/Ramsar site during construction (or operation).	No LSEs
River Avon to Willes Meadow Pond 50 Ml/d	None within 10km (or 20km downstream)	No relevant European sites	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
RES-RWTS_DRA			
Raw Water Systems Abingdon to Farmoor. CON-RWS-ABI-FMR	Cothill Fen Special Area of Conservation (SAC)	All of the Site Improvement Plan (SIP) elements for this SAC are considered relevant to this option element: water pollution, hydrological changes and air pollution. The pipeline runs to the west of the groundwater divide near to the SAC, approximately 500m of the SAC to the west at its closest point. At this distance, no significant water pollution or dust pollution impacts are likely from construction. No significant air quality impacts are anticipated as the option element is a significant distance from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). The following text is taken from the original assessment for option element reference WTW-SWOX-ABI as the pipeline for Abingdon to Farmoor is understood to be identical. As mitigation cannot be considered as part of stage 1 screening it is necessary for this option element to be subject to a Stage 2 Appropriate Assessment if it forms part of the preferred programme. *The pipeline has been re-routed since the draft WRMP19 so that it runs to the west of the groundwater divide near to the SAC, from which the groundwater flows east and west (east towards Cothill Fen). Existing boreholes adjacent to the proposed pipeline route have recorded the groundwater level at 4.5m below ground level. The proposed pipeline would be constructed at a depth less than 2.5m below ground level (possibly only to 1.5m deep) and is therefore unlikely to interfere with groundwater levels or movement towards Cothill Fen. However, in the absence of mitigation, likely significant effects cannot be discounted for hydrological changes. There is a risk that during construction of the pipeline groundwater could be intercepted in the excavation and there would be a need for local dewatering. This pumping of groundwater may impact on groundwater flow regime beneath the western end of Cothill Fen. However due to the temporary nature of the works and the small drawdown required this would not result in a significant adverse impact on the SAC.*	LSEs to/from groundwater flows, dust and physical damage Stage 2 Appropriate Assessment required to address previous Natural England concerns for a similar option element.
	Little Wittenham SAC	No construction or operation impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (9.8km) from the site that there is no likely impact pathway.	No LSEs
	Oxford Meadows SAC	No construction or operation impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (4.8km) from the site that there is no likely impact pathway.	No LSEs
Inter-zonal Transfer Henley to SWA (5 Ml/d)	Chilterns Beechwoods SAC	The only SIP element of potential relevance to this proposed option element is air pollution. Given the distance of the option element to the SAC (approximately 2.7km), significant air quality impacts are considered to be unlikely. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
RES-IZT-HEN-SWA-HAM-5		beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option element to the SAC is 2.7km away. This is beyond the maximum dispersal distance for female stag beetles (~1km), and considerably below the depth of soil and dead wood which stag beetle utilise for their larval stages and therefore significant impacts to members of the qualifying feature population are not expected to occur.	
Inter-zonal Transfer Henley to SWOX (5 Ml/d) RES-IZT-HEN-SWX-NET-5	Aston Rowant SAC	The only SIP element of potential relevance to this proposed option element is air pollution. Given the distance of the option element to the SAC (approximately 8.3km), significant air quality impacts are considered to be unlikely.	No LSEs
	Chilterns Beechwoods SAC	The only SIP element of potential relevance to this proposed option element is air pollution. Given the distance of the option element to the SAC (approximately 8.8km), significant air quality impacts are considered to be unlikely.	No LSEs
Network Reinforcement Guildford WSZ Shalford to Netley Mills NET-GUI-SFD-NML	Thames Basin Heaths Special Protection Area (SPA)	The only SIP element of potential relevance to this proposed option element is air pollution. Given the distance of the option element to the SAC (approximately 4.9km), significant air quality impacts are considered to be unlikely.	No LSEs
	Thursley, Hankley & Frensham Commons SPA	The only SIP element of potential relevance to this proposed option element is air pollution. Given the distance of the option element to the SAC (approximately 8.5km), significant air quality impacts are considered to be unlikely.	No LSEs
	Thursley, Ash, Pirbright & Chobham SAC	The only SIP element of potential relevance to this proposed option element is air pollution. Given the distance of the option element to the SAC (approximately 8km), significant air quality impacts are considered to be unlikely.	No LSEs
	Mole Gap to Reigate Escarpment SAC	The qualifying features (Bechstein's bat) may be at risk of disturbance to off-site functional habitat if a significant area of woodland habitat is directly impacted by the construction of the proposed option element. This is not understood to be the case.	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		The most relevant SIP elements are disturbance and air pollution. Given the distance of the option element to the SAC (approximately 8.7km), significant air quality impacts are considered to be unlikely.	
	Thursley & Ockley Bogs Ramsar	No construction or operation impacts are likely to arise to the Ramsar site or its qualifying features as the option element is located at a sufficient distance (9.9km) from the site that there is no likely impact pathway.	No LSEs
Network Reinforcement SWOX to SWA 48 Ml/d / 72 Ml/d NET-IZT-AB-LC-48 NET-IZT-AB-LC-72	Cothill Fen SAC	All of the SIP elements for this SAC are considered relevant to this option element: water pollution, hydrological changes and air pollution. The pipeline runs to the west of the groundwater divide near to the SAC, approximately 500m of the SAC to the west at its closest point. At this distance, no significant water pollution or dust pollution impacts are likely from construction. No significant air quality impacts are anticipated as the option element is a significant distance from the designated sites and the anticipated number of vehicle movements comes under the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site). The following text is taken from the original assessment for option element reference WTW-SWOX-ABI as the pipeline for North SWOX SWA is understood to be identical. *The pipeline has been re-routed since the draft WRMP19 so that it runs to the west of the groundwater divide near to the SAC, from which the groundwater flows east and west (east towards Cothill Fen). Existing boreholes adjacent to the proposed pipeline route have recorded the groundwater level at 4.5m below ground level. The proposed pipeline would be constructed at a depth less than 2.5m below ground level (possibly only to 1.5m deep) and is therefore unlikely to interfere with groundwater levels or movement towards Cothill Fen. However, in the absence of mitigation, likely significant effects cannot be discounted for hydrological changes. There is a risk that during construction of the pipeline groundwater could be intercepted in the excavation and there would be a need for local dewatering. This pumping of groundwater may impact on groundwater flow regime beneath the western end of Cothill Fen. However due to the temporary nature of the works and the small drawdown required this would not result in a significant adverse impact on the SAC.*	LSEs to/from groundwater flows, dust and physical damage Stage 2 Appropriate Assessment required to address previous Natural England concerns for a similar option element.
	Oxford Meadows SAC	The following text is taken from the original assessment for option element Treated transfer to North SWA as the pipeline for North SWOX SWA is understood to be identical. As mitigation cannot be considered as part of stage 1 screening it is necessary for this option element to be subject to a Stage 2 Appropriate Assessment if it forms part of the preferred programme. *The closest part of the option element to Oxford Meadows SAC is approximately 135m to the west of the site at the closest point. The pipeline also encircles the northern part of this SAC to the north and west. Short term impacts could occur due to dust emissions from pipeline construction but these will be controlled by implementing dust suppression measures. The relatively shallow depth of the pipeline construction is such that it is not thought it would*	LSEs to/from groundwater flows, dust and non-native species Stage 2 Appropriate Assessment required to address previous Natural England

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		significantly impede ground water flows to or from the site. In addition, the pipeline would be backfilled with gravel as an extra measure to help maintain the permeability around the pipeline. Best practice biosecurity measures as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading Crassula or other invasive species on to this site. Once constructed, the pipeline component of this option element is therefore not considered likely to present a material obstruction to either infiltration or groundwater flow to Oxford Meadows SAC.	concerns for a similar option element.
	Chilterns Beechwood SAC	No construction or operation impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (3.4km) from the site that there is no likely impact pathway.	No LSEs
	Little Wittenham SAC	No construction or operation impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (9.8km) from the site that there is no likely impact pathway.	No LSEs
SWA north: Abingdon WTW (24 Ml/d) WTW-SWOX-ABI-SWA	Cothill Fen SAC	No construction or operation impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (4.7km) from the site that there is no likely impact pathway.	No LSEs
Groundwater Honor Oak RES-GW-HON	None within 10km	No relevant European sites	No LSEs
Removal of constraints Epsom Groundwater RES-RC-EPS	Wimbledon Common SAC	The only SIP element of potential relevance to this proposed option element is air pollution. Given the distance of the option element to the SAC (approximately 8.9km), significant air quality impacts are considered to be unlikely.	No LSEs
	Richmond Park SAC	Given the distance of the option element to the SAC (approximately 8.9km), no likely significant effects are anticipated.	No LSEs
	Mole Gap to Reigate Escarpment SAC	The only SIP element of potential relevance to this proposed option element is air pollution. Given the distance of the option element to the SAC (approximately 7.0km), significant air quality impacts are considered to be unlikely.	No LSEs
	South West London Waterbodies SPA & Ramsar	Screened out as beyond 10km from the option element and not hydrologically connected.	No LSEs
Raw Water Systems Medmenham Intake-53 CON-RWS-MMM-53	Chilterns Beechwoods SAC	The closest part of the option element to Chilterns Beechwood SAC is approximately 2.5 km to the south west of the site at the closest point. Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option element to the SAC is 2.5km away. This is beyond the maximum dispersal distance for female stag beetles (~1km), and considerably below the depth of soil and dead wood which stag beetle utilise for their larval stages and therefore significant impacts to members of the qualifying feature population are not expected to occur. Given the distance of the option element to the SAC (approximately 2.5km), significant air quality impacts are considered to be unlikely.	
Groundwater Horton Kirby RES-ASR-HTK	None within 10km	No relevant European sites	No LSEs
Groundwater Removal of Constraints New River Head RES-RC-NRV	Lee Valley SPA and Ramsar	The SIP elements of potential relevance to this proposed option element are water pollution, hydrological changes, disturbance and air pollution. As there is no construction associated with this option element, and the option element is located at a sufficient distance (approximately 6km) from the site there is no likely impact pathway.	No LSEs
	Epping Forest SAC	The SIP elements of potential relevance to this proposed option element are air pollution, inappropriate water levels and water pollution. As there is no construction associated with this option element, and the option element is located at a sufficient distance (approximately 9.5km) from the site there is no likely impact pathway.	No LSEs
Removal of constraints Britwell Stream RES-RC-BTW	Aston Rowant SAC	The only SIP element of potential relevance to this proposed option element is air pollution. Given the distance of the option element to the SAC (approximately 4.3km), significant air quality impacts are considered to be unlikely.	No LSEs
	Little Wittenham SAC	No construction or operation impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (9km) from the site that there is no likely impact pathway.	No LSEs
Datchet Groundwater RES-GW-DAT	South West London Waterbodies SPA and Ramsar	No change since original assessment due to no material change to option element: *The SIP elements of potential relevance to this proposed option element are (1) disturbance (only) and (3) invasive species but both are considered to be of negligible likelihood given the scale, nature and location of the*	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		groundwater abstraction. The closest constituent SSSI (approximately 1.6km away: Wraysbury No. 1 Gravel Pit SSSI) is currently 100% favourable. Any potential significant impacts identified could lead to a decline in this good condition and affect the ability of the site to achieve its conservation objectives. Whilst all but two of the remaining SSSIs are 100% favourable any potential impacts could negatively affect this good condition and also hinder the recovery of the SSSIs that are not currently favourable. There are no SSSIs or potential functional habitat within 1km of this option element. *As the proposed scheme abstracts from the confined Chalk aquifer there is no direct hydrological impact of abstraction on the surface water features and habitats of the SPA/Ramsar Site. The proposed scheme will not require land take from within SPA/Ramsar Site boundaries, and construction activities are at sufficient distance from SPA/Ramsar Site (approximately 1.6km at the closest point) that no impacts on the qualifying features of the European Sites are anticipated during construction.*	
	Burnham Beeches SAC	No change since original assessment due to no material change to option element: *The only SIP element of potential relevance to this proposed option element is (1) air pollution but given the significant distance of the option element to the SAC (approximately 6.6km), significant air quality impacts can be excluded (assuming sensitive construction traffic routing). The constituent SSSI (Burnham Beeches SSSI) is currently 37.37% unfavourable but this portion is recovering. Any potential significant impacts identified could hinder this current recovery, cause a decline in the condition of areas that are currently favourable and affect the ability of the site to achieve its conservation objectives.* *The SAC is underlain, at least partially, by the Reading Beds that confine the Chalk aquifer from which the groundwater will be abstracted at Datchet. The SAC will therefore be unaffected by changes in the confined chalk groundwater level. The proposed scheme will not require land take from within SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 6.6km at the closest point) that no significant impacts on qualifying features are anticipated.* *Air quality impacts can be avoided by ensuring that construction traffic is not routed within 200m of any designated site with qualifying features sensitive to air quality.*	No LSEs
	Windsor Forest and Great Park SAC	No change since original assessment due to no material change to option element: *The only SIP element of potential relevance to this proposed option element is (5) air pollution but given the distance of the option element to the SAC (approximately 3.2km), significant air quality impacts are considered to be unlikely (assuming sensitive construction traffic routing). The constituent SSSI (Windsor Forest & Great Park SSSI) is currently 48.16% unfavourable but that portion is recovering. Any potential impacts identified could hinder this current recovery, cause a decline in the 51.84% that is currently favourable and affect the ability of the site to achieve its conservation objectives.*	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		The SAC is underlain by the London Clay that confines the Chalk aquifer from which water would be abstracted at Datchet. As a consequence, the groundwater abstraction will not adversely affect the local water table underlying the SAC and there will be no adverse effects on the qualifying features. The proposed scheme will not require land take from within SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 3.2km at the closest point) that no significant impacts on qualifying features are anticipated. *Significant air quality impacts can be avoided by ensuring that construction traffic is not routed within 200m of any designated site with qualifying features sensitive to air quality.*	
South East London Pipelines (chalk streams)	*No sites impacted*	No impacts identified	No LSEs
South West London Pipelines (chalk streams)	South West London Waterbodies SPA & Ramsar	The pipeline runs along the Bessborough Reservoir which is a constituent part of the South West London Waterbodies SPA & Ramsar. It also passes close to the Island Barn Reservoir which has the potential to be used as functional habitat for the qualifying bird species of the designated site. As such, there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site, namely over-wintering gadwall and shoveler (this 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. According to a report from the Institute of Estuarine and Coastal Studies in 2009 (as cited above), if noise levels at the SPA can be kept at 50dB(A) or lower and visible human presence is hidden, or in excess of 250m from the SPA, then there should be no significant disturbance effect on bird behaviour. Qualifying feature bird species utilising the designated site itself and/or potential functional habitat within 250m of this option element would therefore be vulnerable to visual disturbance as well as noise disturbance. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds and spread of invasive non-native species.	LSEs Stage 2 Appropriate Assessment required if the option element is included in the Preferred Programme.
	Richmond Park SAC	The closest part of this option is 8.8km to south east of the designated site. This is sufficiently distant from the site such that noise disturbance from construction activities is unlikely to lead to adverse effects on the qualifying features of the SPA/Ramsar Site (overwintering shoveler or gadwall). No other potential impact pathways exist during construction. No potential functional habitat was identified within 1km of the option element and therefore there is no	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		risk of noise or visual disturbance to members of the qualifying feature populations of the SPA/Ramsar Site. This 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull.	
River Lee New Gauge pipeline (chalk streams)	Lee Valley SPA & Ramsar	The closest part of this option from the SPA/Ramsar Site is approximately 4.5km to the north. At this distance, no likely significant effects to any of the bird qualifying features for this site are anticipated during construction, as disturbance effects for wintering birds only extend a maximum of ~1 kilometre from the designated site. However, the adjacent William Girling Reservoir collectively forms part of the Chingford Reservoirs SSSI, which are in part designated for their importance to overwintering wildfowl. As such, this reservoir has clear potential to be used as functional habitat for the bird qualifying features of the SPA/Ramsar Site and therefore be at risk of disturbance. As the works are located within 1km of a SSSI that provides functional habitat to the Lee Valley SPA/Ramsar, there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site, namely over-wintering bittern, gadwall and shoveler (this 1km screening threshold for bird disturbance is a precautionary distance applied based on the following report 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, which itself references Cutts, N, Phelps, A and Burdon, D (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA. Institute of Coastal and Estuarine Studies. University of Hull. The Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects takes this work further and looks at the sensitivity of a number of specific species to visual and noise disturbance. This showed that effects of disturbance on wintering waterbirds (estuarine) did not tend to extend beyond 250m from the source of the noise, and also derived a generic overview table to calculate the likely disturbance effect for a noise level and the distance required from the source to the receptor allowing for a likely 'acceptable' noise dose of 70dB(A) (The 50dB(A) cited elsewhere in this report is a more precautionary noise level taken from earlier studies, used for initial screening purposes, at which no behavioural response was observed).	LSEs Stage 2 Appropriate Assessment required if the option element is included in the Preferred Programme.
	Epping Forest SAC	Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. The closest part of this option to Epping Forest SAC is approximately 5km to the north west. At this distance, no likely significant effects to any of the qualifying features for this site are anticipated during construction (beech woodland, North Atlantic wet heathland, European dry heaths and stag beetles).	
SWA Pipelines (chalk streams)	Chiltern Beechwoods SAC	Based on the following study, Rink, M. and Sinsch, U. (2007) Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. Journal of Zoology, 272 (3), pp. 235-243., we have applied a dispersal distance of a maximum of 1km for stag beetles. This is based on a precautionary distance for female dispersal (compared to the maximum dispersal recorded of 727m) because although males were recorded dispersing up to around 2km, their dispersal is directed to sites with reproductive females and any deadwood habitat used for reproduction would be located within that 1km buffer. The study states 'the colonization of new nest sites depends on dispersal ability of females and amounts to less than 1km'. According to the Peoples Trust for Endangered Species website: https://ptes.org/campaigns/stag-beetles/stag-beetle-facts/ 'Once they've mated, females return to the spot where they emerged (if there is enough rotting wood to feed their young)' This behaviour limits their dispersal and would mean that members of the qualifying feature population are largely restricted to the applicable European site rather than slowly dispersing further from it. Males of the qualifying feature population would only be at risk of direct killing and injury during dispersal in May-August (when beyond 1km from the SAC) and this low risk of loss of individuals is not considered likely to have a significant impact on the qualifying feature population. This is beyond the maximum dispersal distance for female stag beetles (~1km) and therefore significant impacts to members of the qualifying feature population are not expected to occur. The proposed scheme will not require land take from within the SAC boundaries, and construction activities are at sufficient distance from the SAC (approximately 3.5km to the west at the closest point) that no significant impacts on the qualifying features are anticipated during construction	No LSEs

Option name	Designated sites assessed	Assessment	Likely Significant Effects?
		or operation of this inter-zonal water conveyance transfer asset.	
	Pewsey Downs SAC	No construction or operation impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (6.5km) from the site that there is no likely impact pathway.	No LSEs
	North Meadow and Clattinger Farm SAC	No construction or operation impacts are likely to arise to the SAC or its qualifying features as the option element is located at a sufficient distance (5km) from the site that there is no likely impact pathway.	No LSEs

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

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Final Water Resources Management Plan 2019 Appendix C: Habitats Regulations Assessment – April 2020: Appendix E

Appendix E: Mitigation identified in Stage 2 Appropriate Assessments

Report for: Thames Water Utilities Limited

ED10169 | Issue Number Final | Date 20/04/2020

Customer:

Thames Water Utilities Ltd

Customer reference:

ED10169

Contact:

Ben Stansfield
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Miriam Westbrook

Approved By:

Ben Stansfield

Date:

20 April 2020

Ricardo Energy & Environment reference:

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Appendix E

Mitigation identified in Stage 2 Appropriate Assessments

Table F.1 lists the mitigation that has been identified in the Stage 2 Appropriate Assessment as being required to prevent adverse impacts to site integrity or the ability of the site to achieve its conservation objectives.

For all other option elements in the Feasible List for which LSEs could not be ruled out, a Stage 2 Appropriate Assessment would have to be carried out to determine what mitigation would be required should these option elements be taken forward in the Final WRMP19. A high level summary of the type of mitigation that might be required for each option element in the Feasible List is presented in Appendix I of the SEA report, however a full Stage 2 Appropriate Assessment would be required to confirm if this mitigation is feasible and sufficient to rule out adverse effects on site integrity.

Table F.1 Mitigation required for the Preferred Programme.

Option name	Relevant European site(s)	Construction mitigation	Operational mitigation
Coppermills Water Treatment Works Extension 100 MLD	Lee Valley SPA & Ramsar	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Noise assessment to be completed during the detailed design and planning/permit applications and associated HRA, prior to commencement of works to ensure mitigation measures will be effective (if not, seasonal avoidance to be used). • Adherence to EA Pollution Prevention Guidelines (now formally withdrawn but still relevant and useful) • Best practice construction methods. • Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction.	No specific operational mitigation required. Certain mitigation advocated for construction will be applied during operation (visual screening) and depending on the baseline findings of the noise assessment (to be completed during the detailed design and planning/permit applications and associated HRA) additional noise reduction measures would be enacted to ensure that noise levels do not significantly exceed the current baseline such that qualifying feature birds could experience a significant level of disturbance.
Culham to Farmoor 180 MLD (chalk streams)	Cothill Fen SAC	• Groundwater survey of the site to confirm exact location of the groundwater divide and minor rerouting of the pipeline if required to avoid impacts to groundwater flow.	• Backfill pipe with gravel to maintain permeability around the pipeline.

Deephams Reuse	Lee Valley SPA & Ramsar	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Noise assessment to be completed during the detailed design and planning/permit applications and associated HRA, prior to commencement of works to ensure mitigation measures will be effective (if not, seasonal avoidance to be used).	No specific operational mitigation required. Certain mitigation advocatedfor construction will be applied during operation (visual screening) and depending on the baseline findings of the noise assessment (to be completed during the detailed design and planning/permit applications and associated HRA) additional noise reduction measures would be enacted to ensure that noise levels do not significantly exceed the current baseline such that qualifying feature birds could experience a significant level of disturbance.
Kempton Water Treatment Works 100 MLD	South West London Waterbodies SPA & Ramsar	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Noise assessment to be completed during the detailed design and planning/permit applications and associated HRA, prior to commencement of works to ensure mitigation measures will be effective (if not, seasonal avoidance to be used). • Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction.	No specific operational mitigation required. Certain mitigation advocated for construction will be applied during operation (visual screening) and depending on the baseline findings of the noise assessment (to be completed during the detailed design and planning/permit applications and associated HRA) additional noise reduction measures would be enacted to ensure that noise levels do not significantly exceed the current baseline such that qualifying feature birds could experience a significant level of disturbance.
River Lee New Gauge pipeline (chalk streams)	Lee Valley SPA & Ramsar	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Minimising the works footprint of the pipeline corridor to maximise the effectiveness of any visual screening employed. • Noise assessment to be completed during the detailed design and planning/permit applications and associated HRA, prior to commencement of works to ensure mitigation measures will be effective (if not, seasonal avoidance to be used). •	No specific operational mitigation required.

South West London Pipelines (chalk streams)	South West London Waterbodies SPA & Ramsar	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Minimising the works footprint of the pipeline corridor to maximise the effectiveness of any visual screening employed. • Noise assessment to be completed during the detailed design and planning/permit applications and associated HRA, prior to commencement of works to ensure mitigation measures will be effective (if not, seasonal avoidance to be used). Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction.	No specific operational mitigation required.
Severn Thames Transfer	Severn Estuary SAC, SPA & Ramsar	• Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction. • Adherence to EA Pollution Prevention Guidelines (now formally withdrawn but still relevant and useful) • Best practice construction methods.	• A Hands-off flow is a two-stage restriction comprising: o a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to as HOF-1); o a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as HOF-2); this is in addition to application of HOF-1. • Intake screens to guard against fish mortality through abstraction. With further mitigation in the form of reduced attractant velocities at the intake would guard against potential mortality of fish through abstraction at times of supported abstraction below the hands-off flow conditions.

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

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Habitats Regulations Assessment

Appendix F: Information to Inform an Appropriate Assessment (Habitats Regulations Assessment (HRA) Stage 2) – Deephams Reuse

Report for: Thames Water Utilities Limited

ED10169 | Issue Number Final | Date 20/04/2020

Customer:

Thames Water Utilities Ltd

Customer reference:

ED10169

Contact:

Ben Stansfield
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Miriam Westbrook

Approved By:

Ben Stansfield

Date:

20 April 2020

Ricardo Energy & Environment reference:

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1 Introduction

1.1 The overall Plan

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 long-term planning horizon in order to ensure security of supply in each of the water resource zones making up its supply area.

As part of the development of Thames Water's Water Resources Management Plan 2019 (WRMP19), the Habitats Regulations Assessment (HRA) assesses the potential effects of alternative options and programmes on sites designated for their international nature conservation interests. The HRA assessment has been undertaken in parallel with the Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment and has been used to inform the development of the WRMP19 to ensure its overall compliance with relevant legislation and national water resource planning guidance.

1.2 Legislation summary

Under the Conservation of Habitats and Species Regulations 2017, (the 'Habitats Regulations'), 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 an Appropriate Assessment to determine the implications for the site in view of the site's conservation objectives.

The objective of an Appropriate Assessment is to determine if there will be a significant adverse effect on site integrity, and is dependent on site-specifics, including condition, status and conservation objectives. As described by the HRA Handbook "*A significant effect is any effect that would undermine the conservation objectives for a European site. There must be a causal connection or link between the subject plan or project and the qualifying features of the site which could result in possible significant effects on the site*."

Habitats Regulations Assessment (HRA) refers to the assessment of the potential effects of a development project on one or more European sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). The Government also expects potential SPAs (pSPAs), candidate SACs (cSACs), and any confirmed HRA compensatory habitat to be considered in the same way.

- **Special Areas of Conservation (SACs)** are designated under the Habitats Directive (92/43/EEC) and target particular habitats (Annex 1) and/or species (Annex II) identified as being of European importance.

- **Special Protection Areas (SPAs)** are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC) (the 'Wild Birds Directive') for the protection of wild birds and their habitats (including particularly rare and vulnerable species listed in Annex 1 of the Directive, and migratory species).

The UK Government has also advised that Ramsar sites should be considered and included within the assessment[1]:

- **Ramsar sites** support internationally important wetland habitats and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

1 Department for Communities and Local Government (2012) National Planning Policy Framework.

For ease of reference during HRA, these three designations are collectively referred to as 'European sites', despite Ramsar designations being at the wider international level, and are also known as 'Natura 2000' sites.

1.3 The proposed Option

The Option proposes a new indirect reuse treatment facility within the Deephams STW site and a conveyance element to the River Lee Diversion upstream of the King George V Reservoir pump station.

This report assesses the proposed impacts of both the reuse plant and conveyance elements of the Deephams Reuse Option.

The option will require the following:

- A new water reuse treatment plant to treat 45Ml/d of treated effluent from the Deephams Sewage Treatment Works using an advanced treatment process to produce a high purity water stream.
- A 5.2km pipeline with 800mm internal diameter.

1.4 Potentially affected European/Ramsar designated sites

The European sites, the qualifying features and the reasons they could be impacted by the Option are detailed below:

- Lee Valley SPA and Ramsar: The new reuse plant is adjacent to the Chingford Reservoirs SSSI which has potential to be used as off-site functional habitat for the non-breeding bird qualifying features of the SPA/Ramsar site. The new conveyance also runs adjacent to Chingford Reservoirs SSSI.

Any designated sites which were screened out (see Section 2) during HRA Stage 1 (see Appendix 1) due to there being no Likely Significant Effect (LSE), are not included in this Stage 2 assessment. Refer to Appendix A for the Stage 1 Assessment. For those designated sites that are included in this Stage 2 report, any of their qualifying features screened-out in Stage 1 due to no LSE are also omitted here, but are detailed in Appendix A.

1.5 Purpose of this report

The purpose of this report is to provide the necessary information to allow the Competent Authority to determine if the proposals within this Plan will have a significant adverse effect on the integrity of the designated site(s) identified in Section 1.4 above. A summary of the HRA process that informs this purpose is provided in Section 2 below.

2 Methodology

2.1 Sources of guidance

The approach to informing the Appropriate Assessment has been developed from the legislation described in Section 1.2 above and informed by the latest guidance for HRA in the UK, namely:

- Tyldesley, D. and Chapman C. The Habitats Regulations Assessment Handbook. Published and updated online by DTA Publications Limited: http://www.dtapublications.co.uk/handbooks. The Handbook is informed and regularly updated with amendments to the Regulations, the latest Government guidance and case law.
- DEFRA (2012) The Habitats and Wild Birds Directives in England and its seas - Core guidance for developers, regulators & land/marine managers (draft for public consultation)

2.2 Stages of HRA

Stage 1 in HRA is a **Screening** stage to determine whether any part of the proposed Option is likely to have a significant effect on any European site, and thus if a full Appropriate Assessment of the project is required.

Stage 2 is the **Appropriate Assessment** stage (if required) that has to conclude whether or not the option will adversely affect the integrity of the European site in question. This is judged in terms of the likely impact on a site's conservation objectives. The conservation objectives specify the overall target for a site's 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated) in order for it to contribute to maintaining or reaching favourable conservation status. Significantly, HRA is based on a rigorous application of the precautionary principle.

If significant adverse effects are identified at the Appropriate Assessment stage, feasible **alternative options** would be examined to avoid or reduce any potential significant effects on the integrity of the European site as **Stage 3** of the HRA if it is deemed that the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI). The selection of such alternatives is limited to those which would meet the objectives of the current Option.

Stage 4 comprises an **assessment of compensatory measures** where the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI).

2.3 Responsibility for undertaking HRA

The responsibility for undertaking HRA lies with the competent authority, i.e. the authority (or authorities) responsible for granting a licence or consent for the Option. Under the Habitats Regulations, the applicant has an obligation to provide the competent authorities with such information as the authority may reasonably require for the purposes of the assessment, or to enable them to determine whether an Appropriate Assessment is required.

2.4 Approach to informing the Appropriate Assessment (HRA Stage 2)

2.4.1 Consultation

Consultation, via meetings and correspondence, has been undertaken with Natural England and the Environment Agency during the screening stage of this HRA (HRA Stage 1). This has helped to determine which potential effects require more detailed, appropriate assessment provided by HRA Stage 2, as presented in this report.

2.4.2 Impact assessment

This assessment considers the potentially damaging aspects of the proposed Option with potential effects on a European site's qualifying features and likely achievement of the conservation objectives.

The potential for adverse effect on the integrity of the site depends on the scale and magnitude of the action and its predicted impacts, taking into account the distribution of the designated 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.

Where qualitative and/or quantitative information is available, this has been used to inform the assessment. Where this information is not available, professional judgement has been used. In some cases, the ecological functioning of the site and the likely effects are well understood and documented elsewhere, for instance in studies commissioned to inform the Habitats Directive Review of Consents. In these cases, the assessment may simply comprise a review of this information. Where there is not sufficient information to undertake the assessment, this is recorded in this report.

This report aims to set out, in sufficient detail for it to be transparent and understandable, what the effects of the proposed Option (alone and in-combination) are likely to be on each internationally-designated site's qualifying feature, referring to relevant background documents and other information on which these judgements, which are essentially ecological judgements, rely. Guidance states that the size or complexity of the HRA Stage 2 report to inform the Appropriate Assessment will not necessarily reflect the scale of the proposed Option, but rather the complexity of potential effects. The length of the report may not reflect the complexity of ecological judgements made to arrive at the necessary conclusions. Very complex ecological analysis and judgements may be expressed succinctly, with detailed supporting analyses contained in appendices or clearly referenced separate documents.

2.4.3 Mitigation measures

Following the People Over Wind ruling, no mitigation measures can be considered to be incorporated, and therefore used at Stage 1 Screening to avoid Likely Significant Effects. The HRA Stage 2 assessment of effects therefore considers mitigation measures separately. The assessment takes into account any mitigation measures that may already form part of the proposed Option specification (i.e. that are 'incorporated'), to determine whether they will most likely reduce the likelihood, magnitude, scale, and/or duration of the effect to a lower level. These measures can include both avoidance and reduction measures, with the former being the preferred option.

2.4.4 In-combination assessment

In accordance with the legislation, an in-combination assessment with other WRMP Options at the Programme level has been undertaken. The approach to this is described as a series of steps below:

- **STEP 1** – Does the Option have no discernible effect, whatsoever, on the European site? If not, then there's no need for in-combination assessment, as logic dictates it can't have in-combination effects.
- **STEP 2** – Does this Option have a discernible effect, but one which is not significantly adverse to site integrity alone? If so, then an in-combination assessment is required. (Effects that are adverse alone do not require in-combination assessment.)
- **STEP 3** – Identify the other Options/Plans/Projects that also have discernible effects that (1) aren't an adverse effect alone but (2) might act in combination with effects of your Option/Plan/Project. It is normal practice to agree this list of potential in-combination Plans/Projects with the Competent Authority before doing the assessment.
- **STEP 4 –** Assess these other Options/Plans/Projects in combination with this Plan.

The above steps recognise that significant adverse effects acting alone are already dealt with for that Option and should not form part of an in-combination assessment. It is only where effects that may *become adverse when acting in combination* that require an in-combination assessment.

Equally, in accordance with best-practice guidance, any projects or plans which have been completed, consented and implemented are considered to be part of the baseline (and should have been subject to their own HRA before being consented and implemented). Therefore, these will not be included as part of any in-combination assessment, but any ongoing operational effects will be noted as part of the baseline environment.

2.4.5 Conservation objectives

The Habitats Regulations require that the Appropriate Assessment is of "the implications for the site in view of that site's conservation objectives." The development of conservation objectives is required by the 1992 'Habitats' Directive (92/43/EEC). In accordance with the Habitats Directive, the objectives aim to achieve the 'favourable conservation status' of the habitat and species features for which SAC is designated (see Figure 1).

Site-specific conservation objectives for SACs have been developed by Natural England and provide a description of what is considered to be the favourable conservation status of the feature within the whole plan area.

Figure 2.1 Favourable conservation status as defined in Articles 1(e) and 1(i) of the Habitats Directive

"The conservation status of a natural ***habitat*** *is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:*

- *Its natural range and areas it covers within that range are stable or increasing, and*
- *The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and*
- *The conservation status of its typical species is favourable.*

The conservation status of a ***species*** *is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:*

- *Population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and*
- *There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."*

The generic conservation objectives covering all the European sites assessed in this report are:

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.

2.4.6 Additional mitigation measures

Where the Option has been assessed as having a significant adverse effect by undermining the site's conservation objectives, additional mitigation may be necessary to satisfy the integrity test (Section 2.4.7). Such mitigation is that which is in addition to the incorporated measures described in Section 2.4.3 above, and which is usually imposed by a Competent Authority through enforceable conditions or restrictions.

2.4.7 Integrity test

The integrity test is the conclusion of the Appropriate Assessment and requires the competent authority to ascertain whether the proposed Option (either alone or in-combination with other plans or projects), will not have an 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"

This report will conclude with a professional opinion on whether such a test can be met, but it is for the Competent Authority to make that decision in light of the information presented.

2.5 Limitations

Information provided by third parties, including publicly available information and databases, is considered correct at the time of publication. 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 Option.

The HRA has been undertaken in as detailed a way as possible, using all available data sources where they exist. However, the conclusions drawn from this are 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.

3 Assessment of Effects on Qualifying Features

The potential effects of the proposed Option (acting alone) on each qualifying feature of the designated site(s) previously identified as having likely significant effects during the Stage 1 screening are detailed below in **Table 3.1.** Both construction phase (where applicable) and operation phase of the Option are assessed

Table 3-1 Assessment of effects on Lee Valley SPA & Ramsar

DESIGNATED SITE: Lee Valley SPA & Ramsar **REF: UK9012111 / UK11034**			**PLAN NAME: Thames Water WRMP 19** **OPTION NAME & REF: Deephams Reuse (RES-RU-DPH & CON-RU-DPH-KGV)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc.**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
CONSTRUCTION PHASE					
Over winter birds; **A021 Bittern, (*Botaurus stellaris)*** **A051 Gadwall, (*Anas strepera)*** **A056 Shoveler, (*Anas clypeata)***	Bittern: 6 individuals representing at least 6.0% of the wintering population in Great Britain (5 year peak mean, 1992/3-1995/6) Gadwall: 515 individuals representing at least 1.7% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) Shoveler: 748 individuals representing at least 1.9% of the wintering Northwestern/Central Europe population (5 year peak mean 1991/2 - 1995/6)	The only SSSI of relevance to these qualifying features (as off-site functional habitat) that could potentially be impacted by this Option is the Chingford Reservoirs. **Chingford Reservoirs SSSI:** Unfavourable (Recovering) 100% Relevant Site Improvement Plan issues: (1) Water pollution (2) Hydrological changes (3) Disturbance (only) (8) Air pollution	<u>Disturbance – noise and visual</u> The William Girling and King George V Reservoirs (which collectively form the Chingford Reservoirs SSSI) are adjacent to the proposed pipeline and reuse plant. Both reservoirs provide important offsite functional habitat for overwintering waterfowl. Potential for disturbance of these species due to construction noise, visual stimuli from the construction workforce and plant on the site, and light pollution as a result of any onsite lighting requirements (considered to be predominantly in the winter) could result in a reduction in foraging and roosting availability. In order to avoid significant effects on the qualifying species, the timing of construction activities with the greatest risk of noise/visual disturbance should be planned to avoid the most sensitive times of the year for wintering bird species (October to March inclusive). The Waterbird Disturbance Mitigation Toolkit[2] showed that effects of disturbance on wintering waterbirds (estuarine) did not tend to extend beyond 250m from the source of the noise, and also derived a generic overview table to calculate the likely disturbance effect for a noise level and the distance required from the source to the receptor allowing for a likely 'acceptable' noise dose of 70dB(A). According to this, any works within 250m of the SPA (or offsite functional habitat) would require the use of plant silencers and visual screening (except where suitable natural screening is identified through habitat survey) to prevent a significant disturbance impact. It is also recognised that, should construction of the pipeline take place during all or part of the winter periods, the works footprint will be visible from the air for a considerable distance and that this change in the local landscape along with the disturbance effect of operating machinery and increased human presence may affect local flight paths of these birds in the short term potentially causing them to avoid valuable foraging and roosting habitat in the vicinity. Assuming a 250m radius from source within which birds could be disturbed, a large proportion of the works would be within this including the pipeline route and site for the permanent treatment works (south east corner of the Deephams site). Baseline noise surveys completed for the Deephams upgrade included a sampling location at the William Girling Reservoir. The main existing noise sources in the area were identified as being from traffic on Meridian Way (A1055) and the London to Cambridge railway, as well as potential noise from the light industrial premises around the site. This recorded ambient noise levels (LAeq) are 53.7dB during the day time (0700-1900) and 50.1dB during the evening (1900-2300). Calculations for the construction works identified that the existing bund of the William Girling Reservoir provided noise attenuation equalling approximately 11dB. Although this offers some mitigation, the noise generated by the demolition and construction for the treatment works will need to be considered and a noise assessment with reference to the Waterbird Disturbance Mitigation Toolkit will need to be completed to demonstrate the mitigation measure are effective at avoiding disturbance before works take place outside the restricted timings. If they aren't, such works will be scheduled to avoid the Oct-March period. These assessments will form part of the detailed design and planning/permit applications and associated HRA to accompany these applications. The recent successful upgrade at Deephams sewage works used similar mitigation measures to protect the designated sites with no adverse effects recorded during that construction work.	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Noise assessment to be completed during the detailed design and planning/permit applications and associated HRA, prior to commencement of works to ensure mitigation measures will be effective (if not, seasonal avoidance to be used). • Detailed noise abatement and visual disturbance mitigation measures to be developed in co-ordination with Natural England, taking account of local site knowledge from the site managers and following professional mitigation guidance, in particular the Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects produced by the Institute of Estuarine and Coastal Studies (IECS) at Hull University. • Sensitive lighting design to be developed following professional guidance to address identified risks relating to light pollution that is applicable to birds in flight, such as that developed by the Institute of Lighting Engineers (Guidance Note 8 Bats and Artificial Lighting, 2018) and others, to ensure no adverse effects on site integrity from light spill.	None

[2] 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.

DESIGNATED SITE: Lee Valley SPA & Ramsar **REF: UK9012111 / UK11034**			**PLAN NAME: Thames Water WRMP 19** **OPTION NAME & REF: Deephams Reuse (RES-RU-DPH & CON-RU-DPH-KGV)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc.**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
				• In combination studies to be conducted to identify the key flight paths of the wintering birds that use the designated site (and associated functional habitat), and an assessment to be made of the impact of the construction activities on these key flight paths. • Agreed mitigation measures to be included in the project-specific HRA of each scheme to support applications for planning permissions and environmental permits. Implementation of planning conditions and/or conditions of relevant environmental permits to be managed through contractual obligations with supervision from an Environmental Clerk of Works appointed by Thames Water.	
	OPERATION PHASE				
	No operational impacts are anticipated. Operational activities will be of a similar nature to those already carried out by Thames Water at the existing Deephams sewage treatment works site (within which this re-use plant will be located) such that birds would be expected to be reasonably habituated to these activities. Depending on the baseline findings of the noise assessment (to be completed during the detailed design and planning/permit applications and associated HRA) additional noise reduction measures would be enacted to ensure that noise levels do not significantly exceed the current baseline such that qualifying feature birds could experience a significant level of disturbance.				

4 In-combination Effects

As this option forms part of a broader programme of proposed schemes, the in-combination effects acting across several options are assessed through the Programme-level HRA. The Programme will also be assessed against other known plans and projects that could have in-combination effects, as agreed with the competent authority.

5 Summary of Adverse Effects on Conservation Objectives

Given the assessment in the 'Assessment of effects on qualifying features' and 'In-combination effects' sections, and assuming that the mitigation outlined therein can be secured, no adverse effects on site integrity or the ability of the site to achieve its conservation objectives are predicted.

6 Additional Mitigation Measures

At this strategic plan level, no additional mitigation measures have been identified; however, it is envisaged that the incorporated mitigation measures will need to be developed in more detail and secured during the project-stage HRA when a detailed design and construction method statement is available.

7 The Integrity Test

If the mitigation measures described in the 'Assessment of effects on quantifying features' section can be imposed and implemented, then it can be reasonably concluded that the proposed Option will not have an adverse effect on the integrity of any SACs, SPAs and Ramsar sites.

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

Ricardo Energy & Environment

Final Water Resources Management Plan Appendix C: Habitats Regulations Assessment – April 2020: Appendix G

Appendix G: Information to Inform an Appropriate Assessment (Habitats Regulations Assessment (HRA) Stage 2) – Culham to Farmoor - 180 Ml/d (chalk streams)

Report for: Thames Water Utilities Limited

ED10169 | Issue Number Final | Date 20/04/2020

Customer:

Thames Water Utilities Ltd

Customer reference:

ED10169

Contact:

Ben Stansfield
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Miriam Westbrook

Approved By:

Ben Stansfield

Date:

20 April 2020

Ricardo Energy & Environment reference:

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1 Introduction

1.1 The overall Plan

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 long-term planning horizon in order to ensure security of supply in each of the water resource zones making up its supply area.

As part of the development of Thames Water's Water Resources Management Plan 2019 (WRMP19), the Habitats Regulations Assessment (HRA) assesses the potential effects of alternative options and programmes on sites designated for their international nature conservation interests. The HRA assessment has been undertaken in parallel with the Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment, and has been used to inform the development of the WRMP19 to ensure its overall compliance with relevant legislation and national water resource planning guidance.

1.2 Legislation summary

Under the Conservation of Habitats and Species Regulations 2017, (the 'Habitats Regulations'), 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 an Appropriate Assessment to determine the implications for the site in view of the site's conservation objectives.

The objective of an Appropriate Assessment is to determine if there will be a significant adverse effect on site integrity, and is dependent on site-specifics, including condition, status and conservation objectives. As described by the HRA Handbook "*A significant effect is any effect that would undermine the conservation objectives for a European site. There must be a causal connection or link between the subject plan or project and the qualifying features of the site which could result in possible significant effects on the site*."

Habitats Regulations Assessment (HRA) refers to the assessment of the potential effects of a development project on one or more European sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). The Government also expects potential SPAs (pSPAs), candidate SACs (cSACs), and any confirmed HRA compensatory habitat to be considered in the same way.

- **Special Areas of Conservation (SACs)** are designated under the Habitats Directive (92/43/EEC) and target particular habitats (Annex 1) and/or species (Annex II) identified as being of European importance.

- **Special Protection Areas (SPAs)** are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC) (the 'Wild Birds Directive') for the protection of wild birds and their habitats (including particularly rare and vulnerable species listed in Annex 1 of the Directive, and migratory species).

The UK Government has also advised that Ramsar sites should be considered and included within the assessment[1]:

- **Ramsar sites** support internationally important wetland habitats and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

1 Department for Communities and Local Government (2012) National Planning Policy Framework.

For ease of reference during HRA, these three designations are collectively referred to as 'European sites', despite Ramsar designations being at the wider international level, and are also known as 'Natura 2000' sites.

1.3 The proposed Option

The Option proposes a new raw water transfer from the River Thames at Culham to an existing raw water reservoir at Farmoor. The scope of works involves:

- Intake at Culham with two screens and a pumping station
- Standby generator for one pump
- 14.9km raw water transfer pipeline (1200mm diameter) with discharge into Farmoor Reservoir

1.4 Potentially affected European/Ramsar designated sites

The European sites, the qualifying features and the reasons they could be impacted by the Option are detailed below:

- Cothill Fen SAC: The new pipeline runs within approximately 90m of the SAC to the north west at its closest point.

Any designated sites which were screened out (see Section 2) during HRA Stage 1 (see Appendix 1) due to there being no Likely Significant Effect (LSE), are not included in this Stage 2 assessment. Refer to Appendix A for the Stage 1 Assessment. For those designated sites that are included in this Stage 2 report, any of their qualifying features screened-out in Stage 1 due to no LSE are also omitted here, but are detailed in Appendix A.

1.5 Purpose of this report

The purpose of this report is to provide the necessary information to allow the Competent Authority to determine if the proposals within this Plan will have a significant adverse effect on the integrity of the designated site(s) identified in Section 1.4 above. A summary of the HRA process that informs this purpose is provided in Section 2 below.

2 Methodology

2.1 Sources of guidance

The approach to informing the Appropriate Assessment has been developed from the legislation described in Section 1.2 above and informed by the latest guidance for HRA in the UK, namely:

- Tyldesley, D. and Chapman C. The Habitats Regulations Assessment Handbook. Published and updated online by DTA Publications Limited: http://www.dtapublications.co.uk/handbooks. The Handbook is informed and regularly updated with amendments to the Regulations, the latest Government guidance and case law.
- DEFRA (2012) The Habitats and Wild Birds Directives in England and its seas - Core guidance for developers, regulators & land/marine managers (draft for public consultation)

2.2 Stages of HRA

Stage 1 in HRA is a **Screening** stage to determine whether any part of the proposed Option is likely to have a significant effect on any European site, and thus if a full Appropriate Assessment of the project is required.

Stage 2 is the **Appropriate Assessment** stage (if required) that has to conclude whether or not the option will adversely affect the integrity of the European site in question. This is judged in terms of the likely impact on a site's conservation objectives. The conservation objectives specify the overall target for a site's 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated) in order for it to contribute to maintaining or reaching favourable conservation status. Significantly, HRA is based on a rigorous application of the precautionary principle.

If significant adverse effects are identified at the Appropriate Assessment stage, feasible **alternative options** would be examined to avoid or reduce any potential significant effects on the integrity of the European site as **Stage 3** of the HRA if it is deemed that the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI). The selection of such alternatives is limited to those which would meet the objectives of the current Option.

Stage 4 comprises an **assessment of compensatory measures** where the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI).

2.3 Responsibility for undertaking HRA

The responsibility for undertaking HRA lies with the competent authority, i.e. the authority (or authorities) responsible for granting a licence or consent for the Option. Under the Habitats Regulations, the applicant has an obligation to provide the competent authorities with such information as the authority may reasonably require for the purposes of the assessment, or to enable them to determine whether an Appropriate Assessment is required.

2.4 Approach to informing the Appropriate Assessment (HRA Stage 2)

2.4.1 Consultation

Consultation, via meetings and correspondence, has been undertaken with Natural England and the Environment Agency during the screening stage of this HRA (HRA Stage 1). This has helped to

determine which potential effects require more detailed, appropriate assessment provided by HRA Stage 2, as presented in this report.

2.4.2 Impact assessment

This assessment considers the potentially damaging aspects of the proposed Option with potential effects on a European site's qualifying features and likely achievement of the conservation objectives.

The potential for adverse effect on the integrity of the site depends on the scale and magnitude of the action and its predicted impacts, taking into account the distribution of the designated 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.

Where qualitative and/or quantitative information is available, this has been used to inform the assessment. Where this information is not available, professional judgement has been used. In some cases, the ecological functioning of the site and the likely effects are well understood and documented elsewhere, for instance in studies commissioned to inform the Habitats Directive Review of Consents. In these cases, the assessment may simply comprise a review of this information. Where there is not sufficient information to undertake the assessment, this is recorded in this report.

This report aims to set out, in sufficient detail for it to be transparent and understandable, what the effects of the proposed Option (alone and in-combination) are likely to be on each internationally-designated site's qualifying feature, referring to relevant background documents and other information on which these judgements, which are essentially ecological judgements, rely. Guidance states that the size or complexity of the HRA Stage 2 report to inform the Appropriate Assessment will not necessarily reflect the scale of the proposed Option, but rather the complexity of potential effects. The length of the report may not reflect the complexity of ecological judgements made to arrive at the necessary conclusions. Very complex ecological analysis and judgements may be expressed succinctly, with detailed supporting analyses contained in appendices or clearly referenced separate documents.

2.4.3 Mitigation measures

Following the People Over Wind ruling, no mitigation measures can be considered to be incorporated, and therefore used at Stage 1 Screening to avoid Likely Significant Effects. The HRA Stage 2 assessment of effects therefore considers mitigation measures separately. The assessment takes into account any mitigation measures that may already form part of the proposed Option specification (i.e. that are 'incorporated'), to determine whether they will most likely reduce the likelihood, magnitude, scale, and/or duration of the effect to a lower level. These measures can include both avoidance and reduction measures, with the former being the preferred option.

2.4.4 In-combination assessment

In accordance with the legislation, an in-combination assessment with other WRMP Options at the Programme level has been undertaken. The approach to this is described as a series of steps below:

- **STEP 1** – Does the Option have no discernible effect, whatsoever, on the European site? If not, then there's no need for in-combination assessment, as logic dictates it can't have in-combination effects.
- **STEP 2** – Does this Option have a discernible effect, but one which is not significantly adverse to site integrity alone? If so, then an in-combination assessment is required. (Effects that are adverse alone do not require in-combination assessment.)
- **STEP 3** – Identify the other Options/Plans/Projects that also have discernible effects that (1) aren't an adverse effect alone but (2) might act in combination with effects of your Option/Plan/Project. It is normal practice to agree this list of potential in-combination Plans/Projects with the Competent Authority before doing the assessment.

- **STEP 4 –** Assess these other Options/Plans/Projects in combination with this Plan.

The above steps recognise that significant adverse effects acting alone are already dealt with for that Option and should not form part of an in-combination assessment. It is only where effects that may *become adverse when acting in combination* that require an in-combination assessment.

Equally, in accordance with best-practice guidance, any projects or plans which have been completed, consented and implemented are considered to be part of the baseline (and should have been subject to their own HRA before being consented and implemented). Therefore, these will not be included as part of any in-combination assessment, but any ongoing operational effects will be noted as part of the baseline environment.

2.4.5 Conservation objectives

The Habitats Regulations require that the Appropriate Assessment is of "the implications for the site in view of that site's conservation objectives." The development of conservation objectives is required by the 1992 'Habitats' Directive (92/43/EEC). In accordance with the Habitats Directive, the objectives aim to achieve the 'favourable conservation status' of the habitat and species features for which SAC is designated (see Figure 1).

Site-specific conservation objectives for SACs have been developed by Natural England and provide a description of what is considered to be the favourable conservation status of the feature within the whole plan area.

Figure 2.1 Favourable conservation status as defined in Articles 1(e) and 1(i) of the Habitats Directive

"The conservation status of a natural ***habitat*** *is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:*

- *Its natural range and areas it covers within that range are stable or increasing, and*
- *The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and*
- *The conservation status of its typical species is favourable.*

The conservation status of a ***species*** *is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:*

- *Population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and*
- *There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."*

The generic conservation objectives covering all the European sites assessed in this report are:

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.

2.4.6 Additional mitigation measures

Where the Option has been assessed as having a significant adverse effect by undermining the site's conservation objectives, additional mitigation may be necessary to satisfy the integrity test (Section 2.4.7). Such mitigation is that which is in addition to the incorporated measures described in Section 2.4.3 above, and which is usually imposed by a Competent Authority through enforceable conditions or restrictions.

2.4.7 Integrity test

The integrity test is the conclusion of the Appropriate Assessment and requires the competent authority to ascertain whether the proposed Option (either alone or in-combination with other plans or projects), will not have an 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"

This report will conclude with a professional opinion on whether such a test can be met, but it is for the Competent Authority to make that decision in light of the information presented.

2.5 Limitations

Information provided by third parties, including publicly available information and databases, is considered correct at the time of publication. 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 Option.

The HRA has been undertaken in as detailed a way as possible, using all available data sources where they exist. However, the conclusions drawn from this are 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.

3 Assessment of Effects on Qualifying Features

The potential effects of the proposed Option (acting alone) on each qualifying feature of the designated site(s) previously identified as having likely significant effects during the Stage 1 screening are detailed below in **Table 3.1.** Both construction phase (where applicable) and operation phase of the Option are assessed.

Table 3-1 Assessment of effects on Cothill Fen SAC

DESIGNATED SITE: Cothill Fen SAC **REF: UK0012889**			**PLAN NAME: Thames Water WRMP 19** **OPTION NAME & REF: Culham to Farmoor - 180 ML/D (chalk streams) (CON-RWS-CUL-FMR-180)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc.**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
	CONSTRUCTION PHASE				
H7230 Alkaline fens **H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)**	**Alkaline fens** This lowland valley mire contains one of the largest surviving examples of alkaline fen vegetation in central England, a region where fen vegetation is rare. The M13 *Schoenus nigricans – Juncus subnodulosus* vegetation found here occurs under a wide range of hydrological conditions, with frequent bottle sedge *Carex rostrata*, grass-of-Parnassus *Parnassia palustris*, common butterwort *Pinguicula vulgaris* and marsh helleborine *Epipactis palustris*. The alkaline fen vegetation forms transitions to other vegetation types that are similar to M24 *Molinia caerulea – Cirsium dissectum* fen-meadow and S25 *Phragmites australis – Eupatorium cannabinum* tall-herb fen and wet alder *Alnus* spp. wood. **Alluvial forests** Clearance of riverine woodland has eliminated most true alluvial forests in the UK. Many surviving fragments, as elsewhere in Europe, are fragmentary and often of recent origin. Residual alder woods frequently occur in association with other woodland types or with other wetland habitats such as fens.	The only SSSI of relevance to these qualifying features that could potentially be impacted by this Option is the Cothill Fen SSSI. **Cothill Fen SSSI:** Favourable 65.22% Unfavourable (Recovering) 34.78% Relevant Site Improvement Plan issues: (1) Water pollution (2) Hydrological changes (3) Air pollution	<u>Hydrological changes</u> The pipeline has been re-routed since the draft WRMP19 so that it runs to the west of the groundwater divide near to the SAC, from which the groundwater flows east and west (east towards Cothill Fen), in order to avoid impacts to groundwater flows towards the SAC. As groundwater data around Cothill Fen SAC are limited, a groundwater survey of the site would be required to confirm the exact location of the groundwater divide and ensure the pipeline is routed to the west of the divide to avoid impact on groundwater flow to the SAC.	• Groundwater survey of the site to confirm exact location of the groundwater divide and minor rerouting of the pipeline if required to avoid impacts to groundwater flow.	None
	OPERATION PHASE				
H7230 Alkaline fens **H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)**	**Alkaline fens** This lowland valley mire contains one of the largest surviving examples of alkaline fen vegetation in central England, a region where fen vegetation is rare. The M13 *Schoenus nigricans – Juncus subnodulosus* vegetation found here occurs under a wide range of hydrological conditions, with frequent bottle sedge *Carex rostrata*, grass-of-Parnassus *Parnassia palustris*, common butterwort *Pinguicula vulgaris* and marsh helleborine *Epipactis palustris*. The alkaline fen vegetation forms transitions to other vegetation types that are similar to M24 *Molinia caerulea – Cirsium dissectum* fen-meadow and S25 *Phragmites australis – Eupatorium cannabinum* tall-herb fen and wet alder *Alnus* spp. wood. **Alluvial forests** Clearance of riverine woodland has eliminated most true alluvial forests in the UK. Many surviving fragments, as elsewhere in Europe,	The only SSSI of relevance to these qualifying features that could potentially be impacted by this Option is the Cothill Fen SSSI. **Cothill Fen SSSI:** Favourable 65.22% Unfavourable (Recovering) 34.78% Relevant Site Improvement Plan issues: (4) Hydrological changes	<u>Hydrological changes</u> There is potential for the operation of the Option to impact groundwater flows to the SAC. The pipeline route would run broadly along the groundwater divide near to the SAC, from which the groundwater flows east and west (east towards Cothill Fen). Existing boreholes adjacent to the proposed pipeline route have recorded the groundwater level at 4.5m below ground level. The proposed pipeline would be constructed at a depth less than 2.5m below ground level (possibly only to 1.5m deep) and would therefore not interfere with groundwater levels or movement towards Cothill Fen. In addition, the pipeline would be backfilled with gravel to help maintain the permeability around the pipeline. If constructed in this way, the pipeline component of this option element is not considered likely to present a material obstruction to either infiltration or groundwater flow to Cothill Fen.	• Backfill pipe with gravel to maintain permeability around the pipeline.	None

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DESIGNATED SITE: Cothill Fen SAC REF: UK0012889			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Culham to Farmoor - 180 ML/D (chalk streams) (CON-RWS-CUL-FMR-180)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc.**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
	are fragmentary and often of recent origin. Residual alder woods frequently occur in association with other woodland types or with other wetland habitats such as fens.				

Ref: Ricardo/ED10169/Issue Number Final

4 In-combination Effects

As this option forms part of a broader programme of proposed schemes, the in-combination effects acting across several options are assessed through the Programme-level HRA. The Programme will also be assessed against other known plans and projects that could have in-combination effects, as agreed with the competent authority.

5 Summary of Adverse Effects on Conservation Objectives

Given the assessment in the ‘Assessment of effects on qualifying features’ and ‘In-combination effects’ sections, and assuming that the mitigation outlined therein can be secured, no adverse effects on site integrity or the ability of the site to achieve its conservation objectives are predicted.

6 Additional Mitigation Measures

At this strategic plan level, no additional mitigation measures have been identified; however, it is envisaged that the incorporated mitigation measures will need to be developed in more detail and secured during the project-stage HRA when a detailed design and construction method statement is available.

7 The Integrity Test

If the mitigation measures described in the ‘Assessment of effects on quantifying features’ section can be imposed and implemented, then it can be reasonably concluded that the proposed Option will not have an adverse effect on the integrity of any SACs, SPAs and Ramsar sites.

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

Ricardo Energy & Environment

Habitats Regulations Assessment

Appendix H: Information to Inform an Appropriate Assessment (Habitats Regulations Assessment (HRA) Stage 2) – Severn Thames Transfer

Report for: Thames Water Utilities Limited

ED10169 | Issue Number Final | Date 20/04/2020

Customer:

Thames Water Utilities Ltd

Customer reference:

ED10169

Contact:

Ben Stansfield
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Miriam Westbrook

Approved By:

Ben Stansfield

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1 Introduction

1.1 The overall Plan

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 long-term planning horizon in order to ensure security of supply in each of the water resource zones making up its supply area.

As part of the development of Thames Water's Water Resources Management Plan 2019 (WRMP19), the Habitats Regulations Assessment (HRA) assesses the potential effects of alternative options and programmes on sites designated for their international nature conservation interests. The HRA assessment has been undertaken in parallel with the Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment and has been used to inform the development of the WRMP19 to ensure its overall compliance with relevant legislation and national water resource planning guidance.

1.2 Legislation summary

Under the Conservation of Habitats and Species Regulations 2017, (the 'Habitats Regulations'), 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 an Appropriate Assessment to determine the implications for the site in view of the site's conservation objectives.

The objective of an Appropriate Assessment is to determine if there will be a significant adverse effect on site integrity, and is dependent on site-specifics, including condition, status and conservation objectives. As described by the HRA Handbook "*A significant effect is any effect that would undermine the conservation objectives for a European site. There must be a causal connection or link between the subject plan or project and the qualifying features of the site which could result in possible significant effects on the site*."

Habitats Regulations Assessment (HRA) refers to the assessment of the potential effects of a development project on one or more European sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). The Government also expects potential SPAs (pSPAs), candidate SACs (cSACs), and any confirmed HRA compensatory habitat to be considered in the same way.

- **Special Areas of Conservation (SACs)** are designated under the Habitats Directive (92/43/EEC) and target particular habitats (Annex 1) and/or species (Annex II) identified as being of European importance.

- **Special Protection Areas (SPAs)** are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC) (the 'Wild Birds Directive') for the protection of wild birds and their habitats (including particularly rare and vulnerable species listed in Annex 1 of the Directive, and migratory species).

The UK Government has also advised that Ramsar sites should be considered and included within the assessment[1]:

- **Ramsar sites** support internationally important wetland habitats and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

1 Department for Communities and Local Government (2012) National Planning Policy Framework.

For ease of reference during HRA, these three designations are collectively referred to as 'European sites', despite Ramsar designations being at the wider international level, and are also known as 'Natura 2000' sites.

1.3 The proposed Option

The Option proposes the transfer of water from the Severn catchment to the River Thames in order to meet the future needs of customers supplied by Thames Water in the wider South East. The option comprises a number of different elements.

1. Release of water (60Ml/d) from Lake Vyrnwy reservoir, an existing reservoir in Mid Wales, into the Afon Vyrnwy (a tributary of the River Severn) for regulation of flow in the River Severn for downstream re-abstraction from the Severn at Deerhurst (and subsequent transfer into the River Thames to supply Thames Water).
2. Using 15 MLD of the unused part of the existing Severn Trent Water abstraction licence at Mythe intake to be left in the River Severn for abstraction downstream at Deerhurst by Thames Water.
3. Redeployment of an existing Severn Trent Water abstraction at Shrewsbury on the River Severn. Abstraction at Shrewsbury currently serves Severn Trent Water customers in Shrewsbury and Oswestry. United Utilities and Severn Trent Water have offered to provide an alternative supply to Oswestry and Shrewsbury, thereby reducing abstraction from the upper River Severn at Shrewsbury and leaving water in the river for abstraction at Deerhurst.
4. Transfer of 35 MLD of final effluent from Netheridge Sewage Treatment Works to the River Severn downstream of the proposed water intake at Deerhurst to replace water abstracted to the Severn Thames Transfer Deerhurst Pipeline Conveyance. Note that despite this transfer of final effluent from Netheridge STW, some discharge will remain under Dry Weather Flow conditions. The consented Dry Weather Flow at Netheridge is 42.8 Ml/d.
5. A new supported conveyance pipeline from Deerhurst on the River Severn to Culham on the River Thames with a 300 MLD capacity and a total length of 88km. Key components of the conveyance include:
    - River intake structure at Deerhurst including inlet screens and a twin pipeline to a low lift pump station;
    - Raw water low lift pump station and a twin pipeline to the water treatment works;
    - Water treatment works;
    - Treated water high lift pump station;
    - 88km of pipeline including rising main and gravity main;
    - Break pressure tank;
    - Outfall at Culham with an actuated valve and an aeration cascade;
    - Washouts along the route provided with permanent discharge pipework to adjacent watercourses; and
    - A tee off the main pipeline for SWOX supply.

This report assesses the proposed impacts of the construction and operation of all the transfer elements.

1.4 Potentially affected European/Ramsar designated sites

The European sites, the qualifying features and the reasons they could be impacted by the Option are detailed below:

- Severn Estuary SAC, SPA & Ramsar: Off-site functional habitat for the three anadromous fish species (river lamprey, sea lamprey and twaite shad) that form qualifying features of the SAC could potentially be affected along the Severn between the river intake at Deerhurst and the European Marine Site by both construction and operation of the Option. Although the proposed option is located 23.9km from the designated site, it is anticipated that operation of the abstraction has the potential impact downstream habitats even at this distance.

Any designated sites which were screened out (see Section 2) during HRA Stage 1 (see Appendix 1) due to there being no Likely Significant Effect (LSE), are not included in this Stage 2 assessment. Refer to Appendix A for the Stage 1 Assessment. For those designated sites that are included in this Stage 2

report, any of their qualifying features screened-out in Stage 1 due to no LSE are also omitted here, but are detailed in Appendix A.

1.5 Purpose of this report

The purpose of this report is to provide the necessary information to allow the Competent Authority to determine if the proposals within this Plan will have a significant adverse effect on the integrity of the designated site(s) identified in Section 1.4 above. A summary of the HRA process that informs this purpose is provided in Section 2 below.

1.6 Previous studies: WRMP09 and WRMP14

A Public Inquiry was held on Thames Water's WRMP09 between June and August 2010. Participants in the Inquiry questioned Thames Water's decision to omit certain options, namely the Severn Thames Transfer schemes from consideration on the basis that they would require AA under the Habitats Regulations. Thames Water agreed to carry out an AA of these options prior to the WRMP14 being prepared.

A Stage 2 Appropriate Assessment was completed in 2014[2] for a variety of options being considered for WRMP14. The Preferred Programme did not select any of the Severn Thames Transfer options for inclusion.

Further work was completed in 2016/2017[3] to look at the potential effects of changes to water quality and the impact to ecological receptors if the option were to be implemented. However, the focus of this study was on the impacts to the River Thames, rather than the Severn Estuary, regarding the water quality and hydroecological implications of transferring water between the two catchments.

The scope and findings of both assessments have been used to inform this Appropriate Assessment, and the assumptions used are detailed in Section 3.1.1.

[2] Thames Water (2014) Severn to Thames Transfer Options: Report to inform the Appropriate Assessment
[3] Thames Water (2016), Severn Thames Transfer: Water Quality and Ecology Assessment - Phase 2: Main Project Report (issued October 2016). Report by Cascade Consulting and HR Wallingford on behalf of Thames Water.

2 Methodology

2.1 Sources of guidance

The approach to informing the Appropriate Assessment has been developed from the legislation described in Section 1.2 above and informed by the latest guidance for HRA in the UK, namely:

- Tyldesley, D. and Chapman C. The Habitats Regulations Assessment Handbook. Published and updated online by DTA Publications Limited: http://www.dtapublications.co.uk/handbooks. The Handbook is informed and regularly updated with amendments to the Regulations, the latest Government guidance and case law.
- DEFRA (2012) The Habitats and Wild Birds Directives in England and its seas - Core guidance for developers, regulators & land/marine managers (draft for public consultation)

2.2 Stages of HRA

Stage 1 in HRA is a **Screening** stage to determine whether any part of the proposed Option is likely to have a significant effect on any European site, and thus if a full Appropriate Assessment of the project is required.

Stage 2 is the **Appropriate Assessment** stage (if required) that has to conclude whether or not the option will adversely affect the integrity of the European site in question. This is judged in terms of the likely impact on a site's conservation objectives. The conservation objectives specify the overall target for a site's 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated) in order for it to contribute to maintaining or reaching favourable conservation status. Significantly, HRA is based on a rigorous application of the precautionary principle.

If significant adverse effects are identified at the Appropriate Assessment stage, feasible **alternative options** would be examined to avoid or reduce any potential significant effects on the integrity of the European site as **Stage 3** of the HRA if it is deemed that the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI). The selection of such alternatives is limited to those which would meet the objectives of the current Option.

Stage 4 comprises an **assessment of compensatory measures** where the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI).

2.3 Responsibility for undertaking HRA

The responsibility for undertaking HRA lies with the competent authority, i.e. the authority (or authorities) responsible for granting a licence or consent for the Option. Under the Habitats Regulations, the applicant has an obligation to provide the competent authorities with such information as the authority may reasonably require for the purposes of the assessment, or to enable them to determine whether an Appropriate Assessment is required.

2.4 Approach to informing the Appropriate Assessment (HRA Stage 2)

2.4.1 Consultation

Consultation, via meetings and correspondence, has been undertaken with Natural England and the Environment Agency during the screening stage of this HRA (HRA Stage 1). This has helped to determine which potential effects require more detailed, appropriate assessment provided by HRA Stage 2, as presented in this report.

2.4.2 Impact assessment

This assessment considers the potentially damaging aspects of the proposed Option with potential effects on a European site's qualifying features and likely achievement of the conservation objectives.

The potential for adverse effect on the integrity of the site depends on the scale and magnitude of the action and its predicted impacts, taking into account the distribution of the designated 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.

Where qualitative and/or quantitative information is available, this has been used to inform the assessment. Where this information is not available, professional judgement has been used. In some cases, the ecological functioning of the site and the likely effects are well understood and documented elsewhere, for instance in studies commissioned to inform the Habitats Directive Review of Consents. In these cases, the assessment may simply comprise a review of this information. Where there is not sufficient information to undertake the assessment, this is recorded in this report.

This report aims to set out, in sufficient detail for it to be transparent and understandable, what the effects of the proposed Option (alone and in-combination) are likely to be on each internationally-designated site's qualifying feature, referring to relevant background documents and other information on which these judgements, which are essentially ecological judgements, rely. Guidance states that the size or complexity of the HRA Stage 2 report to inform the Appropriate Assessment will not necessarily reflect the scale of the proposed Option, but rather the complexity of potential effects. The length of the report may not reflect the complexity of ecological judgements made to arrive at the necessary conclusions. Very complex ecological analysis and judgements may be expressed succinctly, with detailed supporting analyses contained in appendices or clearly referenced separate documents.

2.4.3 Mitigation measures

Following the People Over Wind ruling, no mitigation measures can be considered to be incorporated, and therefore used at Stage 1 Screening to avoid Likely Significant Effects. The HRA Stage 2 assessment of effects therefore considers mitigation measures separately. The assessment takes into account any mitigation measures that may already form part of the proposed Option specification (i.e. that are 'incorporated'), to determine whether they will most likely reduce the likelihood, magnitude, scale, and/or duration of the effect to a lower level. These measures can include both avoidance and reduction measures, with the former being the preferred option.

2.4.4 In-combination assessment

In accordance with the legislation, an in-combination assessment with other WRMP Options at the Programme level has been undertaken. The approach to this is described as a series of steps below:

- **STEP 1** – Does the Option have no discernible effect, whatsoever, on the European site? If not, then there's no need for in-combination assessment, as logic dictates it can't have in-combination effects.
- **STEP 2** – Does this Option have a discernible effect, but one which is not significantly adverse to site integrity alone? If so, then an in-combination assessment is required. (Effects that are adverse alone do not require in-combination assessment.)
- **STEP 3** – Identify the other Options/Plans/Projects that also have discernible effects that (1) aren't an adverse effect alone but (2) might act in combination with effects of your Option/Plan/Project. It is normal practice to agree this list of potential in-combination Plans/Projects with the Competent Authority before doing the assessment.
- **STEP 4 –** Assess these other Options/Plans/Projects in combination with this Plan.

The above steps recognise that significant adverse effects acting alone are already dealt with for that Option and should not form part of an in-combination assessment. It is only where effects that may *become adverse when acting in combination* that require an in-combination assessment.

Equally, in accordance with best-practice guidance, any projects or plans which have been completed, consented and implemented are considered to be part of the baseline (and should have been subject to their own HRA before being consented and implemented). Therefore, these will not be included as part of any in-combination assessment, but any ongoing operational effects will be noted as part of the baseline environment.

2.4.5 Conservation objectives

The Habitats Regulations require that the Appropriate Assessment is of "the implications for the site in view of that site's conservation objectives." The development of conservation objectives is required by the 1992 'Habitats' Directive (92/43/EEC). In accordance with the Habitats Directive, the objectives aim to achieve the 'favourable conservation status' of the habitat and species features for which SAC is designated (see Figure 1).

Site-specific conservation objectives for SACs have been developed by Natural England and provide a description of what is considered to be the favourable conservation status of the feature within the whole plan area.

Figure 2.1 Favourable conservation status as defined in Articles 1(e) and 1(i) of the Habitats Directive

"The conservation status of a natural ***habitat*** *is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:*

- *Its natural range and areas it covers within that range are stable or increasing, and*
- *The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and*
- *The conservation status of its typical species is favourable.*

The conservation status of a ***species*** *is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:*

- *Population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and*
- *There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."*

The generic conservation objectives covering all the European sites assessed in this report are:

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.

2.4.6 Additional mitigation measures

Where the Option has been assessed as having a significant adverse effect by undermining the site's conservation objectives, additional mitigation may be necessary to satisfy the integrity test (Section 2.4.7). Such mitigation is that which is in addition to the incorporated measures described in Section 2.4.3 above, and which is usually imposed by a Competent Authority through enforceable conditions or restrictions.

2.4.7 Integrity test

The integrity test is the conclusion of the Appropriate Assessment and requires the competent authority to ascertain whether the proposed Option (either alone or in-combination with other plans or projects), will not have an 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"

This report will conclude with a professional opinion on whether such a test can be met, but it is for the Competent Authority to make that decision in light of the information presented.

2.5 Limitations

Information provided by third parties, including publicly available information and databases, is considered correct at the time of publication. 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 Option.

The HRA has been undertaken in as detailed a way as possible, using all available data sources 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.

3 Assessment of Effects on Qualifying Features

The potential effects of the proposed Option (acting alone) on each qualifying feature of the designated site(s) previously identified as having likely significant effects during the Stage 1 screening are detailed below in **Table 3.1.** Both construction phase (where applicable) and operation phase of the Option are assessed.

3.1 Previous Assessment Work

3.1.1 Scope of 2014 Appropriate Assessment

The scope of the Appropriate Assessment (2014) is summarised in **Table 3-1**. This provides details of the susceptibility of the qualifying features of the Severn Estuary SAC, SPA and Ramsar site to the potential hazards brought about by an abstraction at Deerhurst.

Table 3-1 Vulnerability of Qualifying Features to Effects of Plan

Feature	Vulnerability to effects of Plan							
	Siltation and deposition	Impedance of movement	Entrapment and impingement	Noise and vibration	Salinity regime changes	Temp. changes	Reduced dissolved oxygen	Change to dilution of pollutants
Severn Estuary SAC								
Estuaries	✓	✓	✓	✓	✓	✓	✓	✓
Subtidal sandbanks	✓				✓	✓	✓	✓
Mudflats and sandflats	✓				✓	✓	✓	✓
Atlantic saltmeadow	✓				✓	✓	✓	✓
Reefs	✓				✓	✓	✓	✓
Hard substrate habitats[1]	✓				✓	✓	✓	✓
Migratory fish (river lamprey, sea lamprey, twaite shad)	✓	✓	✓	✓	✓	✓	✓	✓
Severn Estuary SPA								
Annex 1 species (Bewick's swan and European white-fronted goose) and regularly occurring migratory species (dunlin, redshank, shelduck, gadwall)	✓			✓	✓	✓	✓	✓
Severn Estuary Ramsar								
Migratory fish (allis shad, salmon, sea trout and eel)	✓	✓	✓	✓	✓	✓	✓	✓
Estuarine, marine and freshwater fish species assemblage	✓	✓	✓	✓	✓	✓	✓	✓

✓= potentially vulnerable and may require assessment.
[1] = although being considered separately for the purposes of the AA, the hard substrate habitat is not a feature in its own right; it is a sub-feature of the estuary feature.

The option variants that the 2014 Appropriate Assessment considered, which are relevant to WRMP19, are as follows:

- Unsupported abstraction at Deerhurst – 300Ml/d
- Supported abstraction at Deerhurst (Longdon Marsh reservoir) – 300Ml/d.

It should be noted that the supported abstraction using Vyrnwy Reservoir and Netheridge as proposed in WRMP19 was not specifically assessed in the 2014 Appropriate Assessment. The supported option in the 2014 Appropriate Assessment considered an option using a new reservoir at Longdon Marsh. Impacts were screened out as transfers to the Thames catchment were to take place via pipeline direct from the reservoir. In this case, the only potential for effects would be during refill of the reservoir, which would be undertaken at times of higher river flow, not during dry periods.

The 2014 Appropriate Assessment had one unconfirmed effect in it –"*the migration of adult river lamprey immigration with supported transfers*". This was considered as part of the Severn Thames Transfer Phase 2 Water Quality and Ecology Assessment and concluded to be a negligible impact at that time. Supported and phased pipeline transfers carry a minor risk of temporarily disrupting sea lamprey migration in April to May during low flow condition by causing additional flow to pass over Upper Lode Weir on the River Severn, which may affect the ability of sea lamprey to pass the weir for short infrequent periods. Further assessment of this impact has been completed as part of the WRMP19 work.

3.1.2 Flow Assumptions

The flow assumptions that were used in the 2014 Appropriate Assessment, and the validity to the WRMP19 option are discussed below.

- Sweetening flows will be required to avoid deoxygenation when the pipeline is standing unused but full of water. The current proposals do not include for a sweetening flow. When the pipeline is not in use it will be mothballed. It has been assumed that the main pipeline will be drained, instead of left full or running at sweetening flows. The issue needs to be reviewed in later design stages. Recommissioning lagoon: It has been assumed that the first flush of water during recommissioning would require treatment and the recommissioning lagoon is provided for this purpose;
- The Hands-Off Flows (HOFs) agreed for River Severn at Deerhurst will be complied with in relation to transfers for water resources purposes (i.e. no transfers will take place if the river flow at Deerhurst is less than 1800Ml/d and transfers will be limited to less than 240Ml/d if the flow in the River Severn at Deerhurst is less than 2490Ml/d). The HoFs remain applicable to WRMP19.
- Abstractions for direct transfer will not take place when River Severn flows at Deerhurst exceed 8700Ml/d (in order to avoid transfer of very silty water to the Thames). This is still applicable for WRMP19.

3.1.3 Significance of Effects

To determine the significance of flow reductions, the 2014 Appropriate Assessment produced flow duration curves for two locations on the River Severn, Deerhurst (upstream of Gloucester) and Hock Cliff (downstream of Gloucester where the flow enters the estuary). These locations were chosen to be consistent with those used in the Environment Agency's Severn Estuary Review of Consents[4]. The Water Framework Directive's Good Ecological Status targets **(Table 3-2)** were then applied to the flow data, and these compared with the influenced flows modelled from a combination of scenarios (to include climate change, sustainability reductions, etc) to determine whether there is a significant effect and the extent of sensitivity from the additional scenarios.

[4] Environment Agency (2009) Severn Estuary SPA & cSAC Habitats Directive Review of Consents: Proforma for Stage 3 Appropriate Assessment Part 1: Sections A-E.

Table 3-2 Proposed Standards for Main River Inflows at Good Ecological Status

Flow Threshold:	**High and moderate flow** (flows greater than naturalised Q60)	**Moderate – low flow** (flows between naturalised Q60 and Q70)	**Low flow** (flows between naturalised Q70 and Q95)	**Extreme low flow** (flows less than naturalised Q95)
High sensitivity	40%	35%	30%	25%
Medium sensitivity	45%	40%	35%	30%
Low sensitivity	50%	45%	40%	35%

NB: The percentage is the difference from the naturalised Q statistics stated

Table 3-3 Assessment of effects on Severn Estuary SAC

DESIGNATED SITE: Severn Estuary SAC **REF: UK0013030 / UK9015022 / UK11081**			**PLAN NAME: Thames Water WRMP 19** **OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[5].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
CONSTRUCTION PHASE					
H1130 Estuaries	The UK has over 90 **estuaries**. They are widely distributed around the coast but there are few examples in some areas, such as Northern Ireland and western Scotland.	The main constituent SSSI is the Severn Estuary SSSI. This is 95.80% favourable, 0.08% unfavourable-recovering and 2.43% unfavourable no change. The upper estuary is generally in favourable condition, with units downstream of the power station failing due to coastal squeeze and sea defences. There is a total of 14 other constituent SSSIs, which vary considerably in their current degree of favourability. Relevant Site Improvement Plan issues: (2) Physical modification threat (3) Impacts of development (7) Water pollution (12) Invasive non-native species	<u>Invasive species</u> Exposure of topsoil and movement of construction vehicles could result in the spread of invasive and non-native vegetation. Best practice construction and biosecurity measures to guard against the spread of invasive non-native species, such as New Zealand pygmyweed, *Crassula helmsii*, would be employed as standard. <u>Water pollution</u> Topsoil stripping and excavation works have potential for indirect adverse effects from pollution from site run-off and accidental pollution, such as oil spills, which could cause downstream habitat degradation in the short-term. Due to the distance from the Option to the designated site (approximately 23.9km), there are unlikely to be significant adverse effects to water quality as a result of construction.	• Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction. • Adherence to EA Pollution Prevention Guidelines (now formally withdrawn but still relevant and useful) • Best practice construction methods.	No adverse effect on integrity
H1140 Mudflats and sandflats not covered by seawater at low tide	**Mudflats and sandflats not covered by sea water at low tide** occur widely throughout the UK.				
H1330 Atlantic salt meadows	**Atlantic salt meadows** occur on North Sea, English Channel and Atlantic shores. There are more than 29,000 ha of the habitat type in the UK, mostly in the large, sheltered estuaries of south-east, south-west and north-west England and in south Wales. Smaller areas of saltmarsh are found in Scotland.				
1110 Sandbanks which are slightly covered by seawater at all times	**Sandbanks which are slightly covered by sea water all the time** consist of sandy sediments that are permanently covered by shallow sea water, typically at depths of less than 20 m below chart datum (but sometimes including channels or other areas greater than 20 m deep). The habitat comprises distinct banks (i.e. elongated, rounded or irregular 'mound' shapes) which may arise from horizontal or sloping plains of sandy sediment.				
H1170 Reefs	**Reefs** occur widely around the UK coast, and are found in both inshore and offshore waters. There is a far greater range and extent of rocky reefs than biogenic concretions. Only a few invertebrate species are able to develop on biogenic reefs, and these have a restricted distribution and extent in the UK.				
OPERATION PHASE					
H1130 Estuaries	The UK has over 90 **estuaries**. They are widely distributed around the coast but there are few examples in some areas, such as Northern Ireland and western Scotland.	The main constituent SSSI is the Severn Estuary SSSI. This is 95.80% favourable, 0.08% unfavourable-recovering and 2.43% unfavourable no change. The upper estuary is generally in favourable condition, with units downstream of the power station failing due to coastal squeeze and sea defences. There is a total of 14 other constituent SSSIs, which vary considerably in their current degree of favourability. Relevant Site Improvement Plan issues: (3) Physical modification threat (4) Impacts of development	The Severn Estuary is an example of a coastal plain estuary and covers the extent of the tidal influence from the upstream limit between Frampton and Awre in Gloucestershire, seawards to between Penarth Head (Wales) and Hinkley Point (Somerset). The estuary is maintained through physical, chemical and biological conditions and processes. A variety of key parameters establish the baseline conditions in the estuary; the flood hydrograph, the nature of the catchment and its influence on freshwater flow and nutrient and sediment input, the nature of the estuary sediment, and the relatively high sediment levels in the estuaries resulting in low water retention within the estuary system and exposure of significant proportions of sediment at low tide. The estuary is an all-encompassing feature which covers the	The Hands-off flow is a two-stage restriction comprising: • a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to as HOF-1); • a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as HOF-2); this is in addition to application of HOF-1.	No adverse effect on integrity

[5] Habitat occurrence account for Severn Estuary not yet available from JNCC.

DESIGNATED SITE: Severn Estuary SAC REF: UK0013030 / UK9015022 / UK11081			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[5].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
		(8) Water pollution (13) Invasive non-native species	physical, chemical and biological components of the estuarine ecosystem. As the river inputs contribute to the maintenance of this ecosystem, any changes could adversely affect it. <u>Flow</u> An Appropriate Assessment (Stage 2 AA) was previously undertaken in 2014[6] for this Option which, together with detailed ecology and water quality studies reported in 2016/2017[7], concluded that the freshwater flow requirements to the estuary to protect the designated species and features would be achieved through the inclusion of hands-off flow conditions (as provided to Thames Water by the Environment Agency) in the abstraction licence. This would govern when water can be abstracted by Thames Water from the freshwater Lower River Severn at Deerhurst. Flow modelling carried out by Thames Water indicated that the additional impact of the transfer (300Ml/d) on the long-term flow duration curve would be minor over the long term, but the WFD Good Ecological Status criteria would be met, with a considerable safety margin. The 2014 Appropriate Assessment concluded no adverse impact on the integrity of the Severn Estuary SAC. <u>Water pollution</u> Water quality modelling of the lower River Severn[7] identified no discernible changes in river water quality as a consequence of abstraction associated with this Option.		
H1140 Mudflats and sandflats not covered by seawater at low tide	**Mudflats and sandflats not covered by sea water at low tide** occur widely throughout the UK.	As above	This habitat type is divided into three categories; clean sands and gravels, muddy sands and mud, and the composition of the sediments and level of consolidation determines the fauna species occurring, whilst the salinity regime determines the species distribution by limiting the upstream extent of marine species as freshwater inputs become greater. At the northern extent of the Severn Estuary EMS, and therefore in closer proximity to the intakes to be affected by the abstractions, three distinct sandflat and mudflat systems can be identified; The Noose, Frampton Sand and Waveridge Sand. These support less diverse communities than downstream with greater salinity influences. The structure of the mudflats is reliant on a number of hydrodynamic processes including sediment transport processes. Although sediment inputs from fluvial sources are limited for most estuaries in the UK[8], flocculation is an important process in estuaries where freshwater and saline water meet, allowing sediments to settle out of the water column. This combined with tidal sediment inputs and energy dynamics create areas of deposition and erosion. Changes caused by increased abstraction could therefore affect the controls which determine the formation and maintenance of this habitat[8].	The Hands-off flow is a two-stage restriction comprising: • a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to at HOF-1); • a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as HOF-2); this is in addition to application of HOF-1.	No adverse effects on integrity

[6] Thames Water (2014) Severn to Thames Transfer Options: Report to inform the Appropriate Assessment
[7] Thames Water (2016), Severn Thames Transfer: Water Quality and Ecology Assessment - Phase 2: Main Project Report (issued October 2016). Report by Cascade Consulting and HR Wallingford on behalf of Thames Water.
[8] Defra and Environment Agency (2005) Saltmarsh Management Manual. Accessed at www.saltmarshmanual.co.uk on 22 February 2011.

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DESIGNATED SITE: Severn Estuary SAC REF: UK0013030 / UK9015022 / UK11081			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[5].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
			<u>Flow</u> An Appropriate Assessment (Stage 2 AA) was previously undertaken in 2014[9] for this Option which, together with detailed ecology and water quality studies reported in 2016/2017[10], concluded that the freshwater flow requirements to the estuary to protect the designated species and features would be achieved through the inclusion of hands-off flow conditions (as provided to Thames Water by the Environment Agency) in the abstraction licence. This would govern when water can be abstracted by Thames Water from the freshwater Lower River Severn at Deerhurst. Flow modelling carried out by Thames Water indicated that the additional impact of the transfer (300Ml/d) on the long-term flow duration curve would be minor over the long term, but the WFD Good Ecological Status criteria would be met, with a considerable safety margin. The 2014 Appropriate Assessment concluded no adverse impact on the integrity of the Severn Estuary SAC. <u>Water pollution</u> Water quality modelling of the lower River Severn[7] identified no discernible changes in river water quality as a consequence of abstraction associated with this Option.		
H1330 Atlantic salt meadows	**Atlantic salt meadows** occur on North Sea, English Channel and Atlantic shores. There are more than 29,000 ha of the habitat type in the UK, mostly in the large, sheltered estuaries of south-east, south-west and north-west England and in south Wales. Smaller areas of saltmarsh are found in Scotland.	As above	Saltmarshes, of which the Atlantic salt meadow is a specific component, occur where vegetation colonises intertidal mudflats and sandflats in areas with lower tidal velocities. Four sub-features have been identified for saltmarshes; cord grass (*Spartinion maritimae*), Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) and *Salicornia* and other annuals colonising mud and sand. The structure of the Atlantic salt meadows is governed by hydrodynamic and sediment transport processes, and can be influenced by salinity, water temperature and suspended particulate concentrations. Therefore changes caused by increased abstraction could affect the controls which determine the formation and maintenance of this habitat. <u>Flow</u> An Appropriate Assessment (Stage 2 AA) was previously undertaken in 2014[11] for this Option which, together with detailed ecology and water quality studies reported in 2016/2017[12], concluded that the freshwater flow requirements to the estuary to protect the designated species and features would be achieved through the inclusion of hands-off flow conditions (as provided to Thames Water by the Environment Agency) in the abstraction licence. This would govern when water can be abstracted by	The Hands-off flow is a two-stage restriction comprising: • a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to at HOF-1); • a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as HOF-2); this is in addition to application of HOF-1.	No adverse effect on integrity

[9] Thames Water (2014) Severn to Thames Transfer Options: Report to inform the Appropriate Assessment
[10] Thames Water (2016), Severn Thames Transfer: Water Quality and Ecology Assessment - Phase 2: Main Project Report (issued October 2016). Report by Cascade Consulting and HR Wallingford on behalf of Thames Water.
[11] Thames Water (2014) Severn to Thames Transfer Options: Report to inform the Appropriate Assessment
[12] Thames Water (2016), Severn Thames Transfer: Water Quality and Ecology Assessment - Phase 2: Main Project Report (issued October 2016). Report by Cascade Consulting and HR Wallingford on behalf of Thames Water.

Ref: Ricardo/ED10169/Issue Number Final

DESIGNATED SITE: Severn Estuary SAC REF: UK0013030 / UK9015022 / UK11081			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[5].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
			Thames Water from the freshwater Lower River Severn at Deerhurst. Flow modelling carried out by Thames Water indicated that the additional impact of the transfer (300Ml/d) on the long-term flow duration curve would be minor over the long term, but the WFD Good Ecological Status criteria would be met, with a considerable safety margin. The 2014 Appropriate Assessment concluded no adverse impact on the integrity of the Severn Estuary SAC. <u>Water pollution</u> Water quality modelling of the lower River Severn[7] identified no discernible changes in river water quality as a consequence of abstraction associated with this Option.		
H1110 Sandbanks which are slightly covered by sea water all the time	**Sandbanks which are slightly covered by sea water all the time** occur widely around the UK coast. They are widespread in inshore waters (within 12 nautical miles of the coast) and also occur offshore in the southern North Sea and in the Irish Sea (between 12 and 200 nautical miles).	As above	This habitat consists of sandbanks which are slightly covered by seawater at all times and are predominantly found in the middle and outer parts of the estuary. Long established sandbank features can be found at Cardiff Grounds, Bridgwater Bay and the Middle and Welsh Grounds. The UK SAC subtidal sandbanks can be divided into four categories; gravelly and clean sands, muddy sands, eelgrass beds and maerl beds. The latter two are particularly important due to their scarcity in the UK and the diversity of species they support[13]. The habitat is strongly influenced by tidal currents which result in high mobility of the sediments. On the assumption that the river flow also contributes to the sediment mobility, there is the potential for impact from the abstractions. The communities associated with the structures are determined by a combination of depth, turbidity and salinity of the surrounding water. <u>Flow</u> An Appropriate Assessment (Stage 2 AA) was previously undertaken in 2014[14] for this Option which, together with detailed ecology and water quality studies reported in 2016/2017[15], concluded that the freshwater flow requirements to the estuary to protect the designated species and features would be achieved through the inclusion of hands-off flow conditions (as provided to Thames Water by the Environment Agency) in the abstraction licence. This would govern when water can be abstracted by Thames Water from the freshwater Lower River Severn at Deerhurst. Flow modelling carried out by Thames Water indicated that the additional impact of the transfer (300Ml/d) on the long-term flow duration curve would be minor over the long term, but the WFD Good Ecological Status criteria would be met, with a considerable safety margin. The 2014 Appropriate Assessment concluded no adverse impact on	The Hands-off flow is a two-stage restriction comprising: • a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to at HOF-1); • a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as HOF-2); this is in addition to application of HOF-1.	No adverse effect on integrity

[13] Subtidal Sandbanks First 6-year Report. JNCC website. Accessed at http://www.jncc.gov.uk/page-3579 on 22 February 2011.
[14] Thames Water (2014) Severn to Thames Transfer Options: Report to inform the Appropriate Assessment
[15] Thames Water (2016), Severn Thames Transfer: Water Quality and Ecology Assessment - Phase 2: Main Project Report (issued October 2016). Report by Cascade Consulting and HR Wallingford on behalf of Thames Water.

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DESIGNATED SITE: Severn Estuary SAC REF: UK0013030 / UK9015022 / UK11081			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[5].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
			the integrity of the Severn Estuary SAC. <u>Water pollution</u> Water quality modelling of the lower River Severn[7] identified no discernible changes in river water quality as a consequence of abstraction associated with this Option.		
H1170 Reefs	**Reefs** occur widely around the UK coast, and are found in both inshore and offshore waters. There is a far greater range and extent of rocky reefs than biogenic concretions. Only a few invertebrate species are able to develop biogenic reefs, and these have a restricted distribution and extent in the UK.	As above	This habitat is predominantly subtidal in exposed to moderately exposed coastline areas[16]. The formation rises from the seabed and it has been noted that the formations do not extend far into low salinity areas[17]. Two types can be identified; those where animal and plant communities develop on existing rock, or stable boulders, and those where the animals and plant communities develop the structure themselves (biogenic reef). The Severn Estuary has areas of biogenic reefs formed by *Sabellaria alveolata*, a polychaete worm. The worms form tubes using sand particles to build honeycomb-like structures on the sea beds. An abundance of suitable coarse sand to support tube building, and suitable substrates to attach to is required to maintain the habitat. Distribution within the Severn Estuary occurs predominantly in the mouth of the estuary between Penarth and the M4 crossing between Caldicot and Severn Beach. Given the substrate inputs to estuaries are limited from fluvial sources, and the distance between the areas of *Sabellaria* and the abstraction points, changes due to abstractions are unlikely to significantly affect the feature. However, the feature was included in the 2014 Appropriate Assessment as insufficient evidence was available at screening to conclude no Likely Significant Effect. <u>Flow</u> An Appropriate Assessment (Stage 2 AA) was previously undertaken in 2014[18] for this Option which, together with detailed ecology and water quality studies reported in 2016/2017[19], concluded that the freshwater flow requirements to the estuary to protect the designated species and features would be achieved through the inclusion of hands-off flow conditions (as provided to Thames Water by the Environment Agency) in the abstraction licence. This would govern when water can be abstracted by Thames Water from the freshwater Lower River Severn at Deerhurst. Flow modelling carried out by Thames Water indicated that the additional impact of the transfer (300Ml/d) on the long-term flow duration curve would be minor over the long term, but the WFD Good Ecological Status criteria would be met, with a considerable safety margin. The 2014 Appropriate Assessment concluded no adverse impact on	The Hands-off flow is a two-stage restriction comprising: • a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to as HOF-1); • a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as HOF-2); this is in addition to application of HOF-1.	No adverse effects on integrity

[16] Joint Nature Conservation Committee (date unknown) Biotope classification - LS.LBR.Sab Littoral *Sabellaria* honeycomb worm reefs. Accessed at http://www.jncc.gov.uk/marine/biotopes/biotope.aspx?biotope=JNCCMNCR00001515 on 22 February 2011.
[17] UK Biodiversity Group Tranche 2 Action Plans - Volume V: Maritime species and habitats (October 1999, Tranche 2, Vol V, p125) – Habitat Action Plan for *Sabellaria alevolata* reefs. Accessed at http://www.ukbap.org.uk/ukplans.aspx?id=32 on 22 February 2011.
[18] Thames Water (2014) Severn to Thames Transfer Options: Report to inform the Appropriate Assessment
[19] Thames Water (2016), Severn Thames Transfer: Water Quality and Ecology Assessment - Phase 2: Main Project Report (issued October 2016). Report by Cascade Consulting and HR Wallingford on behalf of Thames Water.

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DESIGNATED SITE: Severn Estuary SAC REF: UK0013030 / UK9015022 / UK11081			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[5].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
			the integrity of the Severn Estuary SAC. <u>Water pollution</u> Water quality modelling of the lower River Severn[7] identified no discernible changes in river water quality as a consequence of abstraction associated with this Option.		
S1095 Sea Lamprey **S1099 River Lamprey**	**Sea lamprey** The sea lamprey (*Petromyzon marinus)* is reasonably widespread in UK rivers. In some places, it is still common, but it has declined in parts of its range and has become extinct in a number of rivers. It appears to reach its northern limit of distribution in Scotland and does not occur north of the Great Glen. **River lamprey** The river lamprey (*Lampetra fluviatilis)* is widespread in the UK, occurring in many rivers from the Great Glen in Scotland southwards, and populations are strong.	As above	<u>Migratory fish impacts</u> Effects on migratory fish could include: - Adverse effects on passage of lamprey species through the flow-depleted sections of the River Severn may lead to a reduction in population within the Severn Estuary. A previous Appropriate Assessment conducted in 2014 for this option and followed by detailed ecology and water quality studies in 2016/2017[20] found that the only potential for a significant effect on migratory fish was a minor risk of temporarily disrupting sea lamprey migration in April to May during low flow conditions by causing additional flow to pass over Upper Lode Weir on the River Severn, which may affect the ability of sea lamprey to pass the weir for short infrequent periods. <u>Flows</u> The 2014 Appropriate Assessment concluded that higher flows were more likely to be an issue for lampreys in the River Severn as high flows make migration to spawning grounds more difficult. Therefore the supported releases from Lake Vyrnwy to allow abstraction below the Hands Off Flow conditions could arise in adverse effects. The release from Lake Vyrnwy will be 60Ml/d which is only a small percentage of the natural flow variation in the River Severn. In the summer, flows can exceed 8000Mld-1 (e.g. in 2011), so the addition of 60Ml/d during lower flows (when the abstraction is likely to be required) is so small a change within the context of the natural flow variation as to be insignificant in relation to availability of conditions suitable for lamprey migration. Targeted lamprey surveys undertaken in 2014 and 2015 indicated very low numbers throughout the Vyrnwy with no lamprey observed above Dolanog Falls during these surveys. Work completed to assess the impacts of the Lake Vyrnwy reservoir releases on the Afon Vyrnwy concluded that with the magnitude of potential impacts on hydrology and water quality related to the Severn Thames Transfer scheme and the importance of the tributaries in the reaches below the reservoir, the risk of impact on the fish community is considered to be negligible for the reach from Vyrnwy Reservoir to the Avon Tanat confluence. With collection of additional monitoring evidence (in the next plan period), as set out in the WRMP, this would not result in deterioration in status and would be confirmed as WFD compliant. No impacts have been identified further downstream.	The Hands-off flow is a two-stage restriction comprising: • a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to as HOF-1); • a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as HOF-2); this is in addition to application of HOF-1. • Intake screens to guard against fish mortality through abstraction. With further mitigation in the form of reduced attractant velocities at the intake would guard against potential mortality of fish through abstraction at times of supported abstraction below the hands-off flow conditions.	No adverse effects on integrity

[20] Thames Water (2016), Severn Thames Transfer: Water Quality and Ecology Assessment - Phase 2: Main Project Report (issued October 2016). Report by Cascade Consulting and HR Wallingford on behalf of Thames Water.

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DESIGNATED SITE: Severn Estuary SAC REF: UK0013030 / UK9015022 / UK11081			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[5].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
			Water quality modelling of the lower River Severn[7] identified no discernible changes in river water quality as a consequence of abstraction associated with this Option. Additionally, the hands-off flow conditions provided by the Environment Agency (as discussed above) are intended to both support favourable condition for migratory species and prevent ecological quality deterioration. Therefore, no significant adverse effects on qualifying fish species related to water quality or flow are anticipated. Impacts to fish passage could potentially result from physical barriers, flow/velocity barriers, water quality barriers (due to reduction in dilution of effluents) or salinity barriers. However, based on the findings of this appropriate assessment hydrological effects are not expected to be realised and the scheme does not involve creating any physical barriers to fish migration.		
Fish species: **S1103 Twaite Shad**	**Twaite shad** The twaite shad *(Alosa fallax)* is found along the western coastline of Europe, from southern Norway to Morocco and along the eastern Mediterranean but has declined substantially throughout Europe. *Species occurrence account for Severn Estuary not yet available from JNCC.*	As above	<u>Migratory fish impacts</u> Effects on migratory fish could include: - Adverse effects on passage of twaite shad species through the flow-depleted sections of the River Severn may lead to a reduction in population within the Severn Estuary. - Effects of flow depletion due to increased abstraction may reduce (or improve) the suitability of habitat in the lower River Severn as a spawning and nursery area for twaite shad. A previous Appropriate Assessment conducted in 2014 for this option and followed by detailed ecology and water quality studies in 2016/2017[21] found that the only potential for a significant effect on migratory fish was a minor risk of temporarily disrupting sea lamprey migration in April to May during low flow conditions by causing additional flow to pass over Upper Lode Weir on the River Severn, which may affect the ability of sea lamprey to pass the weir for short infrequent periods. Work completed to assess the impacts of the Lake Vyrnwy reservoir releases on the Afon Vyrnwy concluded that with the magnitude of potential impacts on hydrology and water quality related to the Severn Thames Transfer scheme and the importance of the tributaries in the reaches below the reservoir, the risk of impact on the fish community is considered to be negligible for the reach from Vyrnwy Reservoir to the Avon Tanat confluence. With collection of additional monitoring evidence (in the next plan period), as set out in the WRMP, this would not result in deterioration in status and would be confirmed as WFD compliant. No impacts have been identified further downstream. No impacts have been identified further downstream. Therefore, as it is anticipated that the potential zone of influence will be restricted to the Severn above Shrewsbury and that shad species will not be present, no adverse effects to the shad population from changes to flow are considered likely. Mitigation in the form of intake screens will guard against potential mortality of fish through abstraction.	The Hands-off flow is a two-stage restriction comprising: • a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to as HOF-1); • a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as HOF-2); this is in addition to application of HOF-1. • Intake screens to guard against fish mortality through abstraction. With further mitigation in the form of reduced attractant velocities at the intake would guard against potential mortality of fish through abstraction at times of supported abstraction below the hands-off flow conditions.	No adverse effects on site integrity

[21] Thames Water (2016), Severn Thames Transfer: Water Quality and Ecology Assessment - Phase 2: Main Project Report (issued October 2016). Report by Cascade Consulting and HR Wallingford on behalf of Thames Water.

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DESIGNATED SITE: Severn Estuary SAC REF: UK0013030 / UK9015022 / UK11081			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[5].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
			Water quality modelling of the lower River Severn[7] identified no discernible changes in river water quality as a consequence of abstraction associated with this Option. Additionally, the hands-off flow conditions provided by the Environment Agency (as discussed above) are intended to both support favourable condition for migratory species and prevent ecological quality deterioration. Therefore, no significant adverse effects on qualifying fish species related to water quality or flow are anticipated. Impacts to fish passage could potentially result from physical barriers, flow/velocity barriers, water quality barriers (due to reduction in dilution of effluents) or salinity barriers. However, based on the findings of this appropriate assessment hydrological effects are not expected to be realised and the scheme does not involve creating any physical barriers to fish migration.		

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Table 3-4 Assessment of effects on Severn Estuary SPA

DESIGNATED SITE: Severn Estuary SPA **REF: UK9015022**			**PLAN NAME: Thames Water WRMP 19** **OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[22].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
OPERATION PHASE					
Article 4.1: Over winter; Bewick's Swan *Cygnus columbianus bewickii*,	280 individuals representing at least 4.0% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)	The main constituent SSSI is the Severn Estuary SSSI. This is 95.80% favourable, 0.08% unfavourable-recovering and 2.43% unfavourable no change. The upper estuary is generally in favourable condition, with units downstream of the power station failing due to coastal squeeze and sea defences. There is a total of 14 other constituent SSSIs, which vary considerably in their current degree of favourability. Relevant Site Improvement Plan issues: (4) Physical modification threat (5) Impacts of development (9) Water pollution (14) Invasive non-native species	See Table 3.3 for assessment as habitats covered by Severn Estuary SAC. As no changes to the habitats were identified because of the proposed Severn Thames Transfer, no changes in prey availability or abundance are considered likely in the lower reaches of the River Severn and estuary. Therefore no adverse effects are anticipated.	The Hands-off flow is a two-stage restriction comprising: • a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to as HOF-1); • a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as HOF-2); this is in addition to application of HOF-1.	No adverse effect on integrity
Article 4.2: On passage; Ringed Plover *Charadrius hiaticula*, Over winter; Curlew *Numenius arquata*, Dunlin *Calidris alpina alpina*, Pintail Anas acuta, Redshank *Tringa totanus,* Shelduck Tadorna tadorna	655 individuals representing at least 1.3% of the Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6) 3,903 individuals representing at least 1.1% of the wintering Europe - breeding population (5 year peak mean 1991/2 - 1995/6) 44,624 individuals representing at least 3.2% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/2 - 1995/6) 599 individuals representing at least 1.0% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) 2,330 individuals representing at least 1.6% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6) 3,330 individuals representing at least 1.1% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)	As above	As above	As above	No adverse effect on integrity
Article 4.2 Over winter, the area regularly supports including: Gadwall *Anas strepera,* Shelduck *Tadorna tadorna*, Pintail *Anas acuta*, Dunlin *Calidris alpina*	93,986 individual waterfowl (5 year peak mean 1991/2 - 1995/6)	As above	As above	As above	No adverse effect on integrity

[22] Habitat occurrence account for Severn Estuary not yet available from JNCC.

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DESIGNATED SITE: Severn Estuary SPA REF: UK9015022			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[22].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
alpina, Curlew *Numenius arquata*, Redshank *Tringa totanus*, Bewick's Swan *Cygnus columbianus bewickii*, Wigeon *Anas penelope,* Lapwing *Vanellus vanellus*, Teal *Anas crecca*, Mallard *Anas platyrhynchos*, Shoveler *Anas clypeata*, Pochard *Aythya ferina*, Tufted Duck *Aythya fuligula*, Grey Plover *Pluvialis squatarola*, White-fronted Goose *Anser albifrons albifrons ,* Whimbrel *Numenius phaeopus.*					

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Table 3-2 Assessment of effects on Severn Estuary Ramsar

DESIGNATED SITE: Severn Estuary Ramsar **REF: UK11081**			**PLAN NAME: Thames Water WRMP 19** **OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[23].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
CONSTRUCTION PHASE					
Ramsar criterion 1 Due to immense tidal range (second-largest in world), this affects both the physical environment and biological communities. Habitats Directive Annex I features present on the SAC include: H1110 Sandbanks which are slightly covered by sea water all the time H1130 Estuaries H1140 Mudflats and sandflats not covered by seawater at low tide H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	See Table 3.3 for assessment as habitats covered by Severn Estuary SAC	See Table 3.3 for assessment as habitats covered by Severn Estuary SAC	See Table 3.3 for assessment as habitats covered by Severn Estuary SAC	See Table 3.3 for assessment as habitats covered by Severn Estuary SAC	No adverse effect on integrity
Ramsar criterion 3 Due to unusual estuarine communities, reduced diversity and high productivity.					
OPERATION PHASE					
Ramsar criterion 4: Migratory fish including Atlantic Salmon (*Salmo salar*), sea trout (*Salmo trutta*), sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*), allis shad (*Alosa alosa*), twaite shad (*Alosa fallax*), and European eel (*Anguilla anguilla*)	See Table 3.3 for assessment as lamprey and twaite shad covered by Severn Estuary SAC	The main constituent SSSI is the Severn Estuary SSSI. This is 95.80% favourable, 0.08% unfavourable-recovering and 2.43% unfavourable no change. The upper estuary is generally in favourable condition, with units downstream of the power station failing due to coastal squeeze and sea defences. There is a total of 14 other constituent SSSIs, which vary considerably in their current degree of favourability. Relevant Site Improvement Plan issues: (5) Physical modification threat (6) Impacts of development (10) Water pollution (15) Invasive non-native species	See Table 3.3 for assessment as lamprey and twaite shad covered by Severn Estuary SAC Migratory fish impacts Effects on migratory fish could include: - Adverse effects on passage of species (Atlantic salmon, sea trout, allis shad and eel) through the flow-depleted sections of the River Severn may lead to a reduction in population within the Severn Estuary. - Effects of flow depletion due to increased abstraction may reduce (or improve) the suitability of habitat in the lower River Severn as a spawning and nursery area for Atlantic salmon, sea trout, allis shad and eel. A previous Appropriate Assessment conducted in 2014 for this option and followed by detailed ecology and water quality studies in 2016/2017[24] found that the only potential for a significant effect on migratory fish was a minor risk of temporarily disrupting sea lamprey migration in April to May during low flow conditions by causing additional flow to pass over Upper Lode Weir on the River Severn, which may affect the ability of sea lamprey to pass the weir for short infrequent periods.	The Hands-off flow is a two-stage restriction comprising: • a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to as HOF-1); • a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as HOF-2); this is in addition to application of HOF-1. • Intake screens to guard against fish mortality through abstraction. With further mitigation in the form of reduced attractant velocities at the intake would guard against potential mortality of fish through abstraction at times of	No adverse effects on integrity

[23] Habitat occurrence account for Severn Estuary not yet available from JNCC.
[24] Thames Water (2016), Severn Thames Transfer: Water Quality and Ecology Assessment - Phase 2: Main Project Report (issued October 2016). Report by Cascade Consulting and HR Wallingford on behalf of Thames Water.

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DESIGNATED SITE: Severn Estuary Ramsar REF: UK11081			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[23].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
			<u>Flows</u> The release from Lake Vyrnwy will be 60Ml/d which is only a small percentage of the natural flow variation in the River Severn. In the summer, flows can exceed 8000Mld-1 (e.g. in 2011), so the addition of 60Ml/d during lower flows (when the abstraction is likely to be required) is so small a change within the context of the natural flow variation as to be insignificant. Work completed to assess the impacts of the Lake Vyrnwy reservoir releases on the Afon Vyrnwy concluded that with the magnitude of potential impacts on hydrology and water quality related to the Severn Thames Transfer scheme and the importance of the tributaries in the reaches below the reservoir, the risk of impact on the fish community is considered to be negligible for the reach from Vyrnwy Reservoir to the Avon Tanat confluence. With collection of additional monitoring evidence (in the next plan period), as set out in the WRMP, this would not result in deterioration in status and would be confirmed as WFD compliant. No impacts have been identified further downstream. *Atlantic salmon and brown/sea trout* The 60 Ml/d releases would increase river levels in the Afon Vyrnwy and there is the potential for changes in the availability of important habitat. Salmonid spawning habitat is not expected to be affected as spawning occurs in the winter months, outside likely scheme operation. Modelling indicates that for high probability scenarios, the scheme will be required for around 40 days per year between August and September, which is outside the spawning and migration period for the salmonids of concern. For medium and low probability scenarios, the transfer scheme will potentially be required for 85 days of the year (most likely between July and October) and 130 days per year (most likely between May and October) respectively. Therefore no adverse effects are anticipated. For the lower reaches of the River Severn and Severn Estuary, the 2014 Appropriate Assessment concluded the following: • Downstream migration: these will be unaffected by flow/velocity and physical barriers, as a result of abstractions, because the HOF of 1800Ml/d at Deerhurst is clearly sufficiently high to provide more than enough capacity to carry salmonid smolt, lamprey transformers, juvenile shad and adult eels downstream to the estuary. • Upstream mitigation: criteria for assessing the flow requirements of salmonids migrating upstream are easily met, even on the basis of the minimum flows allowed during abstraction. Thus, even allowing a margin for uncertainties in the transferability of these criteria between rivers, proposed abstractions for water transfer will have no adverse effect on availability of river flows required for migration of salmonid fish. *Allis shad* As it is anticipated that the potential zone of influence of the Lake Vyrnwry releases will be restricted to the Severn above Shrewsbury	supported abstraction below the hands-off flow conditions.	

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DESIGNATED SITE: Severn Estuary Ramsar REF: UK11081			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[23].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
			and that shad species will not be present, no adverse effects to the shad population from changes to flow are considered likely. For the lower reaches of the River Severn and Severn Estuary, the 2014 Appropriate Assessment concluded the following: • Downstream migration: these will be unaffected by flow/velocity and physical barriers, as a result of abstractions, because the HOF of 1800Ml/d at Deerhurst is clearly sufficiently high to provide more than enough capacity to carry salmonid smolt, lamprey transformers, juvenile shad and adult eels downstream to the estuary. For the upstream mitigation, the reservoir-supported option would increase flows between by up to 60Ml/d. This is only a small percentage of the natural flow variation in the River Severn. Even during the summer, flows exceed 8000 Mld-1 (e.g. in 2011), so the addition of 60Ml/d during lower flows (when the abstraction is likely to be required) falls so far within the natural flow variation as to be insignificant. *European eel* Work completed to assess the impacts of the Lake Vyrnwy reservoir releases on the Afon Vyrnwy concluded that with the magnitude of potential impacts on hydrology and water quality related to the Severn Thames Transfer scheme and the importance of the tributaries in the reaches below the reservoir, the risk of impact on the fish community is considered to be negligible for the reach from Vyrnwy Reservoir to the Avon Tanat confluence. With collection of additional monitoring evidence (in the next plan period), as set out in the WRMP, this would not result in deterioration in status and would be confirmed as WFD compliant. No impacts have been identified further downstream. For the lower reaches of the River Severn and Severn Estuary, the 2014 Appropriate Assessment concluded the following: • Downstream migration: these will be unaffected by flow/velocity and physical barriers, as a result of abstractions, because the HOF of 1800Ml/d at Deerhurst is clearly sufficiently high to provide more than enough capacity to carry salmonid smolt, lamprey transformers, juvenile shad and adult eels downstream to the estuary. • Upstream mitigation: there is no evidence to suggest that relatively minor changes in freshwater flow would significantly affect eel habitat or migration on the River Severn. Reductions in flow will decrease water volume and depth, but significant impacts on habitat availability are only likely if the relative changes in flow are also significant. Conversely, reduced flows may assist upstream elver migration but significant impacts are unlikely. No adverse effects to the eel population is therefore anticipated. <u>Barriers to passage</u> Impacts to fish passage could result from physical barriers, flow/velocity barriers, water quality barriers (due to reduction in		

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DESIGNATED SITE: Severn Estuary Ramsar REF: UK11081			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[23].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
			dilution of effluents) or salinity barriers. However, based on the findings of this appropriate assessment hydrological effects are not expected to be realised and the scheme does not involve creating any physical barriers to fish migration. Mitigation in the form of intake screens will guard against potential mortality of fish through abstraction. <u>Water quality</u> Water quality modelling of the lower River Severn[7] identified no discernible changes in river water quality as a consequence of abstraction associated with this Option. Additionally, the hands-off flow conditions provided by the Environment Agency (as discussed above) are intended to both support favourable condition for migratory species and prevent ecological quality deterioration. Therefore, no significant adverse effects on qualifying fish species related to water quality or flow are anticipated.		
Ramsar criterion 8: Diverse fish assemblages of over 100 species, migratory route for fish listed under criterion 4, feeding and nursery ground, particularly for allis shad (*Alosa alosa*) and twaite shad (*Alosa fallax*).	As above	As above	As above	As above	No adverse effects on integrity
Ramsar criterion 5 Assemblages of international importance: Species with peak counts in winter: 70919 waterfowl (5 year peak mean 1998/99-2002/2003)		As above	See Table 3.3 for assessment as habitats covered by Severn Estuary SAC. As no changes to the habitats were identified because of the proposed Severn Thames Transfer, no changes in prey availability or abundance are considered likely in the lower reaches of the River Severn and estuary. Therefore no adverse effects are anticipated.	The Hands-off flow is a two-stage restriction comprising: • a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to as HOF-1); • a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as HOF-2); this is in addition to application of HOF-1.	No adverse effects on integrity
Ramsar criterion 6 – species/populations occurring at levels of international importance. Species with peak counts in winter: Tundra swan, *Cygnus columbianus bewickii,* Greater white-fronted goose , *Anser albifrons*	 229 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9- 2002/3) 2076 individuals, representing an average of 35.8% of the GB population (5 year peak mean for 1996/7-	As above	See Table 3.3 for assessment as habitats covered by Severn Estuary SAC. As no changes to the habitats were identified because of the proposed Severn Thames Transfer, no changes in prey availability or abundance are considered likely in the lower reaches of the River Severn and estuary. Therefore no adverse effects are anticipated.	The Hands-off flow is a two-stage restriction comprising: • a Hands-Off Flow (HOF) of 1800Ml/d at Deerhurst on the River Severn, below which no abstraction for transfers will be allowed to take place (referred to as HOF-1); • a HOF of 2490Ml/d below which abstractions will be limited to a maximum of 240Ml/d (referred to as	No adverse effects on integrity

Ref: Ricardo/ED10169/Issue Number Final

DESIGNATED SITE: Severn Estuary Ramsar **REF: UK11081**			**PLAN NAME: Thames Water WRMP 19** **OPTION NAME & REF: Severn-Thames Transfer (CON-RWT-DEH-CLM-300)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc[23].**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
*albifron*s, NW Europe Common shelduck , *Tadorna tadorna*, NW Europe Gadwall , *Anas strepera strepera*, NW Europe Dunlin , *Calidris alpina alpina*, W Siberia/W Europe Common redshank , *Tringa totanus totanus,*	2000/01) 3223 individuals, representing an average of 1% of the population (5 year peak mean 1998/9- 2002/3) 241 individuals, representing an average of 1.4% of the GB population (5 year peak mean 1998/9- 2002/3) 25082 individuals, representing an average of 1.8% of the population (5 year peak mean 1998/9-2002/3) 2616 individuals, representing an average of 1% of the population (5 year peak mean 1998/9- 2002/3)			HOF-2); this is in addition to application of HOF-1.	

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4 In-combination Effects

As this option forms part of a broader programme of proposed schemes, the in-combination effects acting across several options are assessed through the Programme-level HRA. The Programme will also be assessed against other known plans and projects that could have in-combination effects, as agreed with the competent authority.

5 Summary of Adverse Effects on Conservation Objectives

Given the assessment in the 'Assessment of effects on qualifying features' and 'In-combination effects' sections, and assuming that the mitigation outlined therein can be secured, no adverse effects on site integrity or the ability of the site to achieve its conservation objectives are predicted.

6 Additional Mitigation Measures

At this strategic plan level, no additional mitigation measures have been identified; however, it is envisaged that the incorporated mitigation measures will need to be developed in more detail and secured during the project-stage HRA when a detailed design and construction method statement is available.

7 The Integrity Test

If the mitigation measures described in the 'Assessment of effects on quantifying features' section can be imposed and implemented, then it can be reasonably concluded that the proposed Option will not have an adverse effect on the integrity of any SACs, SPAs and Ramsar sites.

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

Ricardo Energy & Environment

Habitats Regulations Assessment: Stage 2 Appropriate Assessment – Coppermills WTW

Appendix I: Information to Inform an Appropriate Assessment (Habitats Regulations Assessment (HRA) Stage 2) – Coppermills Water Treatment Works Extension 100 Ml/d

Report for: Thames Water Utilities Limited

ED10169 | Issue Number Final | Date 20/04/2020

Customer:

Thames Water Utilities Ltd

Customer reference:

ED10169

Contact:

Ben Stansfield
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Miriam Westbrook

Approved By:

Ben Stansfield

Date:

20 April 2020

Ricardo Energy & Environment reference:

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1 Introduction

1.1 The overall Plan

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 long-term planning horizon in order to ensure security of supply in each of the water resource zones making up its supply area.

As part of the development of Thames Water's Water Resources Management Plan 2019 (WRMP19), the Habitats Regulations Assessment (HRA) assesses the potential effects of alternative options and programmes on sites designated for their international nature conservation interests. The HRA assessment has been undertaken in parallel with the Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment, and has been used to inform the development of the WRMP19 to ensure its overall compliance with relevant legislation and national water resource planning guidance.

1.2 Legislation summary

Under the Conservation of Habitats and Species Regulations 2017, (the 'Habitats Regulations'), 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 an Appropriate Assessment to determine the implications for the site in view of the site's conservation objectives.

The objective of an Appropriate Assessment is to determine if there will be a significant adverse effect on site integrity, and is dependent on site-specifics, including condition, status and conservation objectives. As described by the HRA Handbook "*A significant effect is any effect that would undermine the conservation objectives for a European site. There must be a causal connection or link between the subject plan or project and the qualifying features of the site which could result in possible significant effects on the site*."

Habitats Regulations Assessment (HRA) refers to the assessment of the potential effects of a development project on one or more European sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). The Government also expects potential SPAs (pSPAs), candidate SACs (cSACs), and any confirmed HRA compensatory habitat to be considered in the same way.

- **Special Areas of Conservation (SACs)** are designated under the Habitats Directive (92/43/EEC) and target particular habitats (Annex 1) and/or species (Annex II) identified as being of European importance.

- **Special Protection Areas (SPAs)** are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC) (the 'Wild Birds Directive') for the protection of wild birds and their habitats (including particularly rare and vulnerable species listed in Annex 1 of the Directive, and migratory species).

The UK Government has also advised that Ramsar sites should be considered and included within the assessment[1]:

- **Ramsar sites** support internationally important wetland habitats and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

1 Department for Communities and Local Government (2012) National Planning Policy Framework.

For ease of reference during HRA, these three designations are collectively referred to as 'European sites', despite Ramsar designations being at the wider international level, and are also known as 'Natura 2000' sites.

1.3 The proposed Option

The Option proposes an extension to the existing WTW at Coppermills with three new pumping stations and a new 800mm diameter pipeline of approximately 100m between the existing and new works. The WTW extension will have a deployable output of 100Ml/d. The Option also includes the replacement of one pump at New River Head.

This report assesses the proposed impacts of both the WTW extension, pipeline and pumping stations. The pump replacement at New River Head has been screened out at HRA Stage 1 (see Appendix A of HRA Main Report).

1.4 Potentially affected European/Ramsar designated sites

The European sites, the qualifying features and the reasons they could be impacted by the Option are detailed below:

- Lee Valley SPA and Ramsar: Coppermills WTW lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the SPA & Ramsar site. It is understood that the expansion works would be located approximately 105m from the SPA & Ramsar site to the east.

Any designated sites which were screened out (see Section 2) during HRA Stage 1 (see Appendix 1) due to there being no Likely Significant Effect (LSE), are not included in this Stage 2 assessment. Refer to Appendix A for the Stage 1 Assessment. For those designated sites that are included in this Stage 2 report, any of their qualifying features screened-out in Stage 1 due to no LSE are also omitted here, but are detailed in Appendix A.

1.5 Purpose of this report

The purpose of this report is to provide the necessary information to allow the Competent Authority to determine if the proposals within this Plan will have a significant adverse effect on the integrity of the designated site(s) identified in Section 1.4 above. A summary of the HRA process that informs this purpose is provided in Section 2 below.

2 Methodology

2.1 Sources of guidance

The approach to informing the Appropriate Assessment has been developed from the legislation described in Section 1.2 above and informed by the latest guidance for HRA in the UK, namely:

- Tyldesley, D. and Chapman C. The Habitats Regulations Assessment Handbook. Published and updated online by DTA Publications Limited: http://www.dtapublications.co.uk/handbooks. The Handbook is informed and regularly updated with amendments to the Regulations, the latest Government guidance and case law.
- DEFRA (2012) The Habitats and Wild Birds Directives in England and its seas - Core guidance for developers, regulators & land/marine managers (draft for public consultation)

2.2 Stages of HRA

Stage 1 in HRA is a **Screening** stage to determine whether any part of the proposed Option is likely to have a significant effect on any European site, and thus if a full Appropriate Assessment of the project is required.

Stage 2 is the **Appropriate Assessment** stage (if required) that has to conclude whether or not the option will adversely affect the integrity of the European site in question. This is judged in terms of the likely impact on a site's conservation objectives. The conservation objectives specify the overall target for a site's 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated) in order for it to contribute to maintaining or reaching favourable conservation status. Significantly, HRA is based on a rigorous application of the precautionary principle.

If significant adverse effects are identified at the Appropriate Assessment stage, feasible **alternative options** would be examined to avoid or reduce any potential significant effects on the integrity of the European site as **Stage 3** of the HRA if it is deemed that the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI). The selection of such alternatives is limited to those which would meet the objectives of the current Option.

Stage 4 comprises an **assessment of compensatory measures** where the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI).

2.3 Responsibility for undertaking HRA

The responsibility for undertaking HRA lies with the competent authority, i.e. the authority (or authorities) responsible for granting a licence or consent for the Option. Under the Habitats Regulations, the applicant has an obligation to provide the competent authorities with such information as the authority may reasonably require for the purposes of the assessment, or to enable them to determine whether an Appropriate Assessment is required.

2.4 Approach to informing the Appropriate Assessment (HRA Stage 2)

2.4.1 Consultation

Consultation, via meetings and correspondence, has been undertaken with Natural England and the Environment Agency during the screening stage of this HRA (HRA Stage 1). This has helped to determine which potential effects require more detailed, appropriate assessment provided by HRA Stage 2, as presented in this report.

2.4.2 Impact assessment

This assessment considers the potentially damaging aspects of the proposed Option with potential effects on a European site's qualifying features and likely achievement of the conservation objectives.

The potential for adverse effect on the integrity of the site depends on the scale and magnitude of the action and its predicted impacts, taking into account the distribution of the designated 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.

Where qualitative and/or quantitative information is available, this has been used to inform the assessment. Where this information is not available, professional judgement has been used. In some cases, the ecological functioning of the site and the likely effects are well understood and documented elsewhere, for instance in studies commissioned to inform the Habitats Directive Review of Consents. In these cases, the assessment may simply comprise a review of this information. Where there is not sufficient information to undertake the assessment, this is recorded in this report.

This report aims to set out, in sufficient detail for it to be transparent and understandable, what the effects of the proposed Option (alone and in-combination) are likely to be on each internationally-designated site's qualifying feature, referring to relevant background documents and other information on which these judgements, which are essentially ecological judgements, rely. Guidance states that the size or complexity of the HRA Stage 2 report to inform the Appropriate Assessment will not necessarily reflect the scale of the proposed Option, but rather the complexity of potential effects. The length of the report may not reflect the complexity of ecological judgements made to arrive at the necessary conclusions. Very complex ecological analysis and judgements may be expressed succinctly, with detailed supporting analyses contained in appendices or clearly referenced separate documents.

2.4.3 Mitigation measures

Following the People Over Wind ruling, no mitigation measures can be considered to be incorporated, and therefore used at Stage 1 Screening to avoid Likely Significant Effects. The HRA Stage 2 assessment of effects therefore considers mitigation measures separately. The assessment takes into account any mitigation measures that may already form part of the proposed Option specification (i.e. that are 'incorporated'), to determine whether they will most likely reduce the likelihood, magnitude, scale, and/or duration of the effect to a lower level. These measures can include both avoidance and reduction measures, with the former being the preferred option.

2.4.4 In-combination assessment

In accordance with the legislation, an in-combination assessment with other WRMP Options at the Programme level has been undertaken. The approach to this is described as a series of steps below:

- **STEP 1** – Does the Option have no discernible effect, whatsoever, on the European site? If not, then there's no need for in-combination assessment, as logic dictates it can't have in-combination effects.
- **STEP 2** – Does this Option have a discernible effect, but one which is not significantly adverse to site integrity alone? If so, then an in-combination assessment is required. (Effects that are adverse alone do not require in-combination assessment.)
- **STEP 3** – Identify the other Options/Plans/Projects that also have discernible effects that (1) aren't an adverse effect alone but (2) might act in combination with effects of your Option/Plan/Project. It is normal practice to agree this list of potential in-combination Plans/Projects with the Competent Authority before doing the assessment.
- **STEP 4 –** Assess these other Options/Plans/Projects in combination with this Plan.

The above steps recognise that significant adverse effects acting alone are already dealt with for that Option and should not form part of an in-combination assessment. It is only where effects that may *become adverse when acting in combination* that require an in-combination assessment.

Equally, in accordance with best-practice guidance, any projects or plans which have been completed, consented and implemented are considered to be part of the baseline (and should have been subject to their own HRA before being consented and implemented). Therefore, these will not be included as part of any in-combination assessment, but any ongoing operational effects will be noted as part of the baseline environment.

2.4.5 Conservation objectives

The Habitats Regulations require that the Appropriate Assessment is of "the implications for the site in view of that site's conservation objectives." The development of conservation objectives is required by the 1992 'Habitats' Directive (92/43/EEC). In accordance with the Habitats Directive, the objectives aim to achieve the 'favourable conservation status' of the habitat and species features for which SAC is designated (see Figure 1).

Site-specific conservation objectives for SACs have been developed by Natural England and provide a description of what is considered to be the favourable conservation status of the feature within the whole plan area.

Figure 2.1 Favourable conservation status as defined in Articles 1(e) and 1(i) of the Habitats Directive

"The conservation status of a natural ***habitat*** *is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:*

- *Its natural range and areas it covers within that range are stable or increasing, and*
- *The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and*
- *The conservation status of its typical species is favourable.*

The conservation status of a ***species*** *is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:*

- *Population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and*
- *There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."*

The generic conservation objectives covering all the European sites assessed in this report are:

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.

2.4.6 Additional mitigation measures

Where the Option has been assessed as having a significant adverse effect by undermining the site's conservation objectives, additional mitigation may be necessary to satisfy the integrity test (Section 2.4.7). Such mitigation is that which is in addition to the incorporated measures described in Section 2.4.3 above, and which is usually imposed by a Competent Authority through enforceable conditions or restrictions.

2.4.7 Integrity test

The integrity test is the conclusion of the Appropriate Assessment and requires the competent authority to ascertain whether the proposed Option (either alone or in-combination with other plans or projects), will not have an 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"

This report will conclude with a professional opinion on whether such a test can be met, but it is for the Competent Authority to make that decision in light of the information presented.

2.5 Limitations

Information provided by third parties, including publicly available information and databases, is considered correct at the time of publication. 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 Option.

The HRA has been undertaken in as detailed a way as possible, using all available data sources where they exist. However, the conclusions drawn from this are 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.

3 Assessment of Effects on Qualifying Features

The potential effects of the proposed Option (acting alone) on each qualifying feature of the designated site(s) previously identified as having likely significant effects during the Stage 1 screening are detailed below in **Table 3.1.** Both construction phase (where applicable) and operation phase of the Option are assessed.

Figure 3-1 Assessment of impacts to Lee Valley SPA & Ramsar

DESIGNATED SITE: Lee Valley SPA & Ramsar **REF: UK9012111 / UK11034**			**PLAN NAME: Thames Water WRMP 19** **OPTION NAME & REF: Coppermills WTW Extension 100 ML/D (WTW-LON-COP-100)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc.**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
CONSTRUCTION PHASE					
Over winter birds; **A021 Bittern, (*Botaurus stellaris)*** **A051 Gadwall, (*Anas strepera)*** **A056 Shoveler, (*Anas clypeata)***	Bittern: 6 individuals representing at least 6.0% of the wintering population in Great Britain (5 year peak mean, 1992/3-1995/6) Gadwall: 515 individuals representing at least 1.7% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) Shoveler: 748 individuals representing at least 1.9% of the wintering Northwestern/Central Europe population (5 year peak mean 1991/2 - 1995/6)	The only SSSI of relevance to these qualifying features that could potentially be impacted by this Option is the Walthamstow Reservoirs **Walthamstow Reservoirs SSSI:** Unfavourable (Recovering) 100% Relevant Site Improvement Plan issues: (1) Water pollution (2) Hydrological changes (3) Disturbance (only) (6) Invasive species (8) Air pollution	<u>Disturbance – noise and visual</u> The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar. The site provides important habitat for overwintering waterfowl. However it is understood that the expansion works would be located approximately 105m from the SPA & Ramsar site to the east. Potential for disturbance of these species due to construction noise, visual stimuli from the construction workforce and plant on the site, and light pollution as a result of any onsite lighting requirements (considered to be predominantly in the winter) could result in a reduction in foraging and roosting availability. In order to avoid significant effects on the qualifying species, the timing of construction activities with the greatest risk of noise/visual disturbance should be planned to avoid the most sensitive times of the year for wintering bird species (October to March inclusive). The Waterbird Disturbance Mitigation Toolkit[2] showed that effects of disturbance on wintering waterbirds (estuarine) did not tend to extend beyond 250m from the source of the noise, and also derived a generic overview table to calculate the likely disturbance effect for a noise level and the distance required from the source to the receptor allowing for a likely 'acceptable' noise dose of 70dB(A). According to this, any works within 250m of the SPA (or offsite functional habitat) would require the use of plant silencers and visual screening (except where suitable natural screening is identified through habitat survey) within 250m so as to prevent a significant disturbance impact. It is also recognised that, should construction of the pipeline take place during all or part of the winter periods, the works footprint will be visible from the air for a considerable distance and that this change in the local landscape along with the disturbance effect of operating machinery and increased human presence may affect flight paths of these bird in the short term causing them to avoid valuable foraging and roosting habitat. Assuming a 250m radius from source within which birds could be disturbed, a large proportion of the works would be within this. The noise generated by the demolition and construction for the treatment works extension will need to be considered and a noise assessment with reference to the Waterbird Disturbance Mitigation Toolkit will need to be completed to demonstrate the mitigation measures are effective in avoiding disturbance before works take place outside the restricted timings. If they aren't, such works will be scheduled to avoid the Oct-March period. These assessments will form part of the detailed design and planning/permit applications and associated HRA to accompany these applications. The recent successful upgrade at Deephams sewage works used similar mitigation measures to protect the designated sites with no adverse effects recorded during that construction work. <u>Water pollution</u> Topsoil stripping and excavation works have potential for indirect adverse effects from pollution from site run-off and accidental pollution, such as oil spills, which could cause habitat degradation in the short-term.	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Noise assessment to be completed during the detailed design and planning/permit applications and associated HRA, prior to commencement of works to ensure mitigation measures will be effective (if not, seasonal avoidance to be used). • Adherence to EA Pollution Prevention Guidelines (now formally withdrawn but still relevant and useful) • Best practice construction methods. • Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction. • Detailed noise abatement and visual disturbance mitigation measures to be developed in co-ordination with Natural England, taking account of local site knowledge from the site managers and following professional mitigation guidance, in particular the Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects produced by the Institute of	None

[2] 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.

Ref: Ricardo/ED10169/Issue Number Final

DESIGNATED SITE: Lee Valley SPA & Ramsar REF: UK9012111 / UK11034			PLAN NAME: Thames Water WRMP 19 OPTION NAME & REF: Coppermills WTW Extension 100 ML/D (WTW-LON-COP-100)		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc.**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
			<u>Air quality - dust</u> Dust could be dispersed during the removal of the topsoil, trench digging, storage of the spoil within the working corridor and during refill. Best practice construction mitigation measures should avoid the potential for any significant dust impacts to the SPA/Ramsar i.e. damping down. <u>Invasive species</u> Exposure of topsoil and movement of construction vehicles could result in the spread of invasive and non-native vegetation. Best practice construction and biosecurity measures to guard against the spread of invasive non-native species, such as New Zealand pygmyweed, *Crassula helmsii*, would be employed as standard.	Estuarine and Coastal Studies (IECS) at Hull University. • Sensitive lighting design to be developed following professional guidance to address identified risks relating to light pollution that is applicable to birds in flight, such as that developed by the Institute of Lighting Engineers (Guidance Note 8 Bats and Artificial Lighting, 2018) and others, to ensure no adverse effects on site integrity from light spill. • In combination studies to be conducted to identify the key flight paths of the wintering birds that use the designated site (and associated functional habitat), and an assessment to be made of the impact of the construction activities on these key flight paths. • Agreed mitigation measures to be included in the project-specific HRA of each scheme to support applications for planning permissions and environmental permits. • Implementation of planning conditions and/or conditions of relevant environmental permits to be managed through contractual obligations with supervision from an Environmental Clerk of Works appointed by Thames Water.	
	OPERATION PHASE				
	No operational impacts are anticipated. Operational activities at the water treatment works will be of a similar nature to those already carried out by Thames Water at the existing water treatment works site such that birds would be expected to be reasonably habituated to these activities. Certain mitigation advocated for construction will be applied during operation (visual screening) and depending on the baseline findings of the noise assessment (to be completed during the detailed design and planning/permit applications and associated HRA) additional noise reduction measures would be enacted to ensure that noise levels do not significantly exceed the current baseline such that qualifying feature birds could experience a significant level of disturbance.				

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4 In-combination Effects

As this option forms part of a broader programme of proposed schemes, the in-combination effects acting across several options are assessed through the Programme-level HRA. The Programme will also be assessed against other known plans and projects that could have in-combination effects, as agreed with the competent authority.

5 Summary of Adverse Effects on Conservation Objectives

Given the assessment in the ‘Assessment of effects on qualifying features’ and ‘In-combination effects’ sections, and assuming that the mitigation outlined therein can be secured, no adverse effects on site integrity or the ability of the site to achieve its conservation objectives are predicted.

6 Additional Mitigation Measures

At this strategic plan level, no additional mitigation measures have been identified; however, it is envisaged that the incorporated mitigation measures will need to be developed in more detail and secured during the project-stage HRA when a detailed design and construction method statement is available.

7 The Integrity Test

If the mitigation measures described in the ‘Assessment of effects on quantifying features’ section can be imposed and implemented, then it can be reasonably concluded that the proposed Option will not have an adverse effect on the integrity of any SACs, SPAs and Ramsar sites.

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

Ricardo Energy & Environment

Habitats Regulations Assessment: Stage 2 Appropriate Assessment – Kempton Water Treatment Works 100 Ml/d

Appendix J: Information to Inform an Appropriate Assessment (Habitats Regulations Assessment (HRA) Stage 2) – Kempton Water Treatment Works 100 MLD

Report for: Thames Water Utilities Limited

ED10169 | Issue Number Final | Date 20/04/2020

Customer:

Thames Water Utilities Ltd

Customer reference:

ED10169

Confidentiality, copyright & reproduction:

Contact:

Ben Stansfield
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Miriam Westbrook

Approved By:

Ben Stansfield

Date:

20 April 2020

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1 Introduction

1.1 The overall Plan

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 long-term planning horizon in order to ensure security of supply in each of the water resource zones making up its supply area.

As part of the development of Thames Water's Water Resources Management Plan 2019 (WRMP19), the Habitats Regulations Assessment (HRA) assesses the potential effects of alternative options and programmes on sites designated for their international nature conservation interests. The HRA assessment has been undertaken in parallel with the Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment and has been used to inform the development of the WRMP19 to ensure its overall compliance with relevant legislation and national water resource planning guidance.

1.2 Legislation summary

Under the Conservation of Habitats and Species Regulations 2017, (the 'Habitats Regulations'), 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 an Appropriate Assessment to determine the implications for the site in view of the site's conservation objectives.

The objective of an Appropriate Assessment is to determine if there will be a significant adverse effect on site integrity, and is dependent on site-specifics, including condition, status and conservation objectives. As described by the HRA Handbook "*A significant effect is any effect that would undermine the conservation objectives for a European site. There must be a causal connection or link between the subject plan or project and the qualifying features of the site which could result in possible significant effects on the site*."

Habitats Regulations Assessment (HRA) refers to the assessment of the potential effects of a development project on one or more European sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). The Government also expects potential SPAs (pSPAs), candidate SACs (cSACs), and any confirmed HRA compensatory habitat to be considered in the same way.

- **Special Areas of Conservation (SACs)** are designated under the Habitats Directive (92/43/EEC) and target particular habitats (Annex 1) and/or species (Annex II) identified as being of European importance.

- **Special Protection Areas (SPAs)** are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC) (the 'Wild Birds Directive') for the protection of wild birds and their habitats (including particularly rare and vulnerable species listed in Annex 1 of the Directive, and migratory species).

The UK Government has also advised that Ramsar sites should be considered and included within the assessment[1]:

1 Department for Communities and Local Government (2012) National Planning Policy Framework.

- **Ramsar sites** support internationally important wetland habitats and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

For ease of reference during HRA, these three designations are collectively referred to as 'European sites', despite Ramsar designations being at the wider international level, and are also known as 'Natura 2000' sites.

1.3 The proposed Option

The Option proposes a new treatment capacity located at the existing Kempton WTW, including a conveyance from the existing WTW to the new treatment site, as well as a new shaft on the Thames Water Ring Main (TWRM) to accommodate additional treated potable water.

This Option will require the following:

- New 100 Ml/d water treatment works
- Three new pumping stations (within the 100 Ml/d water treatment site)
- One 12.5m diameter drop shaft on the TWRM

This report assesses the proposed impacts of both the treatment plant and new shaft elements of the Kempton WTW Option.

1.4 Potentially affected European/Ramsar designated sites

The European sites, the qualifying features and the reasons they could be impacted by the Option are detailed below:

- South West London Waterbodies SPA and Ramsar: The new WTW is located approximately 520m from the designated site and 240m from a non-designated waterbody at Kempton racecourse that could be used as off-site functional habitat by the qualifying feature bird species of the designated site. The new shaft is located approximately 220m from the designated site.

Any designated sites which were screened out (see Section 2) during HRA Stage 1 (see Appendix 1) due to there being no Likely Significant Effect (LSE), are not included in this Stage 2 assessment. Refer to Appendix A for the Stage 1 Assessment. For those designated sites that are included in this Stage 2 report, any of their qualifying features screened-out in Stage 1 due to no LSE are also omitted here, but are detailed in Appendix A.

1.5 Purpose of this report

The purpose of this report is to provide the necessary information to allow the Competent Authority to determine if the proposals within this Plan will have a significant adverse effect on the integrity of the designated site(s) identified in Section 1.4 above. A summary of the HRA process that informs this purpose is provided in Section 2 below.

2 Methodology

2.1 Sources of guidance

The approach to informing the Appropriate Assessment has been developed from the legislation described in Section 1.2 above and informed by the latest guidance for HRA in the UK, namely:

- Tyldesley, D. and Chapman C. The Habitats Regulations Assessment Handbook. Published and updated online by DTA Publications Limited: http://www.dtapublications.co.uk/handbooks. The Handbook is informed and regularly updated with amendments to the Regulations, the latest Government guidance and case law.
- DEFRA (2012) The Habitats and Wild Birds Directives in England and its seas - Core guidance for developers, regulators & land/marine managers (draft for public consultation)

2.2 Stages of HRA

Stage 1 in HRA is a **Screening** stage to determine whether any part of the proposed Option is likely to have a significant effect on any European site, and thus if a full Appropriate Assessment of the project is required.

Stage 2 is the **Appropriate Assessment** stage (if required) that has to conclude whether or not the option will adversely affect the integrity of the European site in question. This is judged in terms of the likely impact on a site's conservation objectives. The conservation objectives specify the overall target for a site's 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated) in order for it to contribute to maintaining or reaching favourable conservation status. Significantly, HRA is based on a rigorous application of the precautionary principle.

If significant adverse effects are identified at the Appropriate Assessment stage, feasible **alternative options** would be examined to avoid or reduce any potential significant effects on the integrity of the European site as **Stage 3** of the HRA if it is deemed that the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI). The selection of such alternatives is limited to those which would meet the objectives of the current Option.

Stage 4 comprises an **assessment of compensatory measures** where the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI).

2.3 Responsibility for undertaking HRA

The responsibility for undertaking HRA lies with the competent authority, i.e. the authority (or authorities) responsible for granting a licence or consent for the Option. Under the Habitats Regulations, the applicant has an obligation to provide the competent authorities with such information as the authority may reasonably require for the purposes of the assessment, or to enable them to determine whether an Appropriate Assessment is required.

2.4 Approach to informing the Appropriate Assessment (HRA Stage 2)

2.4.1 Consultation

Consultation, via meetings and correspondence, has been undertaken with Natural England and the Environment Agency during the screening stage of this HRA (HRA Stage 1). This has helped to determine which potential effects require more detailed, appropriate assessment provided by HRA Stage 2, as presented in this report.

2.4.2 Impact assessment

This assessment considers the potentially damaging aspects of the proposed Option with potential effects on a European site's qualifying features and likely achievement of the conservation objectives.

The potential for adverse effect on the integrity of the site depends on the scale and magnitude of the action and its predicted impacts, taking into account the distribution of the designated 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.

Where qualitative and/or quantitative information is available, this has been used to inform the assessment. Where this information is not available, professional judgement has been used. In some cases, the ecological functioning of the site and the likely effects are well understood and documented elsewhere, for instance in studies commissioned to inform the Habitats Directive Review of Consents. In these cases, the assessment may simply comprise a review of this information. Where there is not sufficient information to undertake the assessment, this is recorded in this report.

This report aims to set out, in sufficient detail for it to be transparent and understandable, what the effects of the proposed Option (alone and in-combination) are likely to be on each internationally-designated site's qualifying feature, referring to relevant background documents and other information on which these judgements, which are essentially ecological judgements, rely. Guidance states that the size or complexity of the HRA Stage 2 report to inform the Appropriate Assessment will not necessarily reflect the scale of the proposed Option, but rather the complexity of potential effects. The length of the report may not reflect the complexity of ecological judgements made to arrive at the necessary conclusions. Very complex ecological analysis and judgements may be expressed succinctly, with detailed supporting analyses contained in appendices or clearly referenced separate documents.

2.4.3 Mitigation measures

Following the People Over Wind ruling, no mitigation measures can be considered to be incorporated, and therefore used at Stage 1 Screening to avoid Likely Significant Effects. The HRA Stage 2 assessment of effects therefore considers mitigation measures separately. The assessment takes into account any mitigation measures that may already form part of the proposed Option specification (i.e. that are 'incorporated'), to determine whether they will most likely reduce the likelihood, magnitude, scale, and/or duration of the effect to a lower level. These measures can include both avoidance and reduction measures, with the former being the preferred option.

2.4.4 In-combination assessment

In accordance with the legislation, an in-combination assessment with other WRMP Options at the Programme level has been undertaken. The approach to this is described as a series of steps below:

- **STEP 1** – Does the Option have no discernible effect, whatsoever, on the European site? If not, then there's no need for in-combination assessment, as logic dictates it can't have in-combination effects.
- **STEP 2** – Does this Option have a discernible effect, but one which is not significantly adverse to site integrity alone? If so, then an in-combination assessment is required. (Effects that are adverse alone do not require in-combination assessment.)
- **STEP 3** – Identify the other Options/Plans/Projects that also have discernible effects that (1) aren't an adverse effect alone but (2) might act in combination with effects of your Option/Plan/Project. It is normal practice to agree this list of potential in-combination Plans/Projects with the Competent Authority before doing the assessment.
- **STEP 4 –** Assess these other Options/Plans/Projects in combination with this Plan.

The above steps recognise that significant adverse effects acting alone are already dealt with for that Option and should not form part of an in-combination assessment. It is only where effects that may *become adverse when acting in combination* that require an in-combination assessment.

Equally, in accordance with best-practice guidance, any projects or plans which have been completed, consented and implemented are considered to be part of the baseline (and should have been subject to their own HRA before being consented and implemented). Therefore, these will not be included as part of any in-combination assessment, but any ongoing operational effects will be noted as part of the baseline environment.

2.4.5 Conservation objectives

The Habitats Regulations require that the Appropriate Assessment is of "the implications for the site in view of that site's conservation objectives." The development of conservation objectives is required by the 1992 'Habitats' Directive (92/43/EEC). In accordance with the Habitats Directive, the objectives aim to achieve the 'favourable conservation status' of the habitat and species features for which SAC is designated (see Figure 1).

Site-specific conservation objectives for SACs have been developed by Natural England and provide a description of what is considered to be the favourable conservation status of the feature within the whole plan area.

Figure 2.1 Favourable conservation status as defined in Articles 1(e) and 1(i) of the Habitats Directive

"The conservation status of a natural ***habitat*** *is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:*

- *Its natural range and areas it covers within that range are stable or increasing, and*
- *The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and*
- *The conservation status of its typical species is favourable.*

The conservation status of a ***species*** *is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:*

- *Population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and*
- *There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."*

The generic conservation objectives covering all the European sites assessed in this report are:

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.

2.4.6 Additional mitigation measures

Where the Option has been assessed as having a significant adverse effect by undermining the site's conservation objectives, additional mitigation may be necessary to satisfy the integrity test (Section 2.4.7). Such mitigation is that which is in addition to the incorporated measures described in Section 2.4.3 above, and which is usually imposed by a Competent Authority through enforceable conditions or restrictions.

2.4.7 Integrity test

The integrity test is the conclusion of the Appropriate Assessment and requires the competent authority to ascertain whether the proposed Option (either alone or in-combination with other plans or projects), will not have an 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"

This report will conclude with a professional opinion on whether such a test can be met, but it is for the Competent Authority to make that decision in light of the information presented.

2.5 Limitations

Information provided by third parties, including publicly available information and databases, is considered correct at the time of publication. 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 Option.

The HRA has been undertaken in as detailed a way as possible, using all available data sources 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.

3 Assessment of Effects on Qualifying Features

The potential effects of the proposed Option (acting alone) on each qualifying feature of the designated site(s) previously identified as having likely significant effects during the Stage 1 screening are detailed below in **Table 3.1.** Both construction phase (where applicable) and operation phase of the Option are assessed.

Table 3-1 Assessment of effects on South West London Waterbodies SPA & Ramsar

DESIGNATED SITE: South West London Waterbodies SPA & Ramsar **REF: UK9012171 / UK11065**			**PLAN NAME: Thames Water WRMP 19** **OPTION NAME & REF: Kempton WTW 100 ML/D (WTW-LON-KEM-100 & NET-TWRM-KEM)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc.**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
	CONSTRUCTION PHASE				
Over winter birds; **A051 Gadwall, (*Anas strepera)*** **A056 Shoveler, (*Anas clypeata)***	Gadwall: 786 individuals representing at least 2.6% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) Shoveler: 1,075 individuals representing at least 2.7% of the wintering Northwestern/Central Europe population (5 year peak mean 1991/2 - 1995/6)	The only SSSI of relevance to these qualifying features that could potentially be impacted by this Option is the Kempton Park Reservoirs SSSI. **Kempton Park Reservoirs SSSI:** Unfavourable (Recovering) 100% Relevant Site Improvement Plan issues: (1) Disturbance (only) (3) Invasive species	<u>Disturbance – noise and visual</u> The Kempton Water Treatment Works is located approximately 240m to the north west of a non-designated waterbody that provides off-site functional habitat for the qualifying feature bird species of the SPA/Ramsar site. The proposed new shaft is located approximately 220m from the SPA/Ramsar site itself. Potential for disturbance of overwintering waterfowl species due to construction noise, visual stimuli from the construction workforce and plant on the site, and light pollution as a result of any onsite lighting requirements (considered to be predominantly in the winter) could result in a reduction in foraging and roosting availability. In order to avoid significant effects on the qualifying species, the timing of construction activities with the greatest risk of noise/visual disturbance should be planned to avoid the most sensitive times of the year for wintering bird species (October to March inclusive). The Waterbird Disturbance Mitigation Toolkit[2] showed that effects of disturbance on wintering waterbirds (estuarine) did not tend to extend beyond 250m from the source of the noise, and also derived a generic overview table to calculate the likely disturbance effect for a noise level and the distance required from the source to the receptor allowing for a likely 'acceptable' noise dose of 70dB(A). According to this, any works within 250m of the SPA (or offsite functional habitat) would require the use of plant silencers and visual screening (except where suitable natural screening is identified through habitat survey) to prevent a significant disturbance impact. It is also recognised that, should construction take place during all or part of the winter periods, the works footprint will be visible from the air for a considerable distance and that this change in the local landscape along with the disturbance effect of operating machinery and increased human presence may affect local flight paths of these birds in the short term potentially causing them to avoid valuable foraging and roosting habitat in the vicinity.	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Noise assessment to be completed during the detailed design and planning/permit applications and associated HRA, prior to commencement of works to ensure mitigation measures will be effective (if not, seasonal avoidance to be used). • Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction. • Detailed noise abatement and visual disturbance mitigation measures to be developed in co-ordination with Natural England, taking account of local site knowledge from the site managers and following professional mitigation guidance, in particular the Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects produced by the Institute of Estuarine and Coastal Studies (IECS) at Hull University. • Sensitive lighting design to be developed following professional guidance to address identified risks relating to light pollution that is applicable to birds in flight, such as that developed by the Institute of Lighting Engineers (Guidance Note 8 Bats and Artificial Lighting, 2018) and others, to ensure no adverse effects on site integrity from light spill.	None

[2] 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.

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DESIGNATED SITE: South West London Waterbodies SPA & Ramsar **REF: UK9012171 / UK11065**			**PLAN NAME: Thames Water WRMP 19** **OPTION NAME & REF: Kempton WTW 100 ML/D (WTW-LON-KEM-100 & NET-TWRM-KEM)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc.**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
Over winter birds; **A051 Gadwall, (*Anas strepera)*** **A056 Shoveler, (*Anas clypeata)*** ***Continued***	Gadwall: 786 individuals representing at least 2.6% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) Shoveler: 1,075 individuals representing at least 2.7% of the wintering Northwestern/Central Europe population (5 year peak mean 1991/2 - 1995/6) ***Continued***	The only SSSI of relevance to these qualifying features that could potentially be impacted by this Option is the Kempton Park Reservoirs SSSI. **Kempton Park Reservoirs SSSI:** Unfavourable (Recovering) 100% Relevant Site Improvement Plan issues: (2) Disturbance (only) (4) Invasive species ***Continued***	Assuming a 250m radius from source within which birds could be disturbed, a significant proportion of the works would be within this. The noise generated by the demolition and construction for the treatment works extension will need to be considered and a noise assessment with reference to the Waterbird Disturbance Mitigation Toolkit will need to be completed to demonstrate the mitigation measures are effective in avoiding disturbance before works take place outside the restricted timings. If they aren't, such works will be scheduled to avoid the Oct-March period. These assessments will form part of the detailed design and planning/permit applications and associated HRA to accompany these applications. <u>Invasive species</u> Exposure of topsoil and movement of construction vehicles could result in the spread of invasive non-native vegetation. Best practice construction and biosecurity measures to guard against the spread of invasive non-native species, such as New Zealand pygmyweed, *Crassula helmsii*, would be employed as standard.	• In combination studies to be conducted to identify the key flight paths of the wintering birds that use the designated site (and associated functional habitat), and an assessment to be made of the impact of the construction activities on these key flight paths. • Agreed mitigation measures to be included in the project-specific HRA of each scheme to support applications for planning permissions and environmental permits. • Implementation of planning conditions and/or conditions of relevant environmental permits to be managed through contractual obligations with supervision from an Environmental Clerk of Works appointed by Thames Water.	None
	OPERATION PHASE				
	No operational impacts are anticipated. Operational activities at the water treatment works will be of a similar nature to those already carried out by Thames Water at the existing water treatment works site such that birds would be expected to be reasonably habituated to these activities. Certain mitigation advocated for construction will be applied during operation (visual screening) and depending on the baseline findings of the noise assessment (to be completed during the detailed design and planning/permit applications and associated HRA) additional noise reduction measures would be enacted to ensure that noise levels do not significantly exceed the current baseline such that qualifying feature birds could experience a significant level of disturbance.				

Ref: Ricardo/ED10169/Issue Number Final

4 In-combination Effects

As this option forms part of a broader programme of proposed schemes, the in-combination effects acting across several options are assessed through the Programme-level HRA. The Programme will also be assessed against other known plans and projects that could have in-combination effects, as agreed with the competent authority.

5 Summary of Adverse Effects on Conservation Objectives

Given the assessment in the ‘Assessment of effects on qualifying features’ and ‘In-combination effects’ sections, and assuming that the mitigation outlined therein can be secured, no adverse effects on site integrity or the ability of the site to achieve its conservation objectives are predicted.

6 Additional Mitigation Measures

At this strategic plan level, no additional mitigation measures have been identified; however, it is envisaged that the incorporated mitigation measures will need to be developed in more detail and secured during the project-stage HRA when a detailed design and construction method statement is available.

7 The Integrity Test

If the mitigation measures described in the ‘Assessment of effects on quantifying features’ section can be imposed and implemented, then it can be reasonably concluded that the proposed Option will not have an adverse effect on the integrity of any SACs, SPAs and Ramsar sites.

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

Ricardo Energy & Environment

Habitats Regulations Assessment: Stage 2 Appropriate Assessment – South West London Pipelines (chalk streams)

Appendix K: Information to Inform an Appropriate Assessment (Habitats Regulations Assessment (HRA) Stage 2) – South West London Pipelines (chalk streams)

Report for: Thames Water Utilities Limited

ED10169 | Issue Number Final | Date 20/04/2020

Customer:

Thames Water Utilities Ltd

Customer reference:

ED10169

Contact:

Ben Stansfield
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Miriam Westbrook

Approved By:

Ben Stansfield

Date:

20 April 2020

Ricardo Energy & Environment reference:

Ref: ED10169- Issue Number Final

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1 Introduction

1.1 The overall Plan

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 long-term planning horizon in order to ensure security of supply in each of the water resource zones making up its supply area.

As part of the development of Thames Water's Water Resources Management Plan 2019 (WRMP19), the Habitats Regulations Assessment (HRA) assesses the potential effects of alternative options and programmes on sites designated for their international nature conservation interests. The HRA assessment has been undertaken in parallel with the Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment and has been used to inform the development of the WRMP19 to ensure its overall compliance with relevant legislation and national water resource planning guidance.

1.2 Legislation summary

Under the Conservation of Habitats and Species Regulations 2017, (the 'Habitats Regulations'), 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 an Appropriate Assessment to determine the implications for the site in view of the site's conservation objectives.

The objective of an Appropriate Assessment is to determine if there will be a significant adverse effect on site integrity, and is dependent on site-specifics, including condition, status and conservation objectives. As described by the HRA Handbook "*A significant effect is any effect that would undermine the conservation objectives for a European site. There must be a causal connection or link between the subject plan or project and the qualifying features of the site which could result in possible significant effects on the site*."

Habitats Regulations Assessment (HRA) refers to the assessment of the potential effects of a development project on one or more European sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs).. The Government also expects potential SPAs (pSPAs), candidate SACs (cSACs), and any confirmed HRA compensatory habitat to be considered in the same way.

- **Special Areas of Conservation (SACs)** are designated under the Habitats Directive (92/43/EEC) and target particular habitats (Annex 1) and/or species (Annex II) identified as being of European importance.

- **Special Protection Areas (SPAs)** are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC) (the 'Wild Birds Directive') for the protection of wild birds and their habitats (including particularly rare and vulnerable species listed in Annex 1 of the Directive, and migratory species).

The UK Government has also advised that Ramsar sites should be considered and included within the assessment[1]:

- **Ramsar sites** support internationally important wetland habitats and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

1 Department for Communities and Local Government (2012) National Planning Policy Framework.

For ease of reference during HRA, these three designations are collectively referred to as 'European sites', despite Ramsar designations being at the wider international level, and are also known as 'Natura 2000' sites.

1.3 The proposed Option

The Option proposes reinforcement works on the existing 355mm main from Walton to Chessington for approximately 5.5km.

1.4 Potentially affected European/Ramsar designated sites

The European sites, the qualifying features and the reasons they could be impacted by the Option are detailed below:

- South West London Waterbodies SPA and Ramsar: The pipeline runs adjacent to the Bessborough Reservoir which is a constituent part of the South West London Waterbodies SPA and Ramsar. It also runs adjacent to the Island Barn Reservoir which has the potential to be utilised as off-site functional habitat.

Any designated sites which were screened out (see Section 2) during HRA Stage 1 (see Appendix 1) due to there being no Likely Significant Effect (LSE), are not included in this Stage 2 assessment. Refer to Appendix A for the Stage 1 Assessment. For those designated sites that are included in this Stage 2 report, any of their qualifying features screened-out in Stage 1 due to no LSE are also omitted here, but are detailed in Appendix A.

1.5 Purpose of this report

The purpose of this report is to provide the necessary information to allow the Competent Authority to determine if the proposals within this Plan will have a significant adverse effect on the integrity of the designated site(s) identified in Section 1.4 above. A summary of the HRA process that informs this purpose is provided in Section 2 below.

2 Methodology

2.1 Sources of guidance

The approach to informing the Appropriate Assessment has been developed from the legislation described in Section 1.2 above and informed by the latest guidance for HRA in the UK, namely:

- Tyldesley, D. and Chapman C. The Habitats Regulations Assessment Handbook. Published and updated online by DTA Publications Limited: http://www.dtapublications.co.uk/handbooks. The Handbook is informed and regularly updated with amendments to the Regulations, the latest Government guidance and case law.
- DEFRA (2012) The Habitats and Wild Birds Directives in England and its seas - Core guidance for developers, regulators & land/marine managers (draft for public consultation)

2.2 Stages of HRA

Stage 1 in HRA is a **Screening** stage to determine whether any part of the proposed Option is likely to have a significant effect on any European site, and thus if a full Appropriate Assessment of the project is required.

Stage 2 is the **Appropriate Assessment** stage (if required) that has to conclude whether or not the option will adversely affect the integrity of the European site in question. This is judged in terms of the likely impact on a site's conservation objectives. The conservation objectives specify the overall target for a site's 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated) in order for it to contribute to maintaining or reaching favourable conservation status. Significantly, HRA is based on a rigorous application of the precautionary principle.

If significant adverse effects are identified at the Appropriate Assessment stage, feasible **alternative options** would be examined to avoid or reduce any potential significant effects on the integrity of the European site as **Stage 3** of the HRA if it is deemed that the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI). The selection of such alternatives is limited to those which would meet the objectives of the current Option.

Stage 4 comprises an **assessment of compensatory measures** where the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI).

2.3 Responsibility for undertaking HRA

The responsibility for undertaking HRA lies with the competent authority, i.e. the authority (or authorities) responsible for granting a licence or consent for the Option. Under the Habitats Regulations, the applicant has an obligation to provide the competent authorities with such information as the authority may reasonably require for the purposes of the assessment, or to enable them to determine whether an Appropriate Assessment is required.

2.4 Approach to informing the Appropriate Assessment (HRA Stage 2)

2.4.1 Consultation

Consultation, via meetings and correspondence, has been undertaken with Natural England and the Environment Agency during the screening stage of this HRA (HRA Stage 1). This has helped to determine which potential effects require more detailed, appropriate assessment provided by HRA Stage 2, as presented in this report.

2.4.2 Impact assessment

This assessment considers the potentially damaging aspects of the proposed Option with potential effects on a European site's qualifying features and likely achievement of the conservation objectives.

The potential for adverse effect on the integrity of the site depends on the scale and magnitude of the action and its predicted impacts, taking into account the distribution of the designated 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.

Where qualitative and/or quantitative information is available, this has been used to inform the assessment. Where this information is not available, professional judgement has been used. In some cases, the ecological functioning of the site and the likely effects are well understood and documented elsewhere, for instance in studies commissioned to inform the Habitats Directive Review of Consents. In these cases, the assessment may simply comprise a review of this information. Where there is not sufficient information to undertake the assessment, this is recorded in this report.

This report aims to set out, in sufficient detail for it to be transparent and understandable, what the effects of the proposed Option (alone and in-combination) are likely to be on each internationally-designated site's qualifying feature, referring to relevant background documents and other information on which these judgements, which are essentially ecological judgements, rely. Guidance states that the size or complexity of the HRA Stage 2 report to inform the Appropriate Assessment will not necessarily reflect the scale of the proposed Option, but rather the complexity of potential effects. The length of the report may not reflect the complexity of ecological judgements made to arrive at the necessary conclusions. Very complex ecological analysis and judgements may be expressed succinctly, with detailed supporting analyses contained in appendices or clearly referenced separate documents.

2.4.3 Mitigation measures

Following the People Over Wind ruling, no mitigation measures can be considered to be incorporated, and therefore used at Stage 1 Screening to avoid Likely Significant Effects. The HRA Stage 2 assessment of effects therefore considers mitigation measures separately. The assessment takes into account any mitigation measures that may already form part of the proposed Option specification (i.e. that are 'incorporated'), to determine whether they will most likely reduce the likelihood, magnitude, scale, and/or duration of the effect to a lower level. These measures can include both avoidance and reduction measures, with the former being the preferred option.

2.4.4 In-combination assessment

In accordance with the legislation, an in-combination assessment with other WRMP Options at the Programme level has been undertaken. The approach to this is described as a series of steps below:

- **STEP 1** – Does the Option have no discernible effect, whatsoever, on the European site? If not, then there's no need for in-combination assessment, as logic dictates it can't have in-combination effects.
- **STEP 2** – Does this Option have a discernible effect, but one which is not significantly adverse to site integrity alone? If so, then an in-combination assessment is required. (Effects that are adverse alone do not require in-combination assessment.)
- **STEP 3** – Identify the other Options/Plans/Projects that also have discernible effects that (1) aren't an adverse effect alone but (2) might act in combination with effects of your Option/Plan/Project. It is normal practice to agree this list of potential in-combination Plans/Projects with the Competent Authority before doing the assessment.
- **STEP 4 –** Assess these other Options/Plans/Projects in combination with this Plan.

The above steps recognise that significant adverse effects acting alone are already dealt with for that Option and should not form part of an in-combination assessment. It is only where effects that may *become adverse when acting in combination* that require an in-combination assessment.

Equally, in accordance with best-practice guidance, any projects or plans which have been completed, consented and implemented are considered to be part of the baseline (and should have been subject to their own HRA before being consented and implemented). Therefore, these will not be included as part of any in-combination assessment, but any ongoing operational effects will be noted as part of the baseline environment.

2.4.5 Conservation objectives

The Habitats Regulations require that the Appropriate Assessment is of "the implications for the site in view of that site's conservation objectives." The development of conservation objectives is required by the 1992 'Habitats' Directive (92/43/EEC). In accordance with the Habitats Directive, the objectives aim to achieve the 'favourable conservation status' of the habitat and species features for which SAC is designated (see Figure 1).

Site-specific conservation objectives for SACs have been developed by Natural England and provide a description of what is considered to be the favourable conservation status of the feature within the whole plan area.

Figure 2.1 Favourable conservation status as defined in Articles 1(e) and 1(i) of the Habitats Directive

"The conservation status of a natural ***habitat*** *is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:*

- *Its natural range and areas it covers within that range are stable or increasing, and*
- *The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and*
- *The conservation status of its typical species is favourable.*

The conservation status of a ***species*** *is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:*

- *Population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and*
- *There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."*

The generic conservation objectives covering all the European sites assessed in this report are:

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.

2.4.6 Additional mitigation measures

Where the Option has been assessed as having a significant adverse effect by undermining the site's conservation objectives, additional mitigation may be necessary to satisfy the integrity test (Section 2.4.7). Such mitigation is that which is in addition to the incorporated measures described in Section 2.4.3 above, and which is usually imposed by a Competent Authority through enforceable conditions or restrictions.

2.4.7 Integrity test

The integrity test is the conclusion of the Appropriate Assessment and requires the competent authority to ascertain whether the proposed Option (either alone or in-combination with other plans or projects), will not have an 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"

This report will conclude with a professional opinion on whether such a test can be met, but it is for the Competent Authority to make that decision in light of the information presented.

2.5 Limitations

Information provided by third parties, including publicly available information and databases, is considered correct at the time of publication. 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 Option.

The HRA has been undertaken in as detailed a way as possible, using all available data sources 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.

3 Assessment of Effects on Qualifying Features

The potential effects of the proposed Option (acting alone) on each qualifying feature of the designated site(s) previously identified as having likely significant effects during the Stage 1 screening are detailed below in **Table 3.1.** Both construction phase (where applicable) and operation phase of the Option are assessed.

Table 3-1 Assessment of effects on South West London Waterbodies SPA & Ramsar

DESIGNATED SITE: South West London Waterbodies SPA & Ramsar **REF: UK9012171 / UK11065**			**PLAN NAME: Thames Water WRMP 19** **OPTION NAME: South West London Pipelines (chalk streams)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc.**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
CONSTRUCTION PHASE					
Over winter birds; **A051 Gadwall, (*Anas strepera)*** **A056 Shoveler, (*Anas clypeata)***	Gadwall: 786 individuals representing at least 2.6% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) Shoveler: 1,075 individuals representing at least 2.7% of the wintering Northwestern/Central Europe population (5 year peak mean 1991/2 - 1995/6)	The only SSSI of relevance to these qualifying features that could potentially be impacted by this Option is the Knight & Bessborough Reservoirs SSSI. **Knight & Bessborough Reservoirs SSSI:** Favourable 100% Relevant Site Improvement Plan issues: (1) Disturbance (only) (3) Invasive species	<u>Disturbance – noise and visual</u> The Walton to Chessington reinforcement runs adjacent to the Bessborough Reservoir which is a part of the South West London Waterbodies SPA & Ramsar. It also runs adjacent to the Island Barn Reservoir which is not itself designated but has the potential to be used as off-site functional habitat by the qualifying bird species of the SPA & Ramsar. Potential for disturbance of overwintering waterfowl species due to construction noise, visual stimuli from the construction workforce and plant on the site, and light pollution as a result of any onsite lighting requirements (considered to be predominantly in the winter) could result in a reduction in foraging and roosting availability. In order to avoid significant effects on the qualifying species, the timing of construction activities with the greatest risk of noise/visual disturbance should be planned to avoid the most sensitive times of the year for wintering bird species (October to March inclusive). The Waterbird Disturbance Mitigation Toolkit[2] showed that effects of disturbance on wintering waterbirds (estuarine) did not tend to extend beyond 250m from the source of the noise, and also derived a generic overview table to calculate the likely disturbance effect for a noise level and the distance required from the source to the receptor allowing for a likely 'acceptable' noise dose of 70dB(A). According to this, any works within 250m of the SPA (or offsite functional habitat) would require the use of plant silencers and visual screening (except where suitable natural screening is identified through habitat survey) to prevent a significant disturbance impact. It is also recognised that, should construction of the pipeline take place during all or part of the winter periods, the works footprint will be visible from the air for a considerable distance and that this change in the local landscape along with the disturbance effect of operating machinery and increased human presence may affect local flight paths of these birds in the short term potentially causing them to avoid valuable foraging and roosting habitat in the vicinity. Assuming a 250m radius from source within which birds could be disturbed, a significant proportion of the works would be within this. The noise generated by the demolition and construction for the treatment works extension will need to be considered and a noise assessment with reference to the Waterbird Disturbance Mitigation Toolkit will need to be completed to demonstrate the mitigation measures are effective in avoiding disturbance before works take place outside the restricted timings. If they aren't, such works will be scheduled to avoid the Oct-March period. These assessments will form part of the detailed design and planning/permit applications and associated HRA to accompany these applications.	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Minimising the works footprint of the pipeline corridor to maximise the effectiveness of any visual screening employed. • Noise assessment to be completed during the detailed design and planning/permit applications and associated HRA, prior to commencement of works to ensure mitigation measures will be effective (if not, seasonal avoidance to be used). • Best practice biosecurity measures, as recommended by the GB Non-Native Species Secretariat (http://www.nonnativespecies.org/index.cfm?sectionid=58) would guard against any potential for spreading invasive species as a result of construction. •	None

[2] 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.

Over winter birds; **A051 Gadwall, (*Anas strepera)*** **A056 Shoveler, (*Anas clypeata)*** ***Continued***	Gadwall: 786 individuals representing at least 2.6% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) Shoveler: 1,075 individuals representing at least 2.7% of the wintering Northwestern/Central Europe population (5 year peak mean 1991/2 - 1995/6) ***Continued***	The only SSSI of relevance to these qualifying features that could potentially be impacted by this Option is the Knight & Bessborough Reservoirs SSSI. **Knight & Bessborough Reservoirs SSSI:** Favourable 100% Relevant Site Improvement Plan issues: (2) Disturbance (only) (4) Invasive species ***Continued***	<u>Invasive species</u> Exposure of topsoil and movement of construction vehicles could result in the spread of Invasive and Non-Native vegetation. Best practice construction and biosecurity measures to guard against the spread of invasive non-native species, such as New Zealand pygmyweed, *Crassula helmsii*, would be employed as standard.	• Detailed noise abatement and visual disturbance mitigation measures to be developed in co-ordination with Natural England, taking account of local site knowledge from the site managers and following professional mitigation guidance, in particular the Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects produced by the Institute of Estuarine and Coastal Studies (IECS) at Hull University. • Sensitive lighting design to be developed following professional guidance to address identified risks relating to light pollution that is applicable to birds in flight, such as that developed by the Institute of Lighting Engineers (Guidance Note 8 Bats and Artificial Lighting, 2018) and others, to ensure no adverse effects on site integrity from light spill. • In combination studies to be conducted to identify the key flight paths of the wintering birds that use the designated site (and associated functional habitat), and an assessment to be made of the impact of the construction activities on these key flight paths. • Agreed mitigation measures to be included in the project-specific HRA of each scheme to support applications for planning permissions and environmental permits. • Implementation of planning conditions and/or conditions of relevant environmental permits to be managed through contractual obligations with supervision from an Environmental Clerk of Works appointed by Thames Water.	None
OPERATION PHASE					
No operational impacts are anticipated.					

4 In-combination Effects

The South West London Pipelines (Chalk Streams) scheme has the potential to result in adverse effects on site integrity of the South West London Waterbodies SPA & Ramsar in combination with the following two Options from the Affinity Water WRMP:

- AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50Ml)
- AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50Ml/d)

The Walton to Chessington pipeline which forms part of the Affinity Water schemes runs adjacent to the South West London Waterbodies SPA & Ramsar and another reservoir that is not designated but has the potential to be utilised as off-site functional habitat by the qualifying bird species of the designated site. As such the proposals carry a risk of causing an adverse effect on the integrity of the European site and its qualifying features, namely over-wintering gadwall and shoveler, without appropriate mitigation. Table 3.1 identifies a series of construction-period mitigation measures very similar to those identified in the HRA of the Affinity Water WRMP for schemes AFF-RTR-WRZ1-4010 and AFF-RTR-WRZ1-4011. This enabled the HRA to conclude no adverse effects on site integrity. As such, since both the South West London pipelines (Chalk Streams) scheme and the two Affinity Water schemes will be implementing appropriate mitigation, even if construction occurs simultaneously, any low level residual effects (not significant alone) from the three schemes cannot act in combination to exceed the threshold for an adverse effect.
Additionally, the South West London pipelines (Chalk Streams) scheme will be constructed between 2033-2037 and the two Affinity Water Abingdon Reservoir transfer schemes will be constructed after 2038, therefore no adverse cumulative effects will arise.

5 Summary of Adverse Effects on Conservation Objectives

Given the assessment in the ‘Assessment of effects on qualifying features’ and ‘In-combination effects’ sections, and assuming that the mitigation outlined therein can be secured, no adverse effects on site integrity or the ability of the site to achieve its conservation objectives are predicted.

6 Additional Mitigation Measures

At this strategic plan level, no additional mitigation measures have been identified; however, it is envisaged that the incorporated mitigation measures will need to be developed in more detail and secured during the project-stage HRA when a detailed design and construction method statement is available.

7 The Integrity Test

If the mitigation measures described in the ‘Assessment of effects on quantifying features’ section can be imposed and implemented, then it can be reasonably concluded that the proposed Option will not have an adverse effect on the integrity of any SACs, SPAs and Ramsar sites.

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com

Ricardo Energy & Environment

Habitats Regulations Assessment: Stage 2 Appropriate Assessment – River Lee New Gauge pipeline (chalk streams)

Appendix L: Information to Inform an Appropriate Assessment (Habitats Regulations Assessment (HRA) Stage 2) – Lee Valley Improvements

Report for: Thames Water Utilities Limited

ED10169 | Issue Number Final | Date 20/04/2020

Customer:

Thames Water Utilities Ltd

Customer reference:

ED10169

Contact:

Ben Stansfield
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3430

e: ben.stansfield@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Miriam Westbrook

Approved By:

Ben Stansfield

Date:

20 April 2020

Ricardo Energy & Environment reference:

Ref: ED10169- Issue Number Final

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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 long-term planning horizon in order to ensure security of supply in each of the water resource zones making up its supply area.

As part of the development of Thames Water's Water Resources Management Plan 2019 (WRMP19), the Habitats Regulations Assessment (HRA) assesses the potential effects of alternative options and programmes on sites designated for their international nature conservation interests. The HRA assessment has been undertaken in parallel with the Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment and has been used to inform the development of the WRMP19 to ensure its overall compliance with relevant legislation and national water resource planning guidance.

1.2 Legislation summary

Under the Conservation of Habitats and Species Regulations 2017, (the 'Habitats Regulations'), 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 an Appropriate Assessment to determine the implications for the site in view of the site's conservation objectives.

The objective of an Appropriate Assessment is to determine if there will be a significant adverse effect on site integrity, and is dependent on site-specifics, including condition, status and conservation objectives. As described by the HRA Handbook "*A significant effect is any effect that would undermine the conservation objectives for a European site. There must be a causal connection or link between the subject plan or project and the qualifying features of the site which could result in possible significant effects on the site*."

Habitats Regulations Assessment (HRA) refers to the assessment of the potential effects of a development project on one or more European sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). The Government also expects potential SPAs (pSPAs), candidate SACs (cSACs), and any confirmed HRA compensatory habitat to be considered in the same way.

- **Special Areas of Conservation (SACs)** are designated under the Habitats Directive (92/43/EEC) and target particular habitats (Annex 1) and/or species (Annex II) identified as being of European importance.

- **Special Protection Areas (SPAs)** are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC) (the 'Wild Birds Directive') for the protection of wild birds and their habitats (including particularly rare and vulnerable species listed in Annex 1 of the Directive, and migratory species).

The UK Government has also advised that Ramsar sites should be considered and included within the assessment[1]:

- **Ramsar sites** support internationally important wetland habitats and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

1 Department for Communities and Local Government (2012) National Planning Policy Framework.

For ease of reference during HRA, these three designations are collectively referred to as 'European sites', despite Ramsar designations being at the wider international level, and are also known as 'Natura 2000' sites.

1.3 The proposed Option

The Option proposes a new pipeline and raw water pumping station along the New River Transfer Tunnel.

1.4 Potentially affected European/Ramsar designated sites

The European sites, the qualifying features and the reasons they could be impacted by the Option are detailed below:

- Lee Valley SPA and Ramsar: The new pipeline is adjacent to the Chingford Reservoirs SSSI which have potential to be used as off-site functional habitat for the non-breeding bird qualifying features of the SPA/Ramsar site.

Any designated sites which were screened out (see Section 2) during HRA Stage 1 (see Appendix 1) due to there being no Likely Significant Effect (LSE), are not included in this Stage 2 assessment. Refer to Appendix A for the Stage 1 Assessment. For those designated sites that are included in this Stage 2 report, any of their qualifying features screened-out in Stage 1 due to no LSE are also omitted here, but are detailed in Appendix A.

1.5 Purpose of this report

The purpose of this report is to provide the necessary information to allow the Competent Authority to determine if the proposals within this Plan will have a significant adverse effect on the integrity of the designated site(s) identified in Section 1.4 above. A summary of the HRA process that informs this purpose is provided in Section 2 below.

2 Methodology

2.1 Sources of guidance

The approach to informing the Appropriate Assessment has been developed from the legislation described in Section 1.2 above and informed by the latest guidance for HRA in the UK, namely:

- Tyldesley, D. and Chapman C. The Habitats Regulations Assessment Handbook. Published and updated online by DTA Publications Limited: http://www.dtapublications.co.uk/handbooks. The Handbook is informed and regularly updated with amendments to the Regulations, the latest Government guidance and case law.
- DEFRA (2012) The Habitats and Wild Birds Directives in England and its seas - Core guidance for developers, regulators & land/marine managers (draft for public consultation)

2.2 Stages of HRA

Stage 1 in HRA is a **Screening** stage to determine whether any part of the proposed Option is likely to have a significant effect on any European site, and thus if a full Appropriate Assessment of the project is required.

Stage 2 is the **Appropriate Assessment** stage (if required) that has to conclude whether or not the option will adversely affect the integrity of the European site in question. This is judged in terms of the likely impact on a site's conservation objectives. The conservation objectives specify the overall target for a site's 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated) in order for it to contribute to maintaining or reaching favourable conservation status. Significantly, HRA is based on a rigorous application of the precautionary principle.

If significant adverse effects are identified at the Appropriate Assessment stage, feasible **alternative options** would be examined to avoid or reduce any potential significant effects on the integrity of the European site as **Stage 3** of the HRA if it is deemed that the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI). The selection of such alternatives is limited to those which would meet the objectives of the current Option.

Stage 4 comprises an **assessment of compensatory measures** where the option should proceed under Imperative Reasons of Overriding Public Interest (IROPI).

2.3 Responsibility for undertaking HRA

The responsibility for undertaking HRA lies with the competent authority, i.e. the authority (or authorities) responsible for granting a licence or consent for the Option. Under the Habitats Regulations, the applicant has an obligation to provide the competent authorities with such information as the authority may reasonably require for the purposes of the assessment, or to enable them to determine whether an Appropriate Assessment is required.

2.4 Approach to informing the Appropriate Assessment (HRA Stage 2)

2.4.1 Consultation

Consultation, via meetings and correspondence, has been undertaken with Natural England and the Environment Agency during the screening stage of this HRA (HRA Stage 1). This has helped to determine which potential effects require more detailed, appropriate assessment provided by HRA Stage 2, as presented in this report.

2.4.2 Impact assessment

This assessment considers the potentially damaging aspects of the proposed Option with potential effects on a European site's qualifying features and likely achievement of the conservation objectives.

The potential for adverse effect on the integrity of the site depends on the scale and magnitude of the action and its predicted impacts, taking into account the distribution of the designated 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.

Where qualitative and/or quantitative information is available, this has been used to inform the assessment. Where this information is not available, professional judgement has been used. In some cases, the ecological functioning of the site and the likely effects are well understood and documented elsewhere, for instance in studies commissioned to inform the Habitats Directive Review of Consents. In these cases, the assessment may simply comprise a review of this information. Where there is not sufficient information to undertake the assessment, this is recorded in this report.

This report aims to set out, in sufficient detail for it to be transparent and understandable, what the effects of the proposed Option (alone and in-combination) are likely to be on each internationally-designated site's qualifying feature, referring to relevant background documents and other information on which these judgements, which are essentially ecological judgements, rely. Guidance states that the size or complexity of the HRA Stage 2 report to inform the Appropriate Assessment will not necessarily reflect the scale of the proposed Option, but rather the complexity of potential effects. The length of the report may not reflect the complexity of ecological judgements made to arrive at the necessary conclusions. Very complex ecological analysis and judgements may be expressed succinctly, with detailed supporting analyses contained in appendices or clearly referenced separate documents.

2.4.3 Mitigation measures

Following the People Over Wind ruling, no mitigation measures can be considered to be incorporated, and therefore used at Stage 1 Screening to avoid Likely Significant Effects. The HRA Stage 2 assessment of effects therefore considers mitigation measures separately. The assessment takes into account any mitigation measures that may already form part of the proposed Option specification (i.e. that are 'incorporated'), to determine whether they will most likely reduce the likelihood, magnitude, scale, and/or duration of the effect to a lower level. These measures can include both avoidance and reduction measures, with the former being the preferred option.

2.4.4 In-combination assessment

In accordance with the legislation, an in-combination assessment with other WRMP Options at the Programme level has been undertaken. The approach to this is described as a series of steps below:

- **STEP 1** – Does the Option have no discernible effect, whatsoever, on the European site? If not, then there's no need for in-combination assessment, as logic dictates it can't have in-combination effects.
- **STEP 2** – Does this Option have a discernible effect, but one which is not significantly adverse to site integrity alone? If so, then an in-combination assessment is required. (Effects that are adverse alone do not require in-combination assessment.)
- **STEP 3** – Identify the other Options/Plans/Projects that also have discernible effects that (1) aren't an adverse effect alone but (2) might act in combination with effects of your Option/Plan/Project. It is normal practice to agree this list of potential in-combination Plans/Projects with the Competent Authority before doing the assessment.
- **STEP 4 –** Assess these other Options/Plans/Projects in combination with this Plan.

The above steps recognise that significant adverse effects acting alone are already dealt with for that Option and should not form part of an in-combination assessment. It is only where effects that may *become adverse when acting in combination* that require an in-combination assessment.

Equally, in accordance with best-practice guidance, any projects or plans which have been completed, consented and implemented are considered to be part of the baseline (and should have been subject to their own HRA before being consented and implemented). Therefore, these will not be included as part of any in-combination assessment, but any ongoing operational effects will be noted as part of the baseline environment.

2.4.5 Conservation objectives

The Habitats Regulations require that the Appropriate Assessment is of "the implications for the site in view of that site's conservation objectives." The development of conservation objectives is required by the 1992 'Habitats' Directive (92/43/EEC). In accordance with the Habitats Directive, the objectives aim to achieve the 'favourable conservation status' of the habitat and species features for which SAC is designated (see Figure 1).

Site-specific conservation objectives for SACs have been developed by Natural England and provide a description of what is considered to be the favourable conservation status of the feature within the whole plan area.

Figure 2.1 Favourable conservation status as defined in Articles 1(e) and 1(i) of the Habitats Directive

"The conservation status of a natural ***habitat*** *is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:*

- *Its natural range and areas it covers within that range are stable or increasing, and*
- *The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and*
- *The conservation status of its typical species is favourable.*

The conservation status of a ***species*** *is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:*

- *Population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and*
- *There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."*

The generic conservation objectives covering all the European sites assessed in this report are:

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.

2.4.6 Additional mitigation measures

Where the Option has been assessed as having a significant adverse effect by undermining the site's conservation objectives, additional mitigation may be necessary to satisfy the integrity test (Section 2.4.7). Such mitigation is that which is in addition to the incorporated measures described in Section 2.4.3 above, and which is usually imposed by a Competent Authority through enforceable conditions or restrictions.

2.4.7 Integrity test

The integrity test is the conclusion of the Appropriate Assessment and requires the competent authority to ascertain whether the proposed Option (either alone or in-combination with other plans or projects), will not have an 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"

This report will conclude with a professional opinion on whether such a test can be met, but it is for the Competent Authority to make that decision in light of the information presented.

2.5 Limitations

Information provided by third parties, including publicly available information and databases, is considered correct at the time of publication. 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 Option.

The HRA has been undertaken in as detailed a way as possible, using all available data sources where they exist. However, the conclusions drawn from this are 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.

3 Assessment of Effects on Qualifying Features

The potential effects of the proposed Option (acting alone) on each qualifying feature of the designated site(s) previously identified as having likely significant effects during the Stage 1 screening are detailed below in **Table 3.1.** Both construction phase (where applicable) and operation phase of the Option are assessed.

Table 3-1 Assessment of effects on Lee Valley SPA & Ramsar

DESIGNATED SITE: Lee Valley SPA & Ramsar **REF: UK9012111 / UK11034**			**PLAN NAME:** Thames Water WRMP 19 **OPTION NAME: River Lee New Gauge pipeline (chalk streams)**		
Qualifying Feature	**Conservation Status:** **Status of species/habitat in EU and UK: numbers, distribution, trends, threats etc.**	**Site Condition (where relevant to feature):** **Refer to underpinning SSSI condition where relevant. Refer to Site Improvement Plan (SIP) where relevant.**	**Potential Effects**	**Mitigation**	**Adverse Effect? (on conservation objectives and site integrity)**
CONSTRUCTION PHASE					
Over winter birds; **A021 Bittern, (*Botaurus stellaris)*** **A051 Gadwall, (*Anas strepera)*** **A056 Shoveler, (*Anas clypeata)***	Bittern: 6 individuals representing at least 6.0% of the wintering population in Great Britain (5 year peak mean, 1992/3-1995/6) Gadwall: 515 individuals representing at least 1.7% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) Shoveler: 748 individuals representing at least 1.9% of the wintering Northwestern/Central Europe population (5 year peak mean 1991/2 - 1995/6)	The only SSSI of relevance to these qualifying features that could potentially be impacted by this Option is the Chingford Reservoirs. **Chingford Reservoirs SSSI:** Unfavourable (Recovering) 100% Relevant Site Improvement Plan issues: (1) Water pollution (2) Hydrological changes (3) Disturbance (only) (8) Air pollution	<u>Disturbance – noise and visual</u> The new pipeline and pumping station is adjacent to the north bank of the King George V Reservoir (a constituent part of the Chingford Reservoirs SSSI). This reservoir provides important offsite functional habitat for overwintering waterfowl. Potential for disturbance of these species due to construction noise, visual stimuli from the construction workforce and plant on the site, and light pollution as a result of any onsite lighting requirements (considered to be predominantly in the winter) could result in a reduction in foraging and roosting availability. In order to avoid significant effects on the qualifying species, the timing of construction activities with the greatest risk of noise/visual disturbance should be planned to avoid the most sensitive times of the year for wintering bird species (October to March inclusive). The Waterbird Disturbance Mitigation Toolkit[2] showed that effects of disturbance on wintering waterbirds (estuarine) did not tend to extend beyond 250m from the source of the noise, and also derived a generic overview table to calculate the likely disturbance effect for a noise level and the distance required from the source to the receptor allowing for a likely 'acceptable' noise dose of 70dB(A). According to this, any works within 250m of the SPA (or offsite functional habitat) would require the use of plant silencers and visual screening (except where suitable natural screening is identified through habitat survey) to prevent a significant disturbance impact. It is also recognised that, should construction of the pipeline take place during all or part of the winter periods, the works footprint will be visible from the air for a considerable distance and that this change in the local landscape along with the disturbance effect of operating machinery and increased human presence may affect local flight paths of these bird in the short term potentially causing them to avoid valuable foraging and roosting habitat in the vicinity. Assuming a 250m radius from source within which birds could be disturbed, a large proportion of the works would be within this. The noise generated by the demolition and construction for the treatment works extension will need to be considered and a noise assessment with reference to the Waterbird Disturbance Mitigation Toolkit will need to be completed to demonstrate the mitigation measures are effective in avoiding disturbance before works take place outside the restricted timings. If they aren't, such works will be scheduled to avoid the Oct-March period. These assessments will form part of the detailed design and planning/permit applications and associated HRA to accompany these applications.	• Timing of most disruptive construction activities to avoid the winter period (October – March inclusive) • Use of plant silencers and visual screening within 250m of the SPA (or offsite functional habitat). • Minimising the works footprint of the pipeline corridor to maximise the effectiveness of any visual screening employed. • Noise assessment to be completed during the detailed design and planning/permit applications and associated HRA, prior to commencement of works to ensure mitigation measures will be effective (if not, seasonal avoidance to be used).	None
OPERATION PHASE					
No operational impacts are anticipated.					

[2] 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.

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4 In-combination Effects

As this option forms part of a broader programme of proposed schemes, the in-combination effects acting across several options are assessed through the Programme-level HRA. The Programme will also be assessed against other known plans and projects that could have in-combination effects, as agreed with the competent authority.

5 Summary of Adverse Effects on Conservation Objectives

Given the assessment in the 'Assessment of effects on qualifying features' and 'In-combination effects' sections, and assuming that the mitigation outlined therein can be secured, no adverse effects on site integrity or the ability of the site to achieve its conservation objectives are predicted.

6 Additional Mitigation Measures

At this strategic plan level, no additional mitigation measures have been identified; however, it is envisaged that the incorporated mitigation measures will need to be developed in more detail and secured during the project-stage HRA when a detailed design and construction method statement is available.

7 The Integrity Test

If the mitigation measures described in the 'Assessment of effects on quantifying features' section can be imposed and implemented, then it can be reasonably concluded that the proposed Option will not have an adverse effect on the integrity of any SACs, SPAs and Ramsar sites.

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com