



Water Resources Management Plan 2024

Technical Appendix C –
Habitat Regulations Assessment Report

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Table of Acronyms

Acronym	Definition
AA	Appropriate Assessment
AESI	Adverse Effect on Site Integrity
BESP	Best Environment and Societal Plan
BVP	Best Value Plan
CEMP	Construction Environmental Management Plan
CTMP	Construction Traffic Management Plan
DAF	Dissolved Air Flotation
DO	Deployable Output
INNS	Invasive Non-Native Species
IROPI	Imperative Reasons of Overriding Public Interest
GAC	Granular Activated Carbon
LCP	Least Cost Plan
LSE	Likely Significant Effects
MI/d	Megalitres per day
NNSS	Non-native Species Secretariat
NPPF	National Planning Policy Framework
NSN	National Site Network
POM	Programme of Measures [WFD measures required to improve waterbody status]
PS	Pumping station
RAPID	Regulators' Alliance for Progressing Infrastructure Development
RGF	Rapid Gravity Filter
(c)SAC	(candidate) Special Area of Conservation
SACOs	Supplementary Advice on Conservation Objectives
SESRO	South East Strategic Reservoir Option
SIP	Site Improvement Plan
SNCB	Statutory Nature Conservation Body
(c)SPA	(candidate) Special Protection Area
SR	Service Reservoir
SRO	Strategic Resource Option

Acronym	Definition
SSSI	Site of Special Scientific Interest
STT	Severn to Thames Transfer
ToLS	Test of Likely Significance
UKWIR	UK Water Industry Research
WFD	Water Framework Directive
WRMP19	Water Resources Management Plan 2019
WRMP24	Water Resources Management Plan 2024
WSR	Water Supply Reservoir
WRSE	Water Resources South East
WRC	Water Recycling Centre
WRZ	Water Resource Zone
WSW	Water Supply Works
WTW	Water Treatment Works
VSD	Variable Speed Drive
ZoI	Zone of Influence

Executive summary

As a water company, Thames Water has a statutory obligation to produce a Water Resources Management Plan (WRMP) every five years. The WRMP sets out how a sustainable and secure supply of clean drinking water will be provided to its customers over a minimum 25 year planning period whilst showing how its long-term vision for the environment will be achieved. This Habitat Regulations Assessment (HRA) report sits within the suite of plan level environmental assessment documents that accompanies the Water Resources Management Plan 2024 (WRMP24). This assessment process feeds into the plan-making process as part of the Thames Water's best value planning (BVP) approach. The WRMP24 presents significant opportunities to bolster water available to the environment in order to support healthy rivers and watercourses, ensuring the protection and enhancement of our natural habitats.

This report presents the results of the HRA including the Stage 1 Screening and Stage 2 Appropriate Assessment (AA) undertaken for Thames Water's Water Resources Management Plan 2024 (WRMP24). It assesses the potential effects of the WRMP24 on European Designated Sites in the UK's National Site Network (referred to as Habitats Sites in this report), including Special Protection Areas (SPAs), Special Conservation Areas (SCAs) and Ramsar Sites. The HRA and AA was undertaken following the methodology in the *UKWIR (2021) Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15)*.

As part of the environmental assessment process to support the development of the Thames WRMP24 Plan, a HRA Stage 1 Screening assessment (or 'Test of Likely Significance') was undertaken on the constrained list of water resource options to identify options where Likely Significant Effects (LSE) on Habitats Sites could not be ruled out. Where LSE was identified, the option progressed to the HRA Stage 2 Appropriate Assessment (or 'Integrity Test'). The individual option screening assessments are provided in Annex A; Stage 2 AAs are available in Annex C and Annex B provides information on Habitats Sites relevant to those assessed in Annex C.

The Best Value Plan (BVP) (WRMP24) includes a range of supply and demand options, licensing capping and a 'high' environmental destination scenario. The HRA assessed the plan with a focus on supply side options. The HRA AA aimed to test if Adverse Effect on the Site Integrity (AESI) of the Habitats Sites screened as having LSE can be excluded. Where options are likely to, or have the potential to, give rise to LSE upon a Habitats Site a Stage 2 AA was completed. The Stage 2 AA looked at the implications on the integrity of that site in view of that site's structure, function and conservation objectives and taking into account any site-specific supplementary advice or site improvement plan. Scheme design and proposed mitigation measures to be applied to eliminate or reduce any effects identified in screening, may be considered within the AA.

The assessment found that, provided that appropriate mitigation measures are implemented, AESI can be ruled out from all of the BVP options. Within the BVP, LCP and BESP plans there are two options, Oxford Canal to Duke's Cut (SWOX) and Duke's Cut to Farmoor, which AESI have been excluded but may result in low effects on the Cannock Extension Canal SAC and Oxford Meadows SAC respectively. As the two options do not affect the same Habitats Site, there are no in-combination effects between them.

The assessment also found that there would be no in-combination effects between the BVP, LCP or BESP and other plans and projects. In-combination assessment of this plan focuses on other plans and major developments within a similar geographic area to the WRMP24 and where a pathway exists for effects to be possible. Although the development activities arising from the Local

Development Plans may potentially overlap with WRMP activities, there is no pathway for Habitats Sites to be affected either directly or indirectly, alone or in-combination with other projects or plans, and consequently the possibility of in-combination effects is ruled out. This is due to the distance between the identified Local Development plans and the lack of hydrologically connection.

The mitigation measures detailed within this document assume a worst-case scenario at this stage in the absence of detailed survey data or local records. As such, they are considered to be appropriate so that AESI can be avoided. The receipt of additional data may provide evidence that there will be no adverse effects on Habitats Sites even in the absence of mitigation; in this scenario this document should be revised accordingly.

This report will be sent for consultation with the relevant nature conservation authorities and the public. If the competent authority considers that residual adverse effects remain, the next stage of the HRA (Assessment of Alternative Solutions) would be required.

Further design iterations will require revisions to this document and may result in changes to the current conclusion.

1 Introduction

1.1 Overview

Water companies in England and Wales are required to produce a Water Resources Management Plan (WRMP) every five years. The WRMP sets out how the company intends to maintain the balance between supply and demand for water over a minimum of 25 years. In the development of a WRMP, water companies must follow the Environment Agency (EA) Water Resources Planning Guideline (WRPG)¹ and consider broader government policy objectives, ensuring the plan sets out how the company intends to maintain the balance between supply of, and demand for, water over the long-term planning horizon and how to increase security of supply in each of the water resource zones making up its supply area.

The Thames water supply area is situated within the Water Resources South East (WRSE) regional planning area. Therefore, all the water resource options considered as part of the Thames Water Resources Management Plan 2024 (WRMP24) have fed down from the selected options as part of the regional plan. For Thames Water's WRMP24 the Habitats Regulations Assessment (HRA) focuses on the local scale, drawing on the higher-level work previously completed for the regional plan where applicable.

Assessment of the water resource options should be undertaken to identify potential option impacts on the water environment while also considering potential mitigation measures. As part of the environmental assessment process to support the development of the WRSE Regional Plan and Thames Water WRMP24, HRA Screening assessments and, where needed, Appropriate Assessment (AA) have been completed. The HRA Stage 1 screening assessment was undertaken on the feasible list of water resource options (that is those that were considered suitable for inclusion into the plan) to identify options with LSE on European designated sites and Ramsar sites in the UK's National Site Network (hereafter referred to as 'Habitats Sites' in this report and explained in Section 2.1). Options selected with the WRMP and its alternatives, identified as having potential for LSE during the Stage 1 Screening assessment were taken forward to Stage 2 of the HRA process, the AA.

The HRA process was undertaken alongside the development of the Thames WRMP24 to inform the decision-making process and integrate environmental considerations. The HRA for the draft WRMP24 (dWRMP24) was presented in an HRA Report which was issued for consultation from November 2022 to March 2023. Comments received from the consultation process were reviewed and have been addressed where appropriate within this HRA Report. The draft WRMP24 has been updated to the revised draft WRMP24 (rdWRMP24) reflecting additional modelling work undertaken to optimise the plan as well as consultation feedback. This report is the HRA Report for the Thames WRMP24 and forms part of the Thames WRMP24 documentation.

1.2 Thames WRMP24

The WRMP24 is an adaptive plan to deal with uncertainties and future scenarios that will mean further investment is required (e.g., further future sustainability reductions). An adaptive planning approach uses branches to cover these uncertainties. WRSE and Thames Water selected a total of nine branches (hereafter referred to as 'situations'), which were derived based on combinations of

¹ Environment Agency, Natural Resources Wales, Office for Water Services (2022). Water resources planning guideline. Available at: [Water resources planning guideline - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/water-resources-planning-guideline).

the three key drivers: population and housing growth; climate change impact on deployable output (DO) for existing systems; and levels of abstraction reduction associated with delivering Environmental Destination ambitions. Section 10 in the WRMP24 provides further detail on the adaptive planning process. While effects on specific Habitats Sites as a result of the policy decisions cannot be identified at this strategic plan level, the overall retention of water in the environment from the policy decisions and demand management strategies is considered to be beneficial to the maintenance of the national site network (NSN).

As part of the regional plan and WRMP processes, a Best Value Plan (BVP), which forms the WRMP24, and two alternative plans (a Least Cost Plan (LCP) and Best Environment and Societal Plan (BESP)) were developed in line with the WRPG. HRA Screening assessments have been undertaken for all of Thames Water's feasible options, including transfers, reservoirs, water recycling, desalination, groundwater sources and aquifer storage and recharge. Options such as demand management were scoped out of the assessment owing to the characteristics of those options. Where options were selected for the WRMP24 or the two alternative plans, AA was undertaken where required. Further information on the BVP Framework and on the selection of the BVP and the two alternative plans is presented in Section 10 of the WRMP24.

1.3 The purpose of the Habitats Regulations Assessment

This HRA is statutory requirement and has been undertaken for Thames Water's WRMP24 to deliver the duties upon Statutory Undertakers (in this case water utilities) with regard to ensuring that their works comply with the requirements of the Conservation of Habitats and Species Regulations 2017 (as amended) (the 'Habitats Regulations'), by ensuring that the potential effects of the options on Habitats Sites are fully considered. The outcomes of the assessment will inform any likely impediments to the practicality or deliverability of the options being taken forward.

Consultation with Statutory Nature Conservation Body (SNCB) Natural England on the dWRMP24 was undertaken from November 2022 to March 2023 on their agreement as to whether the plan presented in that report could rule out adverse effects when considering the integrity² of Habitats Sites in the region. Comments received from the consultation process were reviewed and have been addressed where appropriate within this WRMP24 HRA Report. It should be noted that where adverse effects on site integrity cannot be ruled out, the competent authority cannot grant a consent or adopt a plan. Further consultation between the Thames Water and Natural England, will be required and this report will form the basis of future iterations of the HRA and ultimately the final WRMP24 assessment.

1.4 Assumptions and 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 undertaking of the proposed works.

Any uncertainties surrounding, and limitations of, the assessment process are acknowledged and highlighted. Recommendations for avoidance and mitigation measures to address the potential adverse effects on the integrity of the Habitats Sites identified by this report are also based on the information available at the time of the assessment. It is acknowledged that the requirement for

² The integrity of a site is defined as 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 levels of populations of the species for which it was designated.

mitigation may change if design of the WRMP24 options progresses. This is expected to be through increasing the level of detail available during later stages of option development. A project level HRA may be required as appropriate.

HRA Stage 1 Screening assessments have been undertaken for all feasible options. A Stage 2 AA has been undertaken, where required, for options selected in the WRMP24 and the two alternative plans (see Section 2.1 for details about the different plans).

2 Habitats Regulations Assessment Process

2.1 Habitats Regulations Assessment Process

As part of the environmental assessment process to support the development of the WRSE Regional Plan and Thames WRMP24, the WRMP24 is subject to the provisions of the Conservation of Habitats and Species Regulations 2017 (as amended) ('the Habitats Regulations')³.

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

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

The process of undertaking this assessment is known as an HRA. An HRA determines whether a plan or project will result in LSE on any Habitats Site as a result of the plan's implementation (either on its own or 'in combination' with other plans or projects)⁵ and, if so, an Appropriate Assessment ('AA') is undertaken to determine whether there will be any 'adverse effects on site integrity'⁶. If there may be such adverse effects on site integrity after mitigation, then there will need to be a further process under Regulation 64 of considering whether there are alternatives and, if none are identified, assessment of compensation measures and whether there are imperative reasons of overriding public interest why consent should be granted or a plan published/approved notwithstanding. The Regulations define the nature and roles of statutory bodies, competent authorities and the appropriate nature conservation body as well as the requirements for

³ Although the Habitats Regulations have been amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, due to the UK's exit from the EU, the effect of these amendments is largely related to wording, with requirements and processes remaining the same, as protection levels remain unchanged.

⁴ The Habitats Regulations include measures to establish and maintain a network of sites protecting habitats which are valuable in themselves as well as for the species they support. These sites form a network of European sites in the Natura 2000 network, which domestically form part of the UK's National Site Network (NSN). The term 'European site' is currently retained in the EU Exit amendment to the Habitats Regulations and for all practical purposes the definition is essentially unchanged. European sites are therefore: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agreed the site as a 'Site of Community Importance' (SCI) (if this was before 31 Jan 2020); any classified Special Protection Area (SPA); and any candidate SAC (cSAC). However, the term is also commonly used when referring to potential SPAs (pSPAs), to which the provisions of Article 4(4) of Directive 2009/147/EC (the 'new wild birds directive') are applied; and to possible SACs (pSACs) and listed Ramsar Sites, to which the provisions of the Habitats Regulations are applied as a matter of Government policy (National Planning Policy Framework (NPPF) para. 181) when considering development proposals that may affect them. In this document the term 'Habitats Sites' is used as an umbrella term for all the above designated and listed sites, after the NPPF.

⁵ The Stage 1 Screening assessment, sometimes known as the 'Test of Likely Significance'

⁶ The Stage 2 Appropriate Assessment, sometimes known as the 'Integrity Test'

information to be submitted to these bodies to enable them to undertake the required assessments.

An important relevant the guidance document for HRAs in WRMPs, UKWIR (2021)⁷, has been followed in this assessment. Other relevant guidance such as The Habitats Regulations Assessment Handbook⁸, existing EU guidance⁹ and preceding domestic and European case law remains valid as a source of direction and interpretation of the requirements of the legislation¹⁰.

2.2 Application of HRA in WRMPs

HRA guidance suggests the HRA should be undertaken in four stages, each stage being informed by the one preceding, to ensure an iterative and objective assessment. If the conclusion of the Stage 1 Screening assessment is that there will be No LSE on a Habitats Site, there is no requirement to undertake further stages. Similarly, if the Stage 2 AA concludes that there will be no Adverse Effects on Site Integrity (AESI), then the assessment is concluded. The HRA stages are summarised within Table 2.1. Stage 3 (Assessment of Alternative Solutions) and Stage 4 (Assessment where no alternative solutions exist and where adverse effects remain) were not required for this WRMP24.

Table 2.1: HRA Stages

Stage	Description
Screening (Stage One) Or 'Test of Likely Significance'	<p>This is the process which identifies the likely effects of the plan on Habitats Sites either alone or in combination with other plans/projects and considers if these are likely to be significant (see definitions below).</p> <p>An effect should be considered 'likely' if the competent authority is unable (on the basis of objective information) to exclude the possibility that the plan or project could have significant effects on any Habitats Site, either alone or in combination with other plans or projects. The effect will be considered 'significant' if it could undermine the site's conservation objectives.</p> <p>Screening is an iterative process and before moving to Stage 2, it can be repeated if required.</p> <p>Proposals to mitigate any LSE cannot be considered at the screening stage.</p>

⁷ UKWIR (2021) Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans. UK Water Industry Research Limited, London.

⁸ Tyldesley, D. & Chapman, C. (2021). The Habitats Regulations Assessment Handbook [online]. DTA Publications Limited. Available at: <https://www.dtapublications.co.uk/handbook/>

⁹ European Commission (2018). Managing Natura 2000 Sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE [online] available at: [EN_art_6_guide_jun_2019.pdf\(europa.eu\)](https://ec.europa.eu/nature/conservation/biodiversity/diversity/eu-law-directives/habitats/natura2000/sites-managing-natura-2000-sites-provisions-article-6-habitats-directive-92-43-cee) (last accessed April 2022).

¹⁰ Other relevant guidance and case-practices include:

- UK Government (2019). Appropriate assessment: Guidance on the use of Habitats Regulations Assessment [online]. Available at: <https://www.gov.uk/guidance/appropriate-assessment>
- Tyldesley, D. & Chapman, C. (2021). The Habitats Regulations Assessment Handbook [online]. DTA Publications Limited. Available at: <https://www.dtapublications.co.uk/handbook/>
- Regulators' Alliance for Progressing Infrastructure Development (2022). Strategic regional water resource solutions guidance for Gate 2
- Landelijke Vereniging tot Behoud van de Waddenzee/ Nederlandse Vereniging tot Bescherming van Vogels, European Court of Justice, Case C-127/02 'Waddenzee 2002'
- Sweetman et al. v An Bord Pleanála, European Court of Justice, Case C-258/11 'Sweetman 2011'
- People over Wind/Sweetman v Coillte Teorante, European Court of Justice Case C-323/17 'People over Wind 2017'

Stage	Description
	If the Screening (Stage 1) identifies that the project or plan, alone or in combination, may have LSE on a Habitats Site and/or its features of interest, or if there is uncertainty, the competent authority must undertake an AA (Stage 2) of the implications for that site in view of that site's conservation objectives and conservation status.
Appropriate Assessment (Stage Two) Or the 'Integrity Test'	<p>This is the process of exploring whether the plan can rule out AESI beyond reasonable scientific doubt, either alone, or in combination with other projects or plans.</p> <p>Site integrity (in HRA terms) is <i>'the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated'</i>¹¹</p> <p>Where mitigation has been proposed to avoid or minimise adverse effects, this stage includes assessment of the effectiveness of any mitigation applied.</p> <p>The assessments must be 'appropriate' to the effects and proposal being considered, and sufficient to ensure that there is no reasonable doubt that adverse effects on site integrity will not occur.</p>
Assessment of Alternative Solutions (Stage Three)	If the mitigation measures applied and assessed during AA cannot avoid adverse effects on the integrity of a Habitats Site, this stage examines alternative ways of achieving the objectives of the project or plan which avoid or reduce adverse effects on the integrity of the Habitats Site or another Habitats Site.
Assessment where no alternative solutions exist and where adverse effects remain (Stage Four)	<p>Where there are no suitable alternative solutions that have no or less adverse effects on Habitats Sites, Stage Four requires an assessment of compensatory measures where the plan should proceed for Imperative Reasons of Overriding Public Interest (IROPI).</p> <p>In making this assessment, it is important to recognise that guidance does not exist for the assessment of IROPI, but it should be appropriate to the likely scale, importance, and impact of the proposed project or plan, and will need to be sufficient to override the AESIs, taking into account the compensatory measures secured. The compensatory measures must ensure the overall coherence of the National Site Network (NSN).</p>

Source: Mott MacDonald Ltd, 2022

The HRA for the Thames WRMP24 has been undertaken in an iterative and objective manner following the above stages. It has been undertaken with reference to best practice guidance and relevant case law to inform the interpretation and therefore correct application of the terms 'likelihood', 'significance' and 'in-combination'.

2.3 HRA Stage 1 Screening assessment methodology

The initial list of sites for the HRA screening assessment was derived by adopting a pathway/receptor approach with a distance-based threshold of 10km, whilst including more distant sites subject to longer pathways; these included those sites which were hydrologically connected via surface or groundwater catchments. This is based on the premise that most significant effects on qualifying features of Habitats Sites will occur within a maximum of a 10km radius¹². This distance of 10km is defined as the Zone of Influence (ZoI) of the Thames Water options, which has been extended where appropriate to capture all potential effects on Habitats Sites.

¹¹ European Commission (2018). Managing Natura 2000 Sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE [online] available at: [EN_art_6_guide_jun_2019.pdf \(europa.eu\)](#) (last accessed April 2022).

¹² UKWIR (2021). Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15), 132p.

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

- Any SPA/SAC/pSPA/cSAC/pSAC/Ramsar sites, including any marine sites or marine elements of these sites within the potential Zol, and any known areas of land outside the site boundary itself, which plays an important role in supporting the site and its features of interest (functionally linked land).
- Potential effects resulting from the plan or project.
- The Zol of these effects, noting this may extend some distance from the site and is not confined to activities on or adjacent to the site.
- Any credible pathways for the project (or plan) to the receptor (Habitats Sites themselves or functionally linked land).
- The qualifying features of the Habitats Site(s) in question.
- The conservation objectives of the Habitats Site, including any site sensitivities given within any supplementary advice, site improvement plan, or equivalent document published by the relevant SNCB.

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

- **Likelihood:** Where an effect was considered to be potentially significant, the assessment of its occurrence was based on the likelihood of it occurring and not certainty that it would occur. Effects were scoped in unless there was evidence to the contrary demonstrating that they would not occur, e.g., there being no valid pathway, or the absence of the species in that area, at that time.
- **Significance:** The significance of any effect was considered objectively, against the scale and nature of the impact in relation to those of that particular feature or condition and in relation to the extent of that feature or condition over the entire Habitats Site. A significant effect within this assessment is one which, if it occurred, would lead to a decline in the quality or status of the habitats or distribution and/or abundance of feature(s) of interest.
- **In-combination:** The assessment of in-combination effects considered those projects or plans which:
 - Are currently in operation
 - Those which are actually proposed – defined by being a valid live planning application, or any referenced with a local plan where there is potential for them being undertaken within a reasonable time period, specified within that plan.

In line with relevant case law, this assessment is undertaken in the absence of mitigation (including measures embedded into the options where these are intended for the avoidance of effects).

Where LSE have been identified (either alone or in combination with other projects or plans) the assessment has taken these effects through to Stage 2 AA. Drawing on other relevant case law, the phrase 'likely significant' should be interpreted as 'a credible risk that the conservation objectives will be undermined'.

2.4 HRA Stage 2 Appropriate Assessment approach and methodology

2.4.1 Approach

Where a plan or project cannot rule out LSE on a Habitats Site, an assessment must be made of the implications for the integrity of that site in view of that site's conservation objectives, considering

any site-specific supplementary advice (i.e., the Supplementary Advice on Conservation Objectives (SACO)) or site improvement plans.

Where mitigation measures are to be applied to eliminate or reduce any effects identified in screening, these may be considered within the AA.

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

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

The HRA Stage 2 AA for the WRMP24 has been undertaken using the following approach:

- Review of the sites identified at Stage 1 and confirmation of any additions or exclusions
- Assessment of the construction and operation effects of the selected options
- Assessment of the Habitats Sites' characteristics and identification of their conservation objectives¹³
- Identification of the aspects of the proposed options that will significantly impact the conservation objectives of the Habitats Site(s)¹⁴.

This assessment has been undertaken having regard to the following guidance:

- UK Water Industry Research (UKWIR, 2021)¹⁵
- GOV.UK (2019) Appropriate Assessment – Guidance on the use of Habitats Regulations Assessment. Published 22 July 2019³
- European Commission (EU, 2018) Managing Natura 2000 sites – The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC¹⁶.

2.4.2 Consultation

Thames Water has been working closely with Natural England and the Habitats Site managers throughout the WRMP process to agree the specific mitigation measures to be included in the HRA. The agreed mitigation measures will be expected to form part of planning conditions, development consent order requirements and/or conditions of relevant environmental permits, and their implementation managed through contractual obligations with supervision from an Environmental Clerk of Works, working on behalf of Thames Water.

¹³ Habitats Sites descriptions, qualifying features and conservation objectives are given in Annex B.

¹⁴ This is the AA given and tabulated in Sections 4, 5 and 7.

¹⁵ UKWIR (2021). Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15).

¹⁶ European Commission (2018). Managing Natura 2000 Sites – The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE [online] available at: [EN_art_6_guide_jun_2019.pdf\(europa.eu\)](#) (last accessed April 2022).

2.4.3 Potential effects considered as part of the HRA

Following UKWIR (2021)¹⁵ guidance and given the nature of the WRMP options, the potential effects considered in this assessment are summarised in Table 2.2 Proposed distances are also provided following the same guidance to ascertain if, where a pathway has been identified, the impact is likely to affect the habitats or species for which the Habitats Site(s) are designated.

Table 2.2: Potential effects and proposed Zone of Influence

Broad categories of potential effects on Habitats Sites (with examples)	Examples of activities which may result in effects and proposed Zoi
<p>Physical loss</p> <p>Destruction (including offsite effects), e.g., foraging habitat, smothering</p>	<p>Development of built infrastructure associated with the options, e.g., reservoir embankments, tunnels, pipelines and access routes.</p> <p>Physical loss only has potential to be significant where the boundary of the option extends within the boundary of the Habitats Site, or within an offsite area of known foraging, roosting, breeding habitat (that supports species for which a Habitats Site is designated or where natural processes link the option to the site, such as through hydrological connectivity downstream, or the option affects the linking habitat).</p>
<p>Physical damage</p> <p>Habitat degradation</p> <p>Erosion</p> <p>Trampling</p> <p>Fragmentation</p> <p>Severance/barrier effects</p> <p>Edge effects</p>	<p>Development of built infrastructure associated with the options, e.g., reservoir embankments, tunnels, pipelines and access routes.</p> <p>Physical damage may result in significant effects where the option is located within or directly adjacent to the boundary of the habitats site, within functionally linked land or where natural processes link the option to the habitats site, such as through hydrological connectivity and coastal processes.</p>
<p>Non-physical disturbance</p> <p>Noise</p> <p>Visual presence</p> <p>Light pollution</p>	<p>Noise from construction activities</p> <p>Taking into consideration the noise level generated from general building activity (c. 122dB(A)) and considering the lowest noise level identified in guidance as likely to cause disturbance to waterbird species (although this guidance is designed primarily for estuarine birds, it was considered appropriate to use for this plan), it is concluded that noise effects could be significant up to 1km from the boundary of the Habitats Site.</p> <p>Noise from vehicular traffic during construction of the option</p> <p>Noise from construction traffic may be significant where the transport route to and from the option is within 500m of the boundary of the Habitats Site(s).</p> <p>Plant and personnel involved in operation of the option</p> <p>These effects (noise, visual/human presence) may be significant where the boundary of the option extends within or is adjacent to an offsite area of known foraging, roosting, breeding habitat that support species for which a Habitats Site is designated.</p> <p>Options that might include artificial lighting, e.g., for security around a temporary pumping station (PS); and lighting of construction compounds.</p> <p>Effects from light pollution are more likely to be significant where the boundary of the option is within 500m of the boundary of the Habitats Site.</p>

Broad categories of potential effects on Habitats Sites (with examples)	Examples of activities which may result in effects and proposed Zol
<p>Water table/availability</p> <p>Drying</p> <p>Flooding/storm water</p> <p>Changes to surface water levels and flows</p> <p>Changes to groundwater levels and flows</p>	<p>Change to water levels and flows due to water abstraction, storage and drainage interception associated with inland options.</p> <p>These effects may be significant where the boundary of the option extends within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the option and the Habitats Site and whether the option is up or downstream from the Habitats Site.</p>
<p>Toxic contamination</p> <p>Water pollution</p> <p>Soil contamination</p> <p>Air pollution</p>	<p>Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems</p> <p>These effects may be significant where the boundary of the option extends within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the option and the Habitats Site, and sometimes whether the option is up- or downstream from that site.</p> <p>Air emissions associated with plant and vehicular traffic during construction and operation of the option.</p> <p>The effect of dust may be significant where site is within or in close proximity to the boundary of a Habitats Site. Without mitigation, dust may be deposited/spread by vehicles on roads up to 500m from large sites, 200m from medium sites, and 50m from small sites as measured from the site exit. Effects of road traffic emissions from the transport route to be taken by the option traffic may be significant where the Habitats Site falls within 200m of the edge of a road affected.</p>
<p>Non-toxic contamination</p> <p>Nutrient enrichment (e.g., of soils and water)</p> <p>Algal blooms</p> <p>Changes in turbidity</p> <p>Changes in sedimentation/silting</p> <p>Air pollution (dust)</p>	<p>Changes to water salinity, nutrient levels, turbidity, thermal regime due to increased water abstraction, discharges, storage, or reduced compensation flow releases to river systems</p> <p>These effects may be significant where the boundary of the option extends within the same ground- or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the option and the Habitats Site, and sometimes whether the option is up- or downstream from that site.</p> <p>Emissions of dust during the earthworks, construction of plant and tunnel/pipeline construction associated with options.</p>

Broad categories of potential effects on Habitats Sites (with examples)	Examples of activities which may result in effects and proposed Zol
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Biological disturbances	Killing or injury due to construction activity
Direct mortality	May be a risk where the boundary of the option extends within or is directly adjacent to the boundary of the Habitats Site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a Habitats Site is designated).
Changes to habitat availability	Changes in habitat availability, such as reductions in wetted width of rivers from abstraction or reduced compensation flow
Changes in species abundance or distribution	These effects may be significant where the boundary of the option extends within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the option and the Habitats Site, and sometimes whether the option is up- or downstream from that site.
Out-competition by non-native species	Creation of new pathway for spread of non-native invasive species
Introduction of disease	This effect may be significant where the option is situated within the Habitats Site or an upstream tributary of the Habitats Site, but also for inter-catchment water transfers.
Introduction of invasive species	

Source: UK Water Industry Research (2021)¹⁵.

2.4.4 Key assumptions and uncertainties measures

2.4.4.1 Overview

A ‘strategic’ or plan-level HRA presents a number of distinct challenges in that it is attempting to assess a long-term plan with specific projects that are in the early stages of design. The high-level nature of this assessment reflects this lack of detailed design for the WRMP24 options, and it is acknowledged that the assessment can only be based on data and information that can be reasonably gathered at this stage and so does not include, for example, option-specific survey data or similar. By law, any plan being taken forward to be implemented will be subject to an application-specific AA at the project stage, when, in the light of more information relating to the construction and design of the option, a more refined HRA assessment can be undertaken.

It is considered that this AA has been undertaken in a robust manner and to the fullest extent possible for all included options at this stage of the plan.

2.4.4.2 Standard best-practice mitigation

Based on the current level of detail available for the WRMP24, a number of established mitigation measures are given which can be assumed for all options. These measures are defined as industry-wide best practice measures to address common risks in the construction and development sectors and thus are proven to reduce the risk of the identified effects in so far as is reasonably possible. These measures will be applied to the construction of the final option and constitute mitigation to avoid or reduce adverse effects on Habitats Site integrity and therefore are only mentioned at the AA stage.

2.4.4.3 Standard best practice measures during construction

The following measures constitute best practice for the WRMP24 options and are control measures which are essential features of the project and will be integrated into the construction phase. Best

practice for the options design, pollution control, biosecurity, disturbance, and the Construction and Environmental Management Plan (CEMP) includes:

Options design

- Should design be altered, every opportunity for avoiding potential effects on Habitats Sites (e.g., through alternative pipeline routes and micro siting) should be taken.
- Construction of new pipelines at watercourse crossings will be designed to avoid direct impacts on riverbed and permanent habitat loss. If project-level hydrological investigations imply that there will be disruption to the water table, it will be recommended that a directional drilling method is employed to ensure that no direct impact on the water course or adjoining Habitats Site(s) occurs. Directional drilling will be used at all watercourses >3m wide. For water courses <3m wide, localised and temporary water quality and hydrology changes may arise during construction, but as pollution control best practices will be applied to all water course crossings at all times, these measures are considered sufficient to mitigate any significant effect related to water pollution. The potential for increased flood risk and groundwater impacts will be confirmed in the hydrological investigations which will inform the HRA at this stage. Pipeline routes will be preferably designed to avoid unnecessary watercourse crossings and as distant as possible to Habitats Site boundaries to offer a buffer, limiting pathways through disturbance and pollution runoff. The buffers applied to assess potential effects will be specific to each option and will consider the Habitats Sites and their qualifying features.

Pollution control

- Indirect construction-related pollution is identified as one key pathway through which Habitats Sites may be affected. There is numerous guidance on environment good practice measures during construction, which can be relied on (at this level) to prevent significant adverse effects on a Habitats Site. The best-practice procedures detailed in the following documents should be followed for all construction works, as a minimum standard:
 - CIRIA C741 Environmental good practice on site guide (Charles and Edwards, 2015)¹⁷
 - CIRIA C532 Control of water pollution from construction sites (Masters-Williams *et al.* 2001)¹⁸
 - Environment Agency's Pollution Prevention Guidance Notes¹⁹ including PPG1: General Guide to Prevention of Pollution (July 2013); PPG5: Works and maintenance in or near water (October 2007), PPG6: Pollution prevention guidance for working at construction and demolition sites (April 2010); PPG21: Pollution incident response planning (March 2009); PPG22: Dealing with spills (April 2011).
- The installation of sediment traps near or in watercourses or the use of cofferdams should be specified at the project stage.
- Compliance with the provisions of the *Health and Safety at Work Act 1974, the Environmental Protection Act 1990, the Environment Act 1995, the Clean Air Act 1993, and the regulations made thereunder, including the Control of Substances Hazardous to Health Regulations (SI 2002/2677)* with regard to air quality management.

¹⁷ Charles P. and Edwards P. (2015) *Environmental good practice on site guide*. CIRIA C741, 260p.

¹⁸ Masters-Williams H., Heap A., Kitts H. *et al.* (2001) *Control of water pollution from construction sites*. CIRIA C532, 27p.

¹⁹ Note: the Environment Agency Pollution Prevention Guidance Notes have been withdrawn by the Government, although the principles within them are robust and still form a reasonable basis for pollution prevention measures. Documents are still available online at: [\[ARCHIVED CONTENT\] Environment Agency - Pollution prevention advice and guidance \(PPG\) \(nationalarchives.gov.uk\)](#) (last accessed April 2022).

- Plans to help mitigate air quality impacts to support this should include an Air Quality/Dust Management Plan and a Construction Traffic Management Plan (CTMP).

Biosecurity

- Biosecurity measures will be in place to ensure the management of invasive non-native species (INNS) on construction sites and during controlled activities. The following considerations will be given pre-construction:
 - INNS risk assessment to be undertaken at site feasibility stage
 - Where INNS are identified, legal requirements and mitigation plan developed at early planning stage
 - INNS to be included on all site method statements including CEMP and any Ecological Protection Plans. INNS risk to be managed by Clerk of Works and INNS brief given to all site contractors
 - Where a species requires long-term management (such as Japanese knotweed *Fallopia japonica*), a specific INNS management plan will be developed.
- The best-practice procedures detailed in the following documents should be followed to reduce the spread of INNS for all construction works derived from these options, as a minimum standard:
 - CIRIA Manual C679 'Invasive species management for infrastructure managers and the construction industry'; The Knotweed Code of Practice – managing Japanese knotweed on development sites'.

Disturbance – noise

- Construction activities will be conducted in accordance with noise limits to avoid disturbance.
- Construction related noise disturbance will be minimised by implementing best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008)²⁰.

Disturbance – light

- Lighting will be kept to a minimum to reduce disturbance. Should the works be undertaken at night and flood lighting required, lighting should be kept to a minimum and hooded spotlights directed away from potentially suitable habitat for qualifying species of Habitats Sites to reduce disturbance, while ensuring standards for health and safety.
- The potential impact of artificial light may be minimised through the implementation of best practice such as 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011)²¹.

Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) must be developed prior to construction, including measures to ensure that the risk of uncontrolled discharges from construction is reduced (including sediment management) and detailing an Emergency Response Plan in the event of a pollution incident. This plan must be prepared for all works and include the industry best practice measures listed above and any targeted mitigation measures identified during the HRA.

²⁰ The British Standards Institute (2008). BS 5228-1:2009+A1:2014. *Code of practice for noise and vibration control on construction and open sites. Noise*. BSI Standards Limited, London.

²¹ Institution of Lighting Professionals (2020). Guidance note for the reduction of obtrusive light. Guidance Note1/20.

2.4.4.4 Standard best-practice mitigation during operation

There are no generic assumptions relating to best practice or otherwise during the operation of the options. This will be tailored to each option as needed.

3 HRA Findings

3.1 HRA Stage 1 Screening Outcomes

As set out in Section 2.3, an HRA Stage 1 Screening assessment was undertaken for the feasible list of options. A summary of the outcomes of the Screening assessment is presented in Table 3.1 and the individual option screening assessments are available in Annex A.

The HRA for the SROs has been undertaken as part of the Gate 2 process and is reported in the Gate 2 HRA Reports for each SRO. A summary of the HRA results (Stage 1 Screening and Stage 2 AA) are provided below in Table 3.2 and Section 3.4.

Table 3.1: HRA Stage 1 Screening Assessment Outcomes for Feasible Options

Option ID	Option name	Description overview	HRA Stage 1 Screening outcomes
TWU_LON_HI-LRE_WT1_ALL_copperwtmecana200/480/680	Coppermills WTW - filtration pre-treatment 680MI/d	Either a 200/480/680MI/d Mecana filtration system for primary filtration of surface water at the Coppermills Water Treatment Works (WTW), including three new shaft connections, inlet pipework diversions, inlet PS and pipe bridge for return pipework.	AA required if option selected
TWU_LON_HI-DES_ALL_CNO_beckton desal50/100/150	Beckton Desalination	Abstraction of 187MI/d raw water for production of 150MI/d desalinated water (conveyance within option below). DO 142MI/d for 150MI/d capacity. The 50 and 100 options involve raw water abstraction for production of 50MI/d and 100MI/d desalinated water.	AA required if option selected
TWU_LON_HI-TFR_LON_CNO_beckton-coppermills	Beckton to Coppermills tunnel (treated) – Construction	Treated desalination water is to be conveyed via tunnel from Beckton desalination works to Coppermills WTW for blending. (Part of the Beckton Desalination Scheme with the option above.)	AA required if option selected
TWU_LON_HI-TFR_SES_ALL_woodwtw-epsomdowns	Transfer - Woodmansterne to Epsom - Resource Element	Proposed new trunk mains to transfer potable water from Woodmansterne (Sutton and East Surrey (SES)) to Epsom including a new PS at Woodmansterne WTW.	AA required if option selected
TWU_SWX_HI-GRW_ALL_ALL_ashton keynes	Groundwater Development - Ashton Keynes borehole pumps - Removal of Constraints to DO	Installation of larger pumps and/or lowering of the pumps in some or all of five existing boreholes, abstracting from the confined Great Oolite aquifer. Change in operational philosophy to improve peak source output.	No LSE
TWU_LON_HI-TFR_LON_ALL_nr v-groundimprov	New River Head - Ground improvements	Rehabilitation and recommissioning of disused groundwater source. This option comprises: <ul style="list-style-type: none"> ground stabilisation around the New River Head borehole, comprising the grouting of the potential voids created by sand migration installation of four near-surface ground anchors placed at convenient locations around the borehole installation of a turbidity meter recommissioning of the licensed but currently disused groundwater source. 	No LSE

Option ID	Option name	Description overview	HRA Stage 1 Screening outcomes
TWU_LON_HI-ROC_NET_CNO_hampton-battersea	TWRM extension - Hampton to Battersea - Construction	New ring main tunnel from Hampton to Battersea.	AA required if option selected
TWU_SWX_HI-TFR_KVZ_ALL_ke nnet-swox2.3	Kennet Valley to SWOX Transfer - 2.3 MI/d	The works proposed include: treated water pipeline from Pangbourne WTW to Cleeve WTW 9.4km (250dia), a PS at Pangbourne WTW (60kW), balance tank at Cleeve WTW (2 x the pipe volume), 800m (700dia) of replacement pipeline at the end of the Fobney WTW to Tilehurst Service Reservoir (SR) main, to increase flow, increased pump capacity at Fobney WTW treated water PS from 18MI/d to 23.88MI/d.	AA required if option selected
TWU_SWX_HI-TFR_KVZ_ALL_ke nnet-swox6.7	Kennet Valley to SWOX Transfer - 6.7 MI/d	The works proposed include: treated water pipeline from Pangbourne WTW to Cleeve WTW 9.4km (350dia), a PS at Pangbourne WTW (150kW), balance tank at Cleeve WTW (2 x the pipe volume), 800m (700dia) of replacement pipeline at the end of the Fobney WTW to Tilehurst SR main to increase flow. Increased pump capacity at Fobney WTW treated water PS from 18MI/d to 28.34MI/d.	AA required if option selected
TWU_SWX_HI-IMP_SWX_CNO_oxc-dukes cutswox	Oxford Canal - Duke's Cut (SWOX) - Construction	Upgrades to the canal network to transfer 15MI/d surplus from the Wolverhampton Levels to upstream of Duke's Cut.	AA required if option selected
TWU_UTC_HI-IMP_UTC_CNO_oxcanal-cropredy	Oxford Canal - Cropredy - Construction	15MI/d resource option for Oxford Canal to the River Thames transfer. Option includes transfer of water to canal at Cropredy for discharge to River Cherwell and subsequent discharge into the River Thames.	AA required if option selected
TWU_SWX_HI-TFR_SWX_ALL_dukescut-farmoor	Oxford Canal - Transfer from Duke's Cut to Farmoor	15MI/d conveyance option from the Oxford Canal to Farmoor Reservoir, with abstraction from a point approximately 800m north of Duke's Cut on the Oxford Canal, discharging into the River Thames for subsequent re-abstraction at the existing Farmoor Reservoir intake. It has been assumed that, as the transfer will only be used in periods of low flow, no works will be required to upgrade the existing intake structure or treatment facilities at Farmoor Reservoir.	AA required if option selected
TWU_LON_HI-TFR_LON_ALL_lockwood ps-kgv res	Thames-Lee Tunnel extension from Lockwood PS to King George V Reservoir intake	New connection from Lockwood PS to the intake of KGV reservoir.	AA required if option selected
TWU_SWX_HI-TFR_HEN_ALL_henley-swox2.4	Henley to SWOX Transfer – 2.4 MI/d	The option is for a new main from New Farm service reservoir (Henley) to Nettlebed Service reservoir (SWOX). This will require a new 5.9km (250dia) main from New Farm to Nettlebed and a new PS at New Farm. 2.4MI/d capacity.	No LSE
TWU_SWX_HI-TFR_HEN_ALL_henley-swox5	Henley to SWOX Transfer – 5 MI/d	The option is for one new main from New Farm service reservoir (Henley) to Nettlebed service reservoir (SWOX). This will require a new 5.9km, 350mm diameter main from New Farm to Nettlebed and a new PS at New Farm. 5MI/d capacity.	No LSE
TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby	Manager Aquifer Recharge - Horton Kirby ASR	Construction of pipelines between two existing ASR boreholes in the Lower Greensand aquifer to an existing WTW at Horton Kirby in Kent. Water	No LSE

Option ID	Option name	Description overview	HRA Stage 1 Screening outcomes
		abstracted from existing Chalk aquifer boreholes (via the mains supply) will be recharged into the two ASR boreholes during periods of water surplus and abstracted when needed and treated at the WTW.	
TWU_SWA_HI-GRW_ALL_ALL_datchet do	Groundwater Development - Datchet Existing Source DO Increase	Increase capacity of Datchet site.	No LSE
TWU_HEN_HI-TFR_KVZ_ALL_tw(kv)to(hen)con	Transfer - Kennet Valley to Henley - Conveyance Element	Potable Water Transfer – Thames Water (Kennet Valley) to Thames Water (Henley) Conveyance.	No LSE
TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg	Groundwater Development - Southfleet & Greenhithe	Southfleet-Greenhithe licence disaggregation and new headworks and PS at borehole sites, new 3km main from Greenhithe to new WTW. DO benefit is 8MI/d average, 9MI/d peak.	No LSE
TWU_LON_HI-GRW_ALL_ALL_aaddington gw	Groundwater Development - Addington	New abstraction borehole and upgrade to WTW. DO benefit 1MI/d average, 1.5MI/d peak.	No LSE
TWU_SWX_HI-GRW_ALL_ALL_woods farm do	Groundwater Development - Woods Farm Existing Source Increase DO	New borehole to be constructed on site to bring DO up to licence (this is an additional 2.4MI/d to average licence of 4.99MI/d or an additional 2.91MI/d to peak licence of 5.5MI/d). The option includes a new borehole and a 1.4km raw water pipeline from the new satellite borehole to Woods Farm WTW.	No LSE
TWU_GUI_HI-TFR_RZ5_ALL_sewtogui	Transfer - SEW to Guildford - Conveyance Element	10MI/d transfer from South East Water (Hogsback) to Mount SR Guildford.	AA required if option selected
TWU_LON_HI-ROC_WT1_CNO_kemptonwtw100/150/300	New WTW at Kempton - 100MI/d - Construction	100/150/300MI/d new capacity at WTW at Kempton treating raw reservoir water in west London. Purpose is to accommodate additional future demand.	AA required if option selected
TWU_SWX_HI-GRW_ALL_ALL_moulsford gw	Groundwater Development - Moulsford Groundwater Source	Construction of an abstraction borehole in the unconfined Chalk north of Streatley on the west bank of the River Thames. Water abstracted from the borehole will be treated at the existing Cleeve WTW located on the eastern side of the River Thames. DO benefit is 3.5MI/d peak and 2MI/d average.	AA required if option selected
TWU_SWA_HI-TFR_SWX_ALL_swoxswa48	Transfer from WTW in Abingdon to SWA - 48MI/d	48MI/d treated water pipeline from Abingdon WTW to Long Crendon to supply SWA.	AA required if option selected
TWU_SWA_HI-TFR_SWX_ALL_swoxswa72	Transfer from WTW in Abingdon to SWA - 72MI/d	72MI/d treated water pipeline from Abingdon WTW to Long Crendon to supply SWA.	AA required if option selected
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con/b/c	SWA to SWOX Transfer - Conveyance Element	Potable water transfer from SWA WRZ to SWOX WRZ.	No LSE
TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney	River Thames to Fobney Transfer	40MI/d raw water transfer option from River Thames to Fobney WTW to supply Kennet Valley WRZ.	No LSE

Option ID	Option name	Description overview	HRA Stage 1 Screening outcomes
TWU_SWX_HI-TFR_STR_ALL_a bing-farmoor pipe	Abingdon Reservoir to Farmoor Reservoir pipeline	Construction of a transfer pipeline to convey 24MI/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir, in the SWOX WRZ. (Note: Abingdon reservoir creation is not part of this option.) The engineering scope includes the provision of a booster PS at the proposed Abingdon reservoir site to facilitate the transfer. Treatment would be provided at the existing WTW.	AA required if option selected
TWU_GUI_HI-GRW_ALL_ALL_d apdune lic disagg	Groundwater Development - Dapdune Licence Disaggregation	Licence disaggregation. DO benefit 0MI/d average, 2.2MI/d peak	No LSE
TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm	Groundwater Development - Recommission Mortimer Disused Source	Refurbishment of two disused abstraction boreholes located on-site at the existing, but disused Mortimer WTW. Water abstracted from the boreholes will be sourced from the underlying deep confined Chalk and treated at the disused WTW which will be upgraded for ammonia and iron removal and recommissioned. DO benefit 4.5MI/d average and peak.	No LSE
TWU_LON_HI-TFR_LON_ALL_cr ossness to beckton	Crossness to Beckton tunnel (treated) - Construction	Transfer of 190MI/d desalinated water to Beckton site via pipeline inside tunnel beneath the Thames.	AA required if option selected
TWU_LON_HI-TFR_LON_CNO_beckton-crossness	Beckton to Crossness tunnel (raw) - Construction	The estuarine water from the Beckton site is to be conveyed under the River Thames via a tunnel to the Crossness desalination treatment site.	AA required if option is selected
TWU_LON_HI-GRW_ALL_ALL_merton recomission	Groundwater Development - Merton Recommissioning	The option comprises the recommissioning and upgrade of the Merton Abbey WTW in order to treat the maximum peak DO of 8MI/d from the Merton Abbey Well. DO benefit 7.86MI/d peak, 2MI/d average	No LSE
TWU_LON_HI-REU_RE1_ALL_d eeephams reuse 46.5	Deephams Reuse – 46.5 MI/d, direct to KGV - Construction	Transfer of Deephams sewage treatment works (STW) final effluent to the new water reuse works with the following technology: pre-screens, ultrafiltration (UF), reverse osmosis (RO), ultraviolet (UV) treatment, inter-process pumping, buildings and disinfection, pH adjustment chemicals. Includes conveyance to KGV reservoir.	AA required if option selected
TWU_KGV_HI-REU_RE1_CNO_deephams reuse 46.5b	Deephams Reuse – 46.5 MI/d, to TLT - Construction	Transfer of Deephams STW final effluent to the new water reuse works with the following technology: pre-screens, UF, RO, UV treatment, inter-process pumping, buildings and disinfection, pH adjustment chemicals. Includes conveyance to TLT extension.	AA required if option is selected
TWU_LON_HI-GRW_ALL_ALL_ondon conchalk	Groundwater Development - Confined Chalk North London	New abstraction borehole. DO benefit 2MI/d average and peak.	No LSE
TWU_GUI_HI-TFR_SES_ALL_re igatetoguildford5/2 0	Transfer - Reigate (SES) to Guildford 20MI/d	Either a 5MI/d or 20MI/d transfer from Reigate (SES) to Guildford.	No LSE

Option ID	Option name	Description overview	HRA Stage 1 Screening outcomes
TWU_HON_HI-ROC_NET_CNO_cop'mills-honoroak	TWRM extension - Coppermills to Honor Oak - Construction	New ring main tunnel from Coppermills to Honor Oak.	AA required if option is selected
TWU_KVZ_HI-GRW_ALL_ALL_east woodhay roc	Groundwater Development - East Woodhay borehole pumps Removal of Constraints to DO	Upgrade of pumps and pump control to increase DO. DO benefit 2.1Ml/d peak, 0 average.	No LSE
TWU_LON_HI-DES_ALL_ALL_cr ossnessdesal50/100	Crossness Desalination	Development of a 50Ml/d or 100Ml/d desalination plant located south of Crossness, using brackish estuarine feedwater from the River Thames. Transfer of treated water to Coppermills WTW for blending.	No LSE
TWU_LON_HI-GRW_ALL_ALL_a ddington asr	Managed Aquifer Recharge - Addington	Two new ASR boreholes near Addington PS, and one borehole refurbishment, 300m length of sewer for conditioning discharges, booster recharge pumps due to artesian head pressures in aquifer. DO benefit 3Ml/d average, 5Ml/d peak.	No LSE
TWU_LON_HI-GRW_ALL_ALL_h onor oak gw	Groundwater Development - Honor Oak	Two new abstraction boreholes, connections to existing WTW, DO benefit 1Ml/d average, 2.82Ml/d peak.	No LSE
TWU_LON_HI-GRW_ALL_ALL_s treatham ar	Managed Aquifer Recharge - Streatham (SLARS2)	One new AR borehole at Streatham PS, and one borehole refurbishment, new 17Ml/d WTW. DO benefit is 4Ml/d average, 4.5Ml/d peak.	No LSE
TWU_LON_HI-GRW_ALL_ALL_t hames valley asr	Managed Aquifer Recharge - Thames Valley, South London	Two new ASR boreholes at Ashford WTW, 1km length of sewer for conditioning discharges, booster injection pumps due to artesian head pressures in aquifer. DO benefit 3Ml/d average, 5Ml/d peak.	AA required if option is selected
TWU_LON_HI-GRW_ALL_CNO_kidbrooke slars	Managed Aquifer Recharge - Kidbrooke (SLARS1) Construction	The scheme comprises the upgrade of the existing borehole at the Rochester Way site, another at the Bromley Reservoir site and the construction of a new AR borehole on private land in Eltham Green. Six observation boreholes will be constructed for groundwater level monitoring, four at the Eltham Green site and two off-site the Eltham Green location. Benefit is 8.1Ml/d peak and 7Ml/d average. The scheme also includes: construction of a new 10Ml/d WTW located on the existing Kidbrooke borehole site to serve the Rochester Way, Bromley Reservoir and a new AR borehole, a 5.7km (300mm) raw water transfer main between Bromley Reservoir and new AR borehole, a 6.4km (400mm) bi-directional raw water transfer main between Rochester Way AR borehole and a new AR borehole via Kidbrooke WTW (3.5km between Rochester Way and Kidbrooke WTW, 2.6km between new borehole and Kidbrooke WTW), a 1.8km (450mm) treated water main between Kidbrooke WTW and Bermondsey (Well Hall PS).	No LSE
TWU_LON_HI-GRW_ALL_CNO_merton ar	Managed Aquifer Recharge - Merton (SLARS3) Construction	The scheme comprises the upgrade of the existing well and adit system at the Merton Abbey WTW for recharge/abstraction purposes and the construction of a new AR borehole at the nearby Byegrove Road site. DO benefit is 5Ml/d average and 6Ml/d peak. The scheme also includes the construction of a new 4.5Ml/d WTW located at the existing Merton Abbey	No LSE

Option ID	Option name	Description overview	HRA Stage 1 Screening outcomes
		WTW site to serve the Byegrove Road AR borehole, and the installation of a 1.1km raw water main from the Byegrove Road AR borehole to the new Merton Abbey WTW.	
TWU_LON_HI-ROC_NET_ALL_b arrowhillpump	Replace pump infrastructure at Barrow Hill - TWRM	Pump 6 at Barrow Hill is to be replaced.	No LSE
TWU_LON_HI-ROC_WT1_CNO_eastlondonwtw100/150/200/300	New East London WTW	Treatment works for reservoir water in London. Purpose is to accommodate additional future demand. Water for treatment could be supplied from various option types including wastewater reuse and water transfers.	AA required if option is selected
TWU_LON_HI-TFR_LON_ALL_c h'ford s intake	Intake Capacity Increase - Chingford South	Increase capacity of Chingford South intake.	AA required if option is selected
TWU_LON_HI-TFR_LON_ALL_d atchet int-qm	Intake Capacity Increase - Datchet	Increase capacity of Datchet PS site.	AA required if option selected
TWU_LON_HI-TFR_LON_ALL_litleton int-qm	Intake Capacity Increase - Queen Mary	Increase capacity of Littleton intake PS site by 300Ml/d capacity.	AA required if option is selected
TWU_LON_HI-TFR_LON_ALL_n ewriverhead pump 4	Replace New River Head Pump - TWRM	Pump 4 at New River Head is to be replaced.	No LSE
TWU_LON_HI-TFR_LON_CNO_s econd spine tunnel	Raw Water System Upgrade - Tunnel from Walthamstow 5 to Coppermills - Construction	Second Spine Tunnel from break tank to Reservoir 5 upstream of Coppermills WTW.	AA required if option is selected
TWU_LON_HI-TFR_LON_CNO_s urbiton int-walton	Surbiton intake capacity increase with transfer to Walton inlet channel - Construction	Increase capacity of Surbiton intake.	AA required if option is selected
TWU_LON_HI-TFR_LON_CNO_tlt upgrade – roc	Raw Water System Upgrade - TLT Removal of Constraints - Construction	TLT reinforcement for a section of the tunnel, a new shaft 6m diameter at a depth of 30m and a new air valve.	AA required if option is selected
TWU_STR_HI-RSR_RE1_CNO_res_marsh gibbon	New Reservoir - Marsh Gibbon 30Mm ³ - Construction	New non-impounding bunded reservoir situated within Oxfordshire, 2km south of Marsh Gibbon with a volume of 30Mm ³ /50Mm ³ /70Mm ³ .	No LSE
TWU_SWA_HI-GRW_ALL_ALL_d orney do	Groundwater Development - Dorney Existing Source DO Increase	Drilling of one new borehole and provision of two new submersible pumps (two per borehole) to increase the overall site capacity up to the source DO. DO benefit 4.3Ml/d (peak). 300m pipeline to connect to existing raw feed pipeline which runs to WTW and 100m run-to-waste pipeline.	AA required if option is selected
TWU_SWA_HI-GRW_ALL_ALL_t aplowincreasedo	Groundwater Development - Taplow Existing Source DO Increase	Aims to increase SDO up to licensed quantities. This is expected to bring peak SDO from 44Ml/d to 50Ml/d. The scope is as follows: increase Taplow to peak licence (50Ml/d) by drilling a new chalk abstraction borehole at the Dorney WTW site but added to the Taplow abstraction licence. Adding two pumps, duty/stand-by fitted with variable speed	AA required if option selected

Option ID	Option name	Description overview	HRA Stage 1 Screening outcomes
		drives (VSDs). 300m rising main and 300m run to waste.	
TWU_SWA_HI-ROC_WT1_CNO_medmenhamwtw	New Medmenham Surface Water WTW	24MI/d treatment works for river water near Medmenham (SWA). Purpose is to accommodate additional future demand. Includes a treated water PS, treated water transfer pipeline and new storage reservoir at Widdenton.	No LSE
TWU_SWA_HI-TFR_HEN_ALL_henley-swa2.4	Henley to SWA Transfer - 2.4 MI/d	The option is for one new main from Sheeplands WTW (Henley) to Hambleden WTW (SWA), 2.4ML/d. This will require a new 9.94km main from Sheeplands WTW and a new PS at Sheeplands.	No LSE
TWU_SWA_HI-TFR_HEN_ALL_henley-swa5	Henley to SWA Transfer – 5 MI/d	The option is for one new main from Sheeplands WTW (Henley) to Hambleden WTW (SWA), 5MI/d. This will require a new 9.94km main from Sheeplands WTW and a new PS at Sheeplands.	No LSE
TWU_SWA_HI-TFR_UTC_ALL_medmenham intake 53/80	New Medmenham Surface Water Intake - 53 MI/d	The Medmenham intake element includes the construction of an intake structure on the River Thames located approximately 1.75km west of the village of Medmenham, close to the village of Mill End. In addition to the intake structure, a PS will be constructed. The intake structure, PS and raw water transfer main would supply water from the River Thames to a new WTW at Medmenham. The intake and all associated infrastructure will be constructed with an abstraction capacity of either 53MI/d or 80MI/d.	No LSE
TWU_SWX_HI-ROC_WT1_ALL_radcotwtw	New WTW - Radcot	24MI/d treatment works for reservoir water in Radcot (SWOX). Purpose is to accommodate additional future demand.	AA required if option is selected
TWU_WLJ_HI-ROC_NET_CNO_twrms shaft kempton	New shaft on the TWRM at Kempton - Construction	This option includes a new shaft on the TWRM to accommodate 800MI/d of treated water flow from the expanded Kempton WTW.	AA required if option selected
TWU_WLJ_HI-TFR_WLJ_CNO_qm res-kempton wtw	Additional conveyance from Queen Mary Reservoir to Kempton WTW - Construction	New conveyance of raw water from Queen Mary Reservoir to Kempton WTW.	AA required if option selected
TWU_UTC_HI-RSR_RE1_CNO_res_chinnor_2	New Reservoir - Chinnor 30Mm ³ - Construction	New non-impounding bunded reservoir situated within Oxfordshire, 5km southwest of Chinnor with a volume of 30Mm ³ .	No LSE
TWU_STT_HI-TFR_STT_ALL_stt-sesro	STT to SESRO Link	Potential increase in DO by integrating the Severn to Thames Transfer (STT) pipeline and the Abingdon Reservoir SROs.	No LSE
TWU_LON_HI-OTH_ALL_ALL_didcot purchase	Didcot Power Station Licence Trading	The option extends the current agreement which is in place from AMP7 between Thames Water and RWE NPower.	No LSE
TWU_LON_HI-TFR_SES_ALL_cheam-merton	Transfer from SES WTW to Merton TWRM shaft	Proposed new trunk mains to transfer water from Cheam WTW (SES) to Merton Ring Main Shaft including a new PS at Cheam WTW.	No LSE
TWU_GUI_HI-GRW_ALL_ALL_dapdune roc	Groundwater Development - Removal of Constraints to Dapdune DO	Removal of the current constraints on the DO at the Dapdune source. Increase in pump capacity at	No LSE

Option ID	Option name	Description overview	HRA Stage 1 Screening outcomes
		Dapdune boreholes with an additional 4 rapid gravity filters at Ladymead WTW to treat.	
TWU_LON_HI-GRW_ALL_ALL_honor oak do	Groundwater Development - Increase DO of Existing Honor Oak Source	Restore Honor Oak well and WTW back into service by refurbishing the treatment works and replacing the pump. This option would utilise the existing license.	No LSE

In addition to the options set out above, several SROs were also considered. These are strategically important water resource options that could provide a large volume of water for more than one water company to use. SROs are being developed in parallel through the RAPID Gate process. The SROs have been assessed under the individual SRO projects, but a summary of these from the published RAPID Gate Two reports is provided in this report for completeness, as these options have been considered as part of the plan. The options included within the SROs as relevant to Thames Water's WRMP are set out in Table 3.2 below.

Table 3.2: Thames Water SRO Based Options - HRA Stage 1 Screening Assessment

SRO	Description	HRA Stage 1 Screening outcomes
Thames to Southern Transfer (T2ST)	<p>A transfer of water from Thames Water to Southern Water's Hampshire area helping to improve resilience through better connectivity. The transfer is dependent on the prior development of new water resource sources namely the STT or SESRO. The T2ST SRO involves two options for the transfer of potable water from a new WTW at the intake location to the west of A34 near Drayton, Oxfordshire to the existing Yew Hill Water Supply Reservoir (WSR) near Winchester, Hampshire. The following water transfer route options were under review at Gate 2:</p> <ul style="list-style-type: none"> Option B: Pipeline from the new WTW at the intake location to the west of A34 near Drayton, then continuing to the west of the A34 to Yew Hill WSR. Connects along the route to three existing assets - Beacon Hill WSR, Micheldever WSR and Crabwood WSR. Option C: Pipeline from the new WTW at the intake location to the west of A34 near Drayton, running to the east of the A34 between Newbury and Whitchurch, then continuing to west of A34 to Yew Hill WSR. Connects along the route to three existing assets - Beacon Hill WSR, Micheldever WSR and Crabwood WSR. 	LSE identified for Option B and Option C; AA required if Option selected ²²
Abingdon Reservoir (South East Strategic Reservoir Option - SESRO)	This is a new water storage reservoir in the Upper Thames catchment, south-west of Abingdon. Water would be abstracted from the River Thames during periods of high flow and pumped into the reservoir. When flow in the river is low and water is required in London, or the wider South East, water would be released back to the Thames for re-abstraction downstream.	No LSE ²³

²² [T2ST-Gate-2-Annex-B2---Habitats-Regulations-Assessment.pdf \(thameswater.co.uk\)](#)

²³ [C-Habitats-Regulations-Assessment.pdf \(thames-wrmp.co.uk\)](#)

SRO	Description	HRA Stage 1 Screening outcomes
	There are a range of sizes of reservoirs being considered including: 100Mm ³ , 125Mm ³ , 150Mm ³ .	
Severn Trent to Thames Transfer (STT)	This is a water transfer from the North West and Midlands to the South East to support the South East of England during drought events. The water would be provided from the River Severn itself, with additional sources of water provided by Severn Trent Water and United Utilities. The water would be moved from the River Severn to the River Thames by a new pipeline.	LSE identified for the construction of the interconnector and Vyrnwy Bypass LSE identified for the operation of the STT SRO; AA required if Option selected ²⁴
London Water Recycling	<p>The solution aims to use treated wastewater to provide a reliable, sustainable supply of water to support the flow in the River Thames. It does this by treating wastewater effluent to a high standard and discharging it to the River Thames or to the River Lee where it can then be abstracted and used as a raw water resource. The water would be treated at a water treatment works to meet high quality drinking water standards. There are four potential schemes being looked at:</p> <ul style="list-style-type: none"> • Beckton Water Recycling - Transfer of recycled water from Beckton to the new water reuse works with the following technology: pre-screens, UF, RO, UV treatment, inter-process pumping, buildings and chemical additions. DO 89MI/d for 100MI/d Capacity. DO 130MI/d for 150MI/d capacity. Conveyance of treated water from Beckton to Lockwood PS. • Mogden Water Recycling - A portion of final effluent from Mogden STW would be conveyed to a new Advanced Water Recycling Plant (AWRP). The Recycled Water would be discharged into the River Thames upstream of the existing Thames Water Walton WTW Intake. The waste streams would be conveyed back to Mogden STW. • Teddington Direct River Abstraction (DRA) - A portion of the final effluent from Mogden STW would be subject to tertiary treatment and transferred in a tunnel for discharge into the River Thames upstream of Teddington weir. An equal volume of water would be abstracted from the Thames upstream of the new outfall. Abstracted water would be pumped into the nearby Thames Lee Tunnel for transfer to Lockwood Reservoir, part of the Lee Valley reservoirs in East London. 	LSE identified for Beckton Water Recycling, Mogden Water Recycling and Teddington DRA; AA required if Option selected.

²⁴ [STT-G2-S3-121-Informal-Habitats-Regulation-Assessment-\(HRA\).pdf \(severntrent.com\)](#)

SRO	Description	HRA Stage 1 Screening outcomes
	<ul style="list-style-type: none"> During the course of Gate 2, Thames Water took the decision to pause development of the Mogden South Sewer scheme due to limitations on available flow within the sewer, cost of the scheme and regional modelling not selecting the scheme under any water resources planning horizon scenario. As such, this scheme is not considered further in the assessment. 	
Thames to Affinity Transfer (T2AT)	<p>A transfer of raw water from Thames Water to Affinity Water. It would rely on new sources of water from one of the strategic resources options (STT, SESRO or London water recycling) contributing to a resilient water supply for Affinity Water.</p> <ul style="list-style-type: none"> Lower Thames Reservoir Option - The Lower Thames Reservoir Option involves the abstraction of raw water from Thames Water's Wraysbury and Queen Mother reservoirs via a proposed connection into Affinity Water's existing tunnel at the existing Iver Water Treatment Works (WTW). This raw water would then be diverted to a new WTW then drinking water would be subsequently conveyed to an existing service reservoir in the vicinity of Harefield. Beckton Reuse Indirect Option - The Beckton Reuse Indirect Option involves the abstraction of raw water from the River Lee flood relief channel and transfer to a new WTW, followed by conveyance of the drinking water produced to an existing service reservoir in the vicinity of Brookmans Park and directly into the existing drinking water transfer network. A proportion of the water would then be able to flow under gravity to the existing booster pumping station in the vicinity of North Mymms. Whilst a proportion of the raw water may arise naturally in the River Lee catchment, in terms of water resources the scheme would depend on the indirect transfer of recycled water from the Beckton Water Recycling option of the London Water Recycling SRO. The proposed abstraction point would be located on the River Lee flood relief channel, downstream of the outfall from the Beckton Water Recycling option. 	LSE identified for Lower Thames Reservoir and Beckton Reuse Indirect; AA required if Option selected

Drought plan options were also included in the feasible options list; these have been assessed through the Drought Plan process and additionally reported here as they have been considered as part of the plan. These options are set out in Table 3.3 below.

The HRA for these drought plan options was carried out using the methodology set out in the Thames Water Drought Plan 2022 Environmental Assessment Methodology²⁵ and the assessments are presented in the Drought Plan Environmental Assessment Reports. A summary of the outcomes of these assessments has been included in this report.

Table 3.3: Thames Drought Plan Options – HRA Stage 1 Screening Assessment Summary

Option ID	Option name	Drought plan option description	HRA Stage 1 Screening outcomes
TWU_SWX_RE-DRP_ALL_ALL_dp-gatehampton-swox	Gatehampton Drought Permit	Under normal license conditions water is abstracted from the Cretaceous Chalk aquifer at Gatehampton. The Gatehampton abstraction consists of seven boreholes (four boreholes are within 100m of the River Thames; the other three are approximately 250m from the river). Normal abstraction comprises: The existing abstraction licence (28/39/23/173) permits abstraction from the Chalk aquifer at Gatehampton at a peak day rate of 105MI/d with an average rate per year and month of 95MI/d and an annual maximum of 3,4770MI/ year. The operation of the existing abstraction licence is limited by flow conditions in the River Thames at Caversham Gauging Station - when flows are less than 400MI/d for 5 days, then abstraction must be maintained at or below 101.5MI/d. Proposed comprises: 3.5MI/d - continuation of abstraction from boreholes beyond licence conditions. This would provide a benefit of 3.5MI/d. There is no construction phase associated with this drought option.	No LSE
TWU_KVZ_RE-DRP_ALL_ALL_dp-playhatch-kv	Playhatch Drought Permit	The abstraction is located in the South-West Chilterns Chalk groundwater body. It consists of two boreholes abstracting from the Chalk. Normal abstraction is annual average abstraction 7.27MI/d, peak abstraction 8.2MI/d. Proposed abstraction is 2.8 - 4.1MI/d - increase in peak abstraction of existing licence from 8.2MI/d to 12.3MI/d providing a benefit of 4.1MI/d. The drought permit could be implemented at any time of year, however it is anticipated to be applied for up to 6 consecutive months between May and December inclusive. There is no	No LSE

²⁵ Ricardo, October 2020. Thames Water Drought Plan 2022. Environmental Assessment Methodology.

Option ID	Option name	Drought plan option description	HRA Stage 1 Screening outcomes
TWU_GUI_RE-DRP_ALL_ALL_dp-shalford-guild	Shalford Drought Permit	<p>construction phase associated with this drought permit.</p> <p>Under normal conditions, the abstraction comprises 30MI/d from the River Wey (licence number 28/39/30/0066, aggregated with abstraction from the Tillingbourne licence 28/39/30/319). Implementation of the drought permit would involve an increase to the existing surface water abstraction from the River Wey and removing the licence aggregates. The benefit would be 5MI/d. The drought permit may be implemented for up to 6 consecutive months between May and December inclusive, although it could be implemented any time of year. The River Wey is a mainly rural catchment of mixed geology, with baseflow originating from both the Chalk and Lower Greensand aquifers. Shalford Water Treatment Works (WTW) treats surface water abstracted from both the River Wey and River Tillingbourne just upstream of their confluence.</p>	No LSE
TWU_HEN_RE-DRP_ALL_ALL_dp-sheep/harp-hen	Sheeplands/Harpsden Drought Permit	<p>The Harpsden abstraction consists of three boreholes abstracting from the unconfined chalk aquifer (that is overlain by superficial gravels). The River Thames is located about 750m east of the abstraction, with the settlement Lower Shiplake lying between the river and the abstraction. The abstraction is licenced in aggregate with the Sheeplands abstraction, a group of three boreholes, also abstracting from the Chalk. The Sheeplands boreholes are located 3km south east of Harpsden, on the other side of the River Thames to the Harpsden boreholes. The proposed drought option will be to relax the aggregate condition of the current abstraction licence and increase total abstraction from both locations to 27.9MI/d. Abstraction at Sheeplands will continue to be pumped at 11.4MI/d which is within the boundaries of the normal operating license. Typically, 10.5MI/d of water is abstracted from the Harpsden boreholes under the normal operating license therefore an increase of 6MI/d during drought would be taken, amounting to a total output of 16.5MI/d.</p>	No LSE

3.2 Appropriate Assessment Outcomes

HRA Stage 2 AA was carried out for options selected in the BVP and the two alternative plans, where LSE were identified through the Stage 1 Screening assessments. A summary of the AA outcomes for the options that were selected is presented in Table 3.4. For all options no adverse effects on the ability of the site to achieve its conservation objectives is anticipated after mitigation, therefore adverse effects on site integrity can be ruled out subject to appropriate mitigation (as identified in the AA).

The full AA for each option is included in Annex C.

Table 3.4: Summary of HRA Stage 2 Appropriate Assessments - Selected Options

Option ID	Option name	Relevant Habitats Site(s)	Potential adverse effects identified	AESI
BVP Situation 4 (WRMP24)				
TWU_SWX_H I- IMP_SWX_CN O_oxc-dukes cutswox	Oxford Canal - Duke's Cut (SWOX) - Construction	Oxford Meadows SAC	<ul style="list-style-type: none"> Physical loss of functionally linked habitat Physical damage due to construction machinery Spread of invasive species Habitat damage or loss Extreme weather conditions such as dry ground or drought Loss of seed bank 	AESI ruled out after application of appropriate mitigation (see Annex C.3 for full AA)
TWU_SWX_H I- TFR_SWX_AL L_dukescut- farmoor	Oxford Canal - Transfer from Duke's Cut to Farmoor	Oxford Meadows SAC	<u>Construction</u> <ul style="list-style-type: none"> Toxic and non-toxic contamination Spread of invasive species Rapid population fluctuations 	AESI ruled out after application of appropriate mitigation (see Annex C.4 for full AA)
TWU_GUI_HI- TFR_RZ5_AL L_sewtogui	South East Water to Guildford	Thames Basin Heath SPA	<u>Construction</u> <ul style="list-style-type: none"> Physical loss of supporting habitat Physical damage – habitat degradation and edge effects Non-physical disturbance Toxic contamination Spread of invasive species Biological disturbances 	AESI ruled out after further studies and application of refined mitigation (see Annex C.5 for full AA)

Option ID	Option name	Relevant Habitats Site(s)	Potential adverse effects identified	AESI
		Thursley, Ash, Pirbright and Chobham SAC	<u>Construction</u> <ul style="list-style-type: none"> Physical damage – habitat degradation and edge effects Non-physical disturbance (dust) Toxic contamination Non-toxic contamination Spread of invasive species Biological disturbances	AESI ruled out after further studies and application of refined mitigation (see Annex C.5 for full AA)
TWU_LON_HI - ROC_WT1_C NO_kemptonw tw100	New WTW at Kempton - 100Ml/d – Construction (WRMP19 option) ²⁶	South West London Waterbodies SPA; South West London Waterbodies Ramsar site	-- <u>Construction</u> <ul style="list-style-type: none"> Biological disturbance – changes to water quality Non-physical disturbance of supporting habitat <u>Operation</u> <ul style="list-style-type: none"> Non-physical disturbance (noise, light and visual disturbance) 	The WRMP19 AA was reviewed and it was concluded that AESI could be ruled out if the mitigation measures described in the 'Assessment of effects on quantifying features' section can be imposed and implemented (see Section 4.4.2 for WRMP19 AA review)
TWU_SWX_HI-GRW_ALL_AL L_moulsford gw	Groundwater Development - Moulsford Groundwater Source	Hartslock Wood SAC	<u>Construction</u> <ul style="list-style-type: none"> Physical damage – habitat degradation Rapid population fluctuations 	AESI ruled out after application of appropriate mitigation (see Annex C.7 for full AA)
TWU_SWX_HI- TFR_STR_AL L_abing-farmoor pipe	Abingdon Reservoir to Farmoor Reservoir pipeline	Cothill Fen SAC	<u>Construction</u> <ul style="list-style-type: none"> Physical loss of habitat Physical damage – habitat degradation Non-physical disturbance (air and light) 	AESI ruled out after application of appropriate mitigation (see Annex C.8 for full AA)

²⁶ A version of Kempton WTW was assessed at WRMP19. The option being assessed for WRMP24 is an updated design and layout of the WRMP19 option and is therefore reassessed in this report.

Option ID	Option name	Relevant Habitats Site(s)	Potential adverse effects identified	AESI
			<ul style="list-style-type: none"> • Toxic contamination (air and water pollution) • Biological disturbances 	
TWU_WLJ_HI - ROC_NET_C NO_twrn shaft kempton	New shaft on the TWRM at Kempton	South West London Waterbodies SPA; South West London Waterbodies Ramsar site	<u>Construction</u> <ul style="list-style-type: none"> • Physical damage • Toxic contamination (air and water pollution) • Non-physical disturbance (air and light) • Biological disturbance 	AESI ruled out after application of appropriate mitigation (included in Kempton WTW AA, see section 3.4.2)
Additional Options Selected in Alternative Situations and Plans				
TWU_LON_HI - DES_ALL_CN O_beckton desal 50/100/150	Beckton Desalination	Thames Estuary & Marshes SPA; Thames Estuary & Marshes Ramsar site	<u>Construction</u> <ul style="list-style-type: none"> • Physical damage • Rapid population fluctuations <u>Operation</u> <ul style="list-style-type: none"> • Physical damage • Water table/availability • Water quality • Non-toxic contamination • Biological disturbances 	AESI ruled out after further studies and application of refined mitigation (see Annex C.1 for full AA)
TWU_LON_HI - TFR_LON_CN O_beckton-coppermills	Beckton to Coppermills tunnel (treated) - Construction	Lee Valley SPA; Lee Valley Ramsar site	<u>Construction</u> <ul style="list-style-type: none"> • Physical loss of functionally linked habitat • Physical damage • Non-physical disturbance • Toxic contamination • Spread of invasive species • Biological disturbance 	AESI ruled out after application of appropriate mitigation (see Annex C.2 for full AA)
TWU_HON_HI - ROC_NET_C NO_cop'mills-honoroak	TWRM extension - Coppermills to Honor Oak - Construction	Lee Valley SPA Lee Valley Ramsar site	<u>Construction</u> <ul style="list-style-type: none"> • Physical damage • Non-physical disturbance 	AESI ruled out after application of appropriate mitigation (see Annex C.9 for full AA)

Option ID	Option name	Relevant Habitats Site(s)	Potential adverse effects identified	AESI
			<ul style="list-style-type: none"> • Toxic contamination • Biological disturbances 	
TWU_KGV_HI - TFR_KGV_AL L_lockwood ps-kgv res	Thames-Lee Tunnel extension from Lockwood PS to King George V Reservoir intake	River Lee SPA River Lee Ramsar	<u>Construction</u> <ul style="list-style-type: none"> • Physical loss • Physical damage – habitat degradation and edge effects • Non-physical disturbance (dust) • Toxic contamination • Spread of invasive species • Biological disturbances <u>Operation</u> <ul style="list-style-type: none"> • Spread of invasive species 	AESI ruled out after further studies and application of refined mitigation (see Annex C.6 for full AA)
TWU_KGV_HI - REU_RE1_CN O_deephams reuse 46.5b	Deephams Reuse – 46.5 MI/d, to TLT - Construction (WRMP19 option ²⁷)	Lee Valley SPA; Lee Valley Ramsar site	<u>Construction</u> <ul style="list-style-type: none"> • Physical disturbance to functionally-linked habitat (noise, visual) • Non-physical disturbance to functionally-linked habitat (light) • Biological disturbances 	The WRMP19 AA was reviewed and it was concluded that AESI could be ruled out, if the mitigation measures described in the 'Assessment of effects on quantifying features' section can be imposed and implemented (see Section 4.4.1 for WRMP19 AA review)

3.3 SRO HRA Summaries

A summary of the HRA results for the SROs²⁸ is presented in this section. The HRAs were undertaken as part of the SRO Gate 2 process and have been summarised below.

²⁷ A summary of the WRMP19 assessment for this option is given in Section 3.4.1

²⁸ Note that not all SROs are included in the different plans included in WRMP24

3.3.1 London Water Recycling

The informal HRAs for the options under the London Water Recycling SRO are presented in the Gate 2 Submission '*London Water Recycling SRO – Habitats Regulations Assessment Report*' and a summary taken from the Gate 2 Report is provided below.

Beckton Water Recycling

The Stage 1 Screening identified the risk of LSE associated with the construction of the Beckton water recycling scheme tunnel alone to qualifying features of the Lee Valley SPA and Ramsar site and Thames Estuary and Marshes SPA and Ramsar site, due to the proximity of components of the option to the Habitats Sites or functionally linked habitat. The risk of LSE has also been identified during the operation of the Beckton water recycling scheme alone on the Thames Estuary and Marshes SPA and Ramsar site. For the purposes of the assessment, it was assumed that Barking Creek provides functionally linked saltmarsh and mudflat habitat to qualifying features of the Thames Estuary and Marshes SPA and Ramsar site. These habitats could be altered through a change in hydrological regime and water quality. No low-level residual effects were identified from Beckton water recycling scheme that could lead to LSE in-combination with other plans and projects.

As part of the AA further consideration has been given to the loss of habitat within the boundary of the Lee Valley SPA and Ramsar due to the construction requirements at Thames Water's Lockwood site. Historic imagery has shown the area in question to always consist of short grassland, and therefore it is unlikely to have ever been supporting habitat for the bird species using the site, given their preference for open water/marginal habitats. As such, it has been concluded that it provides no structural or functional role to the species, and as such its loss, albeit with mitigation to avoid degradation of the habitats surrounding the waterbodies, is not considered to be an adverse effect.

The following recommendations for future survey work at Gate 3 have been made as identified during the Gate 2 AA:

- Overwintering bird surveys along Barking Creek to determine species presence, abundance and distribution on saltmarsh and mudflat priority habitat and within watercourse itself. This is recommended due to a lack of bird survey data in Barking Creek (not surveyed by WeBS) and potential for the area to provide functionally linked habitat to qualifying species of the Thames Estuary and Marshes SPA and Ramsar site. Distribution maps could be reviewed alongside noise impact assessment outputs to determine species typically present within the Zol, and further assessment on species' sensitivity based on approximate noise levels could be undertaken.
- Overwintering bird surveys at Walthamstow Reservoirs (specifically Warwick Reservoir East, Reservoir No. 1, 2 and 5, Low Maynard Reservoir and Lockwood Reservoir) in association with Compound/ Shaft 5 and 6 to determine the abundance and distribution of qualifying features within each reservoir. Distribution maps could be reviewed alongside noise impact assessment outputs to determine species typically present within the Zol, and further assessment on species' sensitivity based on approximate noise levels could be undertaken.

Mogden Water Recycling

A risk of LSE associated with the construction of the Mogden water recycling scheme infrastructure alone was identified for the qualifying features of South West London Waterbodies SPA and Ramsar site. No low-level residual effects were identified from Mogden water recycling scheme that could lead to LSE in-combination with other plans and projects.

As part of the AA, the effects on South West London Waterbodies SPA and Ramsar site from construction activities were further investigated. High level, desk based, noise and air quality assessments were undertaken to determine the potential risk of impact from construction activities when in proximity to South West London Waterbodies SPA and Ramsar site. Adverse effects are identified and therefore additional mitigation has been recommended. However, these assessments were high level for Gate 2, and therefore refinement and additional noise and air quality modelling will be required as the scheme progresses to planning, with the effectiveness of the proposed mitigation measures to be further evidenced in the project-level HRA.

Future survey work requirements will focus on determining the level of use of the waterbodies of the SPA and Ramsar in closest proximity to the scheme infrastructure. The assessment work will focus on noise and air quality modelling to refine the package of mitigation measures required to avoid an adverse effect during construction.

Teddington DRA

A risk of LSE associated with construction of Teddington DRA alone was identified for qualifying features of Richmond Park SAC. No low-level residual effects were identified from Teddington DRA scheme that could lead to LSE in-combination with other plans and projects.

As part of the AA, the effects on Richmond Park SAC from construction activities were further investigated. Suitable habitat consisting of lowland mixed deciduous woodland and other broadleaved woodland has been identified within the footprint of some structures and construction compounds, and could provide functionally linked habitat for stag beetle populations associated with the Richmond Park SAC. A lack of data, including site specific surveys relating to potential use of this habitat, means further work is required ahead of Gate 3. The area of habitat to be lost is considered to be small, and potential mitigation measures (e.g. relocation of deadwood) are available to ensure no adverse effect.

A high level, desk-based air quality assessment was undertaken to determine the potential risk of impact from construction vehicle/plant emissions when in proximity to Richmond Park SAC. Adverse effects are identified and therefore additional mitigation has been recommended. However, these assessments were high level for Gate 2, and there is uncertainty over the routes and numbers of HGVs that could extend within proximity of the Habitat Site. Therefore refinement and additional air quality modelling will be required as the scheme progresses to planning, with the effectiveness of the proposed mitigation measures to be further evidenced in the project-level HRA.

The following recommendations for future survey work at Gate 3 have been made as identified during the Gate 2 AA:

- Invertebrate surveys within the boundary of Ham Lands SINC with a focus on stag beetle presence, abundance and distribution, in order to determine if the deciduous woodland and wood piles present support stag beetles and provide functionally linked habitat for Richmond Park SAC. This will inform appropriate mitigation measures for the construction of Compound/ Shaft 7, the intake and outfall associated with Teddington DRA scheme.

3.3.2 Severn to Thames Transfer

The HRA for the STT SRO is presented in the Gate 2 Submission '*STT Solution – Habitats Regulations Assessment Report*' and a summary taken from the Gate 2 Report is provided below.

The Stage 1 Screening identified the risk of LSE associated with the construction of the Deerhurst to Culham interconnector on qualifying features of Dixton Wood SAC and the Severn Estuary

European sites (SAC, SPA and Ramsar). The risk of LSE was also identified for the Midland Meres and Mosses Phase 2 Ramsar site and the Severn Estuary SAC and Ramsar as a result of Vyrnwy Bypass construction works.

The risk of LSE was identified for the Severn Estuary European sites during the operation of the STT (unsupported and full STT), with a risk of LSE also identified for tributaries of the River Severn and the Severn Estuary (i.e., the River Clun SAC, River Usk SAC and River Wye SAC).

As part of the AA, the following conclusions were made regarding the potential adverse effects during construction of STT SRO:

- For Dixton Wood SAC, no suitable functionally linked habitat was identified for violet click beetle within the footprint of the interconnector and due to the distance from the construction works to the European site, no adverse effects are anticipated from increased air and dust emissions.
- For the Midland Meres and Mosses Phase 2 Ramsar, potential changes to the hydrological regime/ groundwater supply for the site were identified but no adverse effects on site integrity were anticipated, as changes in hydrological regime/ groundwater supply are likely to be localised to the Vyrnwy Bypass installation.
- For the Severn Estuary European sites, no adverse effects on site integrity from the construction of the outfall associated with the Vyrnwy Bypass or the intake associated with the Deerhurst to Culham interconnector were identified, assuming the implementation of appropriate mitigation measures.

As part of the AA, the following conclusions were made regarding potential adverse effects during operation of STT SRO:

- The available data (modelled and measured), indicates that changes in flow, velocity and depth will not be distinct from the baseline pattern or substantial in magnitude and will not result in a change in the quality or quantity of supporting habitat within the River Severn (and tributaries) or within the Severn Estuary. As such, no risk of adverse effects on site integrity have been identified. This is because the changes in flow including pass forward flow into the estuary and the resulting changes in velocity, depth and water level will be within the interannual variations that would be observed under baseline conditions.
- The available data also indicates that changes in water quality will be minimal. The available data (modelled) suggests that changes in physical-chemical characteristics within the River Severn and the Severn Estuary will not be distinct from the baseline pattern or substantial in magnitude with a likely decrease in selected nutrients during operation of the STT. There is a risk of an increase in the load (and concentration) of a handful of chemical determinants, but the potential increase is not considered to be of a magnitude that would result in a risk of adverse effects on site integrity. Furthermore, the assessment has considered the restrictions on the use of selected determinants.

There remains some uncertainty with regards to the assessment of the operational effects on water quality. SRO water quality monitoring programme is still on-going and limited data are available for a number of determinants that are known to result in olfactory inhibition. The risks associated with many of these determinants is based on short-term laboratory exposure studies with limited data of effects in the freshwater, estuarine and marine environment. This was also completed in view of the proposed advanced treatment process at the Minworth and Netheridge WwTWs and there are no cases to date in the UK of reduced performance efficacy and operational reliability for the planned treatment processes.

The ecological data and information used to undertake the HRA at Gate 2 is considered sufficient, however, there is some uncertainty with regards to the current condition of some of the features of the Severn Estuary SAC. The following recommendations for future survey work at Gate 3 have been made due to uncertainties identified during the Gate 2 AA:

- Sufficient physical environment and water quality evidence is available for the Gate 2 assessment. However, there remain gaps in understanding the possible scheme operation: this can be assessed through further scenario modelling using the 1D hydraulic models as the gated process progresses. For example, further model scenarios can be developed to assess alternative STT operating regimes, and cumulative assessments with other water resources options selected by both WRW and WRSE in their respective Regional Plans.
- For the River Severn and Avon environmental water quality model, there are significant missing data, which means that for some sources (rivers and WwTWs), there are no data for certain parameters at all or there are periods of missing data. This includes many of the determinants that are known to be olfactory inhibitors and/or act as endocrine disruptors. Monitoring of these determinants needs to continue at the current monitoring locations to ensure that sufficient data are available to complete further modelling and assessment in Gate 3. In addition, the likely presence of several pesticides at one time and their interactive effects (i.e., additive, antagonistic, or synergistic) requires further investigation at Gate 3.
- It is recommended that the in-channel habitat analysis that has been undertaken for the River Vyrnwy should be undertaken for other locations and reaches. This would generate detailed information on changes in water level, flow and velocities providing greater understanding of the potential effects of the scheme on ecological receptors, allowing more robust conclusions to be reached in terms of changes to habitat availability.
- Further information is also required regarding the proposed advanced treatment processes at the Minworth and Netheridge WwTWs to fully understand the efficacy of the proposed treatment process and the overall risk to the ecological features of the Severn Estuary European site and associated tributaries.
- As potential functionally linked habitat is present (coastal and floodplain grazing marsh priority habitat) for qualifying birds of the Severn Estuary SPA and Ramsar site at the intake and pipeline route, additional wintering surveys are recommended to determine species presence and movement from feeding and roosting grounds. This will determine if qualifying bird populations present are associated with the Severn Estuary SPA and Ramsar site.
- Fish habitat surveys are also recommended at the outfall location of Vyrnwy Bypass (option 27) to determine if suitable silt beds are present for lamprey ammocoetes.
- Fish habitat surveying (for all the notified migratory species of the SAC) should also be undertaken, along the downstream reach where flows will be significantly elevated, to understand the ecological impact.

3.3.3 SESRO

The HRA for SESRO is presented in the Gate 2 Submission '*SESRO – Habitats Regulations Assessment*' and a summary taken from the Gate 2 Report is provided below.

The potential for LSE on National Network Sites was assessed for each of the six SESRO options. The following National Network Sites were identified by applying screening criteria (as detailed in Section 3.2 and Table 4.8 of the Gate 2 HRA Report):

- Cothill Fen SAC
- Hackpen Hill SAC

- Little Wittenham SAC

No LSE on any of the National Network Sites identified as a result of the construction and operation of the project alone or in combination with other plans and projects, was concluded for all six SESRO options, at this stage of the assessment. As a conclusion of no LSE on any of the National Network Sites identified was reached then there is no requirement to progress to Stage 2 Appropriate Assessment to support the Gate 2 submission.

HRA will be required at the project level in due course and will take into account further information that will come forward.

3.3.4 T2ST

The HRA for T2ST is presented in the Gate 2 Submission '*T2ST – Habitats Regulations Assessment*' and a summary taken from the Gate 2 Report is provided below.

Option B and Option C

The Stage 1 Screening identified ten Habitats Sites within the ZoI of the options. LSE were identified for four Habitats Sites and qualifying features for which they were designated, and uncertain effects were identified for six Habitats Sites and qualifying features for which they were designated. These sites were:

- River Lambourn SAC
- Kennet and Lambourn Floodplain SAC
- Kennet Valley Alderwoods SAC
- River Itchen SAC
- Mottisfont Bats SAC
- Solent Maritime SAC
- Solent and Southampton Water SPA
- Solent and Southampton Water Ramsar Site
- Salisbury Plain SPA
- Porton Down SPA

The HRA screening identified LSE on the River Itchen SAC; however, this site is located more than 2km away from this option and therefore will not result in direct effects alone or in-combination with other projects or plans. In addition, the River Itchen SAC is not in hydrological connection with the option and therefore will not result in indirect effects alone or in-combination with other projects or plans. As such, it is considered that there is no pathway through which this site could be affected so LSE are not anticipated. Therefore, a Stage 2 Appropriate Assessment is not required.

The following sites were identified with potential uncertain effects due to hydrological connection with the River Itchen SAC:

- Solent Maritime SAC
- Solent and Southampton Water Ramsar Site
- Solent and Southampton Water SPA

As no LSE are identified for the River Itchen SAC alone or in-combination with other projects or plans, it is considered that there is no pathway for these sites to be affected by this option either directly or indirectly, alone or in-combination with other projects or plans, and consequently, these

sites do not require a Stage 2 Appropriate Assessment. Therefore, these Habitats Sites are not considered further.

Salisbury Plain SPA and SAC and Porton Down SPA are not in hydrological connection with the waterbodies likely to be affected by this option and are located a substantial distance from the proposed pipeline route. As such, following UKWIR guidance, it is considered that effects from this option on these Habitats Sites are negligible alone or in-combination with other projects or plans, and therefore these Habitats Sites are not considered further.

Based on the identification and review of Habitats Sites, the following sites were taken forward to Stage 2 AA:

- River Lambourn SAC
- Kennet and Lambourn Floodplain
- Kennet Valley Alderwoods SAC
- Mottisfont Bats SAC

The AA concluded that no adverse effects resulting from the implementation of the options (alone and in-combination) are reasonably foreseeable on the integrity of the Habitats Sites, if the suggested mitigation measures are observed.

3.3.5 T2AT

The HRA for T2AT is presented in the Gate 2 Submission '*T2AT – Habitats Regulations Assessment*' and a summary taken from the Gate 2 Report is provided below.

Lower Thames Reservoir

The Stage 1 screening identified LSE for the South West London Waterbodies SPA and Ramsar site.

The Stage 2 AA undertaken for the Lower Thames Reservoir Option did not identify adverse effects on the integrity of the South West London Waterbodies SPA and Ramsar.

Following the application of best practice measures, no adverse effects on the integrity of European Sites were identified for the Lower Thames Reservoir Option during construction or operation. It should be noted however that the assessment for the Lower Thames Reservoir Option is based on the conclusion that there would be no change to the current abstraction regime at Wraysbury Reservoir. This assessment must be revised if further investigations lead to a different conclusion in relation to possible impacts to surface water levels and flows at the reservoir and a HRA would be completed pursuant to the consenting stage.

Beckton Reuse Indirect

The Stage 1 screening assessment identified LSE for the Lee Valley Ramsar, Lee Valley SPA and Wormley Hoddesdon park Woods SAC due to potential hydrological connection and risk of pollutions events during construction.

The Stage 2 AA for these sites concluded that with the use of best practice control measures there would be no adverse effects on the integrity of these sites. This assessment must be revised if further design iterations result in changes to potential impact pathways and potential effects upon Habitats Sites as part of a HRA to be completed pursuant to the consenting stage.

3.4 WRMP19 Appropriate Assessment Review

Two of the WRMP24 selected options were included in Thames Waters WRMP19. These are Kempton WTW and Deephams Reuse 46.5. The HRA for these options was reviewed and a summary of the outcomes is presented in this section. The WRMP19 assessments are available in the 'Thames Water Final Water Resources Management Plan 2019 Technical Appendices – Appendix C: Habitats Regulations Assessment. Ricardo Energy & Environment. Report for Thames Water, April 2020'.

3.4.1 Deephams Reuse – 46.6Ml/d direct to TLT

This option involves the transfer of Deephams STW final effluent to the new water reuse works with the following technology: pre-screens, ultrafiltration (UF), reverse osmosis (RO), ultraviolet (UV) treatment, inter-process pumping, buildings and disinfection, pH adjustment chemicals. Includes conveyance to KGV reservoir. The option also includes a conveyance to the Thames Lee Tunnel (TLT) extension.

The HRA Stage 1 screening assessment identified two Habitats Sites where LSE could not be ruled out, namely the Lee Valley SPA and Ramsar site, due to the new reuse plant location 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. The non-breeding bird qualifying features of the Lee Valley SPA/Ramsar site are bittern (*Botaurus stellaris*), gadwall (*Anas strepera*) and shoveler (*Anas clypeata*).

The 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) were identified. In order to avoid significant effects on the qualifying species, it was recommended that 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).

Should construction of the pipeline take place during all or part of the winter periods, it was recognised that the works footprint would 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. 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 was identified through habitat survey) to prevent a significant disturbance impact.

Calculations for the construction works identified that although the existing bund of the William Girling reservoir provided some noise attenuation, the noise generated by the demolition and construction for the treatment works would require a noise assessment to be completed during the detailed design/permit application and associated HRA with reference to the Waterbird Disturbance Mitigation Toolkit²⁹ to demonstrate the mitigation measure proposed would be effective at avoiding disturbance before works take place outside the restricted timings.

²⁹ 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.

Sensitive lighting design that is applicable to birds in flight was also proposed as required to address the identified risks relating to light pollution to ensure no adverse effects on site integrity from light spill occurred.

The HRA concluded that there would be no adverse effects on site integrity once the proposed mitigation was applied, and in-combination studies were conducted to identify the key flight paths of the wintering birds that used the Habitats Sites and the associated functional habitat.

3.4.2 Kempton WTW

This option involves 100MI/d new capacity at WTW at Kempton treating raw reservoir water in west London and includes the New shaft on the TWRM at Kempton option which is for the construction of a new shaft. Purpose is to accommodate additional future demand.

The HRA Stage 1 screening assessment identified two Habitats Sites where LSE could not be ruled out, namely South West London Waterbodies SPA (multiple site units; closest approx. 0.3 km) and South West London Waterbodies Ramsar (multiple site units; closest approx. 0.3km) due to the increased capacity the location close to the South West London Waterbodies SPA and South West London Waterbodies Ramsar site which has potential to be used as off-site functional habitat for the migratory birds qualifying features of the SPA/Ramsar site.

The migratory bird qualifying features of the South West London Waterbodies Ramsar site are Northern shoveler, *Anas clypeata* and Gadwall, *Anas strepera*. The site is designated for its populations of gadwall, which feed primarily on aquatic vegetation and may be highly sensitive to changes in water chemistry and water quality. Factors such as high levels of turbidity or siltation may render sites or parts of sites unsuitable if plant beds are affected during pollution events. Shovelers are also present at this site and rely heavily on aquatic invertebrates as a food source and there are also heavily dependent on good water quality.

Land clearance and the use of vehicles, machinery, disturbance due to construction noise, visual stimuli from the construction workforce and plant on the site, light pollution as a result of any onsite lighting requirements (considered to be predominantly in the winter) and movement of personnel may result in adverse edge effects potentially displacing these bird species from feeding and overwintering grounds both inside the Habitats site boundary and any areas of adjacent functionally linked land. Construction activities in winter and the works footprint would 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.

Biological disturbance such as changes in habitat quality and availability (including functionally linked land); potential for SPA populations to be displaced from current overwintering habitat and feeding areas; direct mortality as a result of reduced food availability.

To avoid significant effects on the qualifying species, it is recommended that 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). Timing of most disruptive construction activities to avoid the winter period (October – March inclusive).

Should construction of the pipeline take place during all or part of the winter periods, 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 was identified through habitat survey) to prevent a significant disturbance impact. Exposure of topsoil and movement of construction vehicles could result in the spread of invasive non-native species (INNS). 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.

It is recommended that further studies should be conducted to identify flight patterns of the wintering birds that use the designated site (and associated functional habitat), and an assessment should be conducted in response to project activities. 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). In addition, any mitigation measures and 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.

Further to that detailed noise abatement and visual disturbance mitigation measures to be developed in coordination with Natural England, using local knowledge 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. Any other guidance and scientific information available at the time of project level activities should be used to ensure no adverse effects on site integrity.

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.

The HRA concluded that there would be no adverse effects on site integrity once the proposed mitigation was applied, and in-combination studies were conducted to identify the key flight paths of the wintering birds that used the Habitats Sites and the associated functional habitat.

4 Best Value Plan

The information set out in Chapter 3 sets out the HRA assessment of all the feasible WRMP24 options. The aim of this Chapter 4 is to set out the Habitats Regulations compliance assessment of the WRMP24 (BVP), continued by Chapter 5 which sets out the Habitats Regulations compliance assessment of the WRMP adaptive scenarios and alternative plans.

The options developed by Thames Water have fed directly into the regional planning process for WRSE by providing opportunities to address strategic water resource management issues and WRSE have adopted a best value approach for the regional plans. The options selected for the emerging regional plans have then been used to identify the options included in the Thames WRMP24. The BVP preferred plan is influenced by a number of aspects which dictate the expected future demand within the region. BVP Situation 4 is the core scenario within the WRMP, or the 'preferred plan'.

Between our revised draft WRMP24 and final WRMP24, we received our decision letter from the Secretary of State authorising us to proceed with publication of our final WRMP24. As part of our Business Plan Draft Determination, Ofwat has made a funding allocation for the delivery of 18 MI/d of additional resilience through the development of supply side schemes in AMP8. Ofwat directed us to incorporate these schemes into our WRMP delivery plan for the period 2025-2030. The schemes are small groundwater schemes and further detail can be found in Section 11 of our final WRMP24.

These additional supply-side schemes have been incorporated into our revised AMP8 BVP delivery plan, and we have updated our environmental assessments accordingly. These schemes were already planned for delivery later in the plan, or (in one case) in an alternative branch, but have been brought forward for the period 2025-2030. As such, they have already undergone an assessment. This HRA has been updated to accord with the revised timing of these schemes, and in particular an assessment has been undertaken to review any in-combination effects resulting from bringing these schemes forward in time, and the results show that there are no new in combination effects that give rise to likely significant effects requiring further assessment.

4.1 Summary of WRMP BVP HRA Outcomes

The results of the HRA assessment of the supply options within this plan are set out in Table 4.1: WRMP BVP (Situation 4) HRA Outcome .1 below. Non-supply options such as demand management that include leakage reduction, metering and media campaigns have been scoped out as they will not have LSE and are not location specific.

Table 4.1: WRMP BVP (Situation 4) HRA Outcome

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_GUI_HI-TFR_RZ4_AL L_sewtogui	SouthEast Water to Guildford	Bulk transfers within region (treated)	Supply	2045	2050	AESI ruled out after further studies and application of refined mitigation (see Annex C.5 for full AA)
TWU_GUI_RE - DRP_ALL_AL	Shalford Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
L_dp-shalford-guild						
TWU_HEN_HI - TFR_KVZ_AL L_tw(kv)to(hen)con	Transfer - Kennet Valley to Henley - Conveyance Element	Bulk transfers within region (treated)	Supply - existing	2021	2057	No LSE
TWU_HEN_RE-DRP_ALL_AL L_dp-sheep/harp-hen	Sheeplands/Harps den Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_KEM_HI - TFR_TED_AL L_tedd-kempton	Teddington to Kempton Conveyance Element	Bulk transfers within region (raw)	Supply - SRO London Reuse	2033	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_KGV_HI - TFR_TED_AL L_teddingtond rated/tlt	Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	Bulk transfers within region (raw)	Supply - SRO London Reuse	2026	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_KVZ_HI - GRW_ALL_AL L_mortimer recomm	Groundwater Development - Recommission Mortimer Disused Source	Groundwater sources	Supply	2040	2042	No LSE
TWU_KVZ_HI - TFR_T2S_AL L_t2st cul to speen	T2ST Spur to Kennet Valley - Speen	Bulk transfers within region (treated)	Supply - SRO T2ST	2038	2040	AESI ruled out after application of appropriate mitigation (see section 3.3.4)
TWU_KVZ_RE-DRP_ALL_AL L_dp-playhatch-kv	Playhatch Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_LON_HI - GRW_ALL_AL L_addington gw	Groundwater Development - Addington	Groundwater sources	Supply	2025	2028	No LSE
TWU_LON_HI - GRW_ALL_AL L_s'fleet lic disagg	Groundwater Development - Southfleet & Greenhithe	Groundwater sources	Supply	2025	2030	No LSE
TWU_LON_HI - ROC_WT1_C NO_kemptonw tw100 p1	New WTW at Kempton - 100MI/d	Increase water treatment works (WTW) capacity	Supply	2045	2050	The WRMP19 AA review concluded that AESI could be ruled out if the mitigation measures described in the 'Assessment of effects on quantifying features' section can be imposed and

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
						implemented (s (see Section 3.4.2 for WRMP19 AA review))
TWU_LON_HI - TFR_LON_AL L_newriverhead pump 4	Replace New River Head Pump - TWRM	Bulk transfers within region (treated)	Supply	2045	2050	No LSE
TWU_STR_HI - RSR_RE1_CN O_abingdon150(lon)	New Reservoir - SESRO 150Mm3	New reservoir	Supply - SRO SESRO	2031	2040	No LSE
TWU_SWA_HI - GRW_ALL_AL L_datchet do	Groundwater Development - Datchet Existing Source DO Increase	Groundwater sources	Supply	2025	2030	No LSE
TWU_SWA_HI - ROC_WT1_CN NO_medmenhamwtw ph1	New Medmenham Surface Water WTW Ph1 - Construction	Increase water treatment works (WTW) capacity	Supply	2047	2050	No LSE
TWU_SWA_HI - TFR_SWX_AL L_tw(swx)to(swa)con	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - existing	2021	2050	No LSE
TWU_SWA_HI - TFR_UTC_AL L_medmenham intake 53	New Medmenham Surface Water Intake - 53 MI/d	Bulk transfers within region (raw)	Supply	2045	2050	No LSE
TWU_SWX_HI - GRW_ALL_AL L_moulsford gw	Groundwater Development - Moulsford Groundwater Source	Groundwater sources	Supply	2030	2033	AESI ruled out after application of appropriate mitigation (see Annex C.7 for full AA)
TWU_SWX_HI - GRW_ALL_AL L_woods farm do	Groundwater Development - Woods Farm Existing Source Increase DO	Groundwater sources	Supply	2025	2030	No LSE
TWU_SWX_HI - IMP_SWX_CN O_oxc-dukes cutswox	Oxford Canal - Duke's Cut (SWOX) - Construction	Bulk transfers into region (raw)	Supply	2037	2040	AESI ruled out after application of appropriate mitigation (see Annex C.3 for full AA)
TWU_SWX_HI - TFR_HEN_AL L_henley-swox5	Henley to SWOX Transfer – 5 MI/d	Bulk transfers within region (treated)	Supply	2035	2040	No LSE

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_SWX_HI-TFR_STR_AL_L_abing-farmoor pipe	Abingdon Reservoir to Farmoor Reservoir pipeline	Bulk transfers within region (raw)	Supply	2035	2040	AESI ruled out after application of appropriate mitigation (see Annex C.8 for full AA)
TWU_SWX_HI-TFR_SWA_AL_L_tw(swa)to(swx)con	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - existing	2021	2033	No LSE
TWU_SWX_HI-TFR_SWA_AL_L_tw(swa)to(swx)con b	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - existing	2021	2033	No LSE
TWU_SWX_HI-TFR_SWA_AL_L_tw(swa)to(swx)con c	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - existing	2021	2021	No LSE
TWU_SWX_HI-TFR_SWX_AL_L_dukescut-farmoor	Oxford Canal - Transfer from Duke's Cut to Farmoor	Bulk transfers within region (raw)	Supply	2035	2040	AESI ruled out after application of appropriate mitigation (see Annex C.4 for full AA)
TWU_SWX_RE-DRP_ALL_AL_L_dp-gatehampton-swox	Gatehampton Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_TED_HI-RAB_RE1_CN_O_teddington dra 75	Teddington Direct River Abstraction (Indirect Water Recycling) 75 MLD - Construction	Direct river abstraction	Supply - SRO London Reuse	2029	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_TED_HI-TFR_TED_AL_L_teddingtond ramog/ted	Transfer of Treated Effluent from Mogden to Teddington 75Ml/d	Bulk transfers within region (raw)	Supply - SRO London Reuse	2026	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_LON_HI-GRW_RE1_A_LL_asrhortonkirby	Manager Aquifer Recharge - Horton Kirby ASR	Aquifer recharge /Artificial recharge (AR)	Supply	2026	2030	No LSE
TWU_LON_HI-OTH_ALL_AL_L_didcot purchase	Didcot Power Station Licence Trading	Abstraction licence trading	Supply - existing agreement with RWE	2026	2026	No LSE
TWU_WLJ_HI-ROC_NET_C_NO_twrm shaft kempton	New shaft on the TWRM at Kempton	Distribution capacity expansion	Supply	2045	2050	AESI ruled out after application of appropriate mitigation (included in Kempton WTW AA, see section 3.4.2)

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_GUI_HI-GRW_ALL_AL L_dapdune lic disagg	Groundwater Development - Dapdune Licence Disaggregation	Groundwater sources	Supply	2025	2030	No LSE

In summary, this plan does not result in overall adverse effects on site integrity for any of the Habitat Sites situated within the Thames region, provided the recommended mitigation measures are implemented.

4.2 In-combination effects assessment - BVP, LCP and BESP

The assessment found that, provided that appropriate mitigation measures are implemented, AESI can be ruled out from all of the BVP options. Within the BVP, LC and BES plans there are two options, Oxford Canal to Duke's Cut (SWOX) and Duke's Cut to Farmoor which may result in low effects on Cannock Extension Canal SAC and Oxford Meadows SAC respectively due to the proximity of the options to the SACs. As the two options affect different Habitats Sites in-combination effects are ruled out.

4.3 In-combination effects assessment with other plans and projects

In-combination assessment of this plan focuses on other plans and major developments within a similar geographic area to the WRMP24. This assessment looked the potential pathways through which other plans or projects could affect the same designated sites for the two options where low effects are possible (Oxford Canal to Duke's Cut (SWOX) and Duke's Cut to Farmoor).

There are no LSE identified in-combination with other projects or plans for the BESP, provided that mitigation measures suggested in the plan are applied at the project stage.

There are 4 Strategic Development Areas (SDAs) in Oxfordshire namely North Witney SDA, East Witney SDA, West Eynsham SDA and East Chipping Norton SDA. There are 16 major mixed developments are proposed (details are provided in the BVP section). It is considered that there are no pathways from the developments proposed in the Local Development Plan and Strategic Development Plan and projects and other plans due construction activities.

There are three waste management plant sites in the SDA owned by the North London Waste Authority. The plants are primarily used for thermal treatment, anaerobic digestion, pyrolysis/gasification, mechanical biological treatment, waste transfer, processing and recycling, waste transfer, indoor composting, in-vessel composting, processing and recycling potentially suitable to handle hazardous waste in addition to uses primary uses. There are only two plans in the North London Waste Authority which overlap with one of the options in BESP, Oxford Canal - Duke's Cut (SWOX) during construction.

For the two options where low effects are possible (Oxford Canal to Duke's Cut (SWOX) and Duke's Cut to Farmoor) it is anticipated that overlapping construction activity could cause an effect within proximity to the Cannock Extension Canal SAC and Oxford Meadows SAC respectively. After reviewing the North London Waste Authority management plans there are no construction activities proposed in these plans and therefore no in-combination effects.

There are two rail development and improvement projects HS2 and East West Rail Bicester to Bedford Improvements. The HS2 overlaps with the Oxford Canal to Dukes Cut option. Given the distance of the Habitat Sites and no pathway connection the in-combination effects of these projects are ruled out.

Neighbouring water company plans were also reviewed for potential in-combination effects. The Grand Union Canal SRO and the Oxford Canal to Duke's Cut option use the same canal network but this will not cause additional in-combination effects for Habitats Sites. It was concluded that no in-combination effects are likely with other water company plans.

The mitigation measures suggested under the individual assessments for each of the two WRMP24 options rules out any in combination effects. There are no other plans or projects that are likely to result in in combination effect and consequently the possibility of in-combination effects is ruled out on Habitats Sites, and it is qualifying species.

5 Alternative Plans

5.1 Summary of HRA Adaptive BVP Scenarios (Situation 1 and 8)

The WRMP24 includes an adaptive strategy to deal with uncertainties and future scenarios that will mean further investment is required (e.g., further future sustainability reductions). In some cases, there may not be a long lead time to implement schemes and therefore Thames Water needs to develop a plan which identifies thresholds beyond which it needs to take further action. As part of the WRMP, a HRA assessment has been carried out on two of the alternative BVP scenarios, Situation 1 and Situation 8 in Table 5.1 and Table 5.2 respectively.

Table 5.1: Adaptive Scenario BVP Situation 1 HRA Outcome

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_GUI_HI-TFR_RZ4_ALL_sewtogui	SouthEast Water to Guildford	Bulk transfers within region (treated)	Supply	2045	2050	AESI ruled out after further studies and application of refined mitigation (see Annex C.5 for full AA)
TWU_HEN_HI-TFR_KVZ_ALL_tw(kv)to(hen)con	Transfer - Kennet Valley to Henley - Conveyance Element	Bulk transfers within region (treated)	Supply - existing	2021	2065	No LSE
TWU_HON_HI-ROC_NET_CN_O_cop'mills-honoroak	TWRM extension - Coppermills to Honor Oak - Construction	Distribution capacity expansion	Supply	2070	2074	AESI ruled out after application of appropriate mitigation (see Annex C.9 for full AA)
TWU_KEM_HI-TFR_TED_ALL_tedd-kempton	Teddington to Kempton Conveyance Element	Bulk transfers within region (raw)	Supply - SRO London	2033	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_KGV_HI-REU_RE1_CNO_deephams_reuse 46.5b	Deephams Reuse – 46.5 MI/d, to TLT - Construction	Reclaimed water, water re-use, effluent re-use	Supply	2065	2069	WRMP19 AA review concluded that AESI could be ruled out, if the mitigation measures described in the 'Assessment of effects on

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
						quantifying features' section can be imposed and implemented (see Section 3.4.1 for WRMP19 AA review)
TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res	Thames-Lee Tunnel extension from Lockwood PS to King George V Reservoir intake	Bulk transfers within region (raw)	Supply	2053	2060	AESI ruled out after further studies and application of refined mitigation (see Annex C.6 for full AA)
TWU_KGV_HI-TFR_TED_ALL_teddingtonrate d/tlt	Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	Bulk transfers within region (raw)	Supply - SRO London	2026	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm	Groundwater Development - Re-commissioning Mortimer Disused Source	Groundwater sources	Supply	2040	2042	No LSE
TWU_KVZ_HI-TFR_T2S_ALL_t2st cul to speen	T2ST Spur to Kennet Valley - Speen	Bulk transfers within region (treated)	Supply - SRO T2ST	2038	2040	AESI ruled out after application of appropriate mitigation (see section 3.3.4)
TWU_KVZ_RE-DRP_ALL_ALL_dp-playhatch-kv	Playhatch Drought Permit	Drought intervention - Drought permit	Supply - DP	2040	2040	No LSE
TWU_LON_HI-DES_ALL_CNO_beckton desal 150	Beckton Desalination	Desalination	Supply	2044	2050	AESI ruled out after further studies and application of refined mitigation

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
						(see Annex C.1 for full AA)
TWU_LON_HI-GRW_ALL_ALL_addington asr	Managed Aquifer Recharge - Addington	Artificial Storage and Recovery wells (or Aquifer Storage and Recovery (ASR))	Supply	2065	2075	No LSE
TWU_LON_HI-GRW_ALL_ALL_addington gw	Groundwater Development - Addington	Groundwater sources	Supply	2026	2029	No LSE
TWU_LON_HI-GRW_ALL_ALL_london conchalk	Groundwater Development - Confined Chalk North London	Groundwater sources	Supply	2070	2075	No LSE
TWU_LON_HI-GRW_ALL_ALL_merton recommission	Groundwater Development - Merton Recommissioning	Groundwater sources	Supply	2070	2072	No LSE
TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg	Groundwater Development - Southfleet & Greenhithe	Groundwater sources	Supply	2025	2030	No LSE
TWU_LON_HI-GRW_ALL_CN_O_kidbrooke slars	Managed Aquifer Recharge - Kidbrooke (SLARS1) Construction	Aquifer recharge /Artificial recharge (AR)	Supply	2070	2074	No LSE
TWU_LON_HI-GRW_ALL_CN_O_merton ar	Managed Aquifer Recharge - Merton (SLARS3)	Aquifer recharge /Artificial	Supply	2070	2074	No LSE

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
	Construction	recharge (AR)				
TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby	Manager Aquifer Recharge - Horton Kirby ASR	Aquifer recharge /Artificial recharge (AR)	Supply	2026	2030	No LSE
TWU_LON_HI-ROC_WT1_CN O_kemptonwtw 100 p1	New WTW at Kempton - 100Ml/d - Construction	Increase water treatment works (WTW) capacity	Supply	2051	2056	WRMP19 AA review concluded that AESI could be ruled out if the mitigation measures described in the 'Assessment of effects on quantifying features' section can be imposed and implemented (s (see Section 3.4.2 for WRMP19 AA review)
TWU_LON_HI-TFR_LON_ALL_newriverhead pump 4	Replace New River Head Pump - TWRM	Bulk transfers within region (treated)	Supply	2051	2056	No LSE
TWU_LON_HI-TFR_LON_CNO_beckton-coppermills	Beckton to Coppermills tunnel (treated) - Construction	Bulk transfers within region (raw)	Supply	2044	2050	AESI ruled out after application of appropriate mitigation (see Annex C.2 for full AA)
TWU_LON_HI-TFR_SES_ALL_chemamerton	Transfer from SES WTW to Merton TWRM shaft	Bulk transfers within region (treated)	Supply	2035	2040	No LSE
TWU_STR_HI-RSR_RE1_CNO_abingdon150(l on)	New Reservoir - SESRO 150Mm3 - Construction	New reservoir	Supply - SRO SESRO	2031	2040	No LSE

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_SWA_HI-GRW_ALL_ALL_datchet do	Groundwater Development - Datchet Existing Source DO Increase	Groundwater sources	Supply	2025	2030	No LSE
TWU_SWA_HI-ROC_WT1_CN O_medmenham wtw ph1	New Medmenham Surface Water WTW Ph1 - Construction	Increase water treatment works (WTW) capacity	Supply	2047	2050	No LSE
TWU_SWA_HI-TFR_SWX_ALL_tw(swx)to(swa) con	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - existing	2021	2050	No LSE
TWU_SWA_HI-TFR.UTC_ALL_medmenham intake 53	New Medmenham Surface Water Intake - 53 MI/d	Bulk transfers within region (raw)	Supply	2045	2050	No LSE
TWU_SWX_HI-GRW_ALL_ALL_moulsford gw	Groundwater Development - Moulford Groundwater Source	Groundwater sources	Supply	2030	2033	AESI ruled out after application of appropriate mitigation (see Annex C.7 for full AA)
TWU_SWX_HI-GRW_ALL_ALL_woods farm do	Groundwater Development - Woods Farm Existing Source Increase DO	Groundwater sources	Supply	2025	2030	No LSE
TWU_SWX_HI-IMP_SWX_CNO_oxc-dukes cutswox	Oxford Canal - Duke's Cut (SWOX) - Construction	Bulk transfers into region (raw)	Supply	2060	2065	AESI ruled out after application of appropriate mitigation (see Annex C.3 for full AA)

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_SWX_HI-TFR_HEN_ALL_henley-swox2.4	Henley to SWOX Transfer – 2.4 Ml/d	Bulk transfers within region (treated)	Supply	2037	2042	No LSE
TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe	Abingdon Reservoir to Farmoor Reservoir pipeline	Bulk transfers within region (raw)	Supply	2035	2040	AESI ruled out after application of appropriate mitigation (see Annex C.8 for full AA)
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx) con	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - existing	2021	2033	No LSE
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx) con b	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - existing	2021	2033	No LSE
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx) con c	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - existing	2021	2021	No LSE
TWU_SWX_HI-TFR_SWX_ALL_dukescut-farmoor	Oxford Canal - Transfer from Duke's Cut to Farmoor	Bulk transfers within region (raw)	Supply	2060	2065	AESI ruled out after application of appropriate mitigation (see Annex C.4 for full AA)
TWU_SWX_RE-DRP_ALL_ALL_dp-gatehampton-swox	Gatehampton Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_TED_HI-RAB_RE1_CNO_teddington dra 75	Teddington Direct River Abstraction (Indirect Water Recycling) 75 MLD - Construction	Direct river abstraction	Supply - SRO London	2029	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_TED_HI-TFR_TED_ALL_teddingtondramog/ted	Transfer of Treated Effluent from Mogden to Teddington 75MI/d	Bulk transfers within region (raw)	Supply - SRO London	2026	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_LON_HI-OTH_ALL_ALL_didcot purchase	Didcot Power Station Licence Trading	Supply - existing agreement with RWE	Supply	2026	2026	No LSE
TWU_WLJ_HI-ROC_NET_CN O_twrmm shaft kempton	New shaft on the TWRM at Kempton	Distribution capacity expansion	Supply	2045	2050	AESI ruled out after application of appropriate mitigation (included in Kempton WTW AA, see section 3.4.2)
TWU_GUI_HI-GRW_ALL_ALL_dapdune lic disagg	Groundwater Development - Dapdune Licence Disaggregation	Groundwater sources	Supply	2025	2030	No LSE

In summary, this plan does not result in overall adverse effects on site integrity for any of the Habitat Sites situated within the Zol, provided the recommended mitigation measures are implemented.

Table 5.2: Adaptive Scenario BVP Situation 8 HRA Outcome

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_GUI_RE-DRP_ALL_ALL_dp-shalford-guild	Shalford Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_HEN_RE-DRP_ALL_ALL_dp-sheep/harp-hen	Sheeplands/Harpsden Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_KEM_HI-TFR_TED_ALL_tedd-kempton	Teddington to Kempton Conveyance Element	Bulk transfers within region (raw)	Supply - SRO London Reuse	2033	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_KGV_HI-TFR_TED_ALL_teddingtondrat/tt	Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	Bulk transfers within region (raw)	Supply - SRO London Reuse	2026	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_KVZ_RE-DRP_ALL_ALL_dp-playhatch-kv	Playhatch Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_STR_HI-RSR_RE1_CN_O_abingdon150(lon)	New Reservoir - SESRO 150Mm3 - Construction	New reservoir	Supply - SRO SESRO	2031	2040	No LSE
TWU_SWX_HI-GRW_ALL_AL_L_moulsford gw	Groundwater Development - Moulsford Groundwater Source	Groundwater sources	Supply	2030	2033	AESI ruled out after application of appropriate mitigation (see Annex C.7 for full AA)
TWU_SWX_HI-TFR_SWA_AL_L_tw(swa)to(swx)con	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - existing	2021	2033	No LSE
TWU_SWX_HI-TFR_SWA_AL_L_tw(swa)to(swx)con b	Thames Water Radnage (SWA) to Thames Water Bledlow (SWOX) Conveyance	Bulk transfers within region (treated)	Supply - existing	2021	2033	No LSE
TWU_SWX_HI-TFR_SWA_AL_L_tw(swa)to(swx)con c	Thames Water Stokenchurch (SWA) to Thames Water Chinnor (SWOX) Conveyance	Bulk transfers within region (treated)	Supply - existing	2021	2021	No LSE
TWU_SWX_RE-DRP_ALL_ALL_dp-gatehampton-swox	Gatehampton Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_TED_HI-RAB_RE1_CN_O_teddington dra 75	Teddington Direct River Abstraction (Indirect Water Recycling) 75 MLD - Construction	Direct river abstraction	Supply - SRO London Reuse	2029	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_TED_HI-TFR_TED_ALL_teddingtondra mog/ted	Transfer of Treated Effluent from Mogden to Teddington 75MI/d	Bulk transfers within region (raw)	Supply - SRO London Reuse	2026	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_LON_HI-GRW_RE1_AL	Manager Aquifer	Aquifer recharge	Supply	2026	2030	No LSE

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
L_asrhortonkirby	Recharge - Horton Kirby ASR	/Artificial recharge (AR)				
TWU_LON_HI-GRW_ALL_AL-L_addington gw	Groundwater Development - Addington	Groundwater sources	Supply	2026	2029	No LSE
TWU_LON_HI-OTH_ALL_ALL-_didcot purchase	Didcot Power Station Licence Trading		Supply - existing agreement with RWE	2026	2026	No LSE
TWU_GUI_HI-GRW_ALL_AL-L_dapdune lic disagg	Groundwater Development - Dapdune Licence Disaggregation	Groundwater sources	Supply	2025	2030	No LSE
TWU_SWX_HI-GRW_ALL_AL-L_woods farm do	Groundwater Development - Woods Farm Existing Source Increase DO	Groundwater sources	Supply	2025	2030	No LSE
TWU_SWA_HI-GRW_ALL_AL-L_datchet do	Groundwater Development - Datchet Existing Source DO Increase	Groundwater sources	Supply	2025	2030	No LSE
TWU_LON_HI-GRW_ALL_AL-L_s'fleet lic disagg	Groundwater Development - Southfleet & Greenhithe	Groundwater sources	Supply	2025	2030	No LSE

In summary, this plan does not result in overall adverse effects on site integrity for any of the Habitat Sites situated within the Zol, provided the recommended mitigation measures are implemented.

5.2 Summary of HRA outcomes for the two Alternative Plans

In line with the WRPG, two alternative plans were developed (selected from hundreds of model runs undertaken), the Least Cost Plan (LCP) and the Best Environmental and Societal Plan (BESP). The HRA outcomes for the LCP and BESP are presented in Table 5.3 and Table 5.4 respectively.

Table 5.3: Alternative Least Cost Plan HRA Outcome

Option ID	Option Name	Type	Category	Year (selected)	Year (first utilised)	HRA Outcome
TWU_GUI_HI-TFR_RZ4_AL-L_sewtogui	SouthEast Water to Guildford	Supply	Bulk transfers within region (treated)	2045	2050	AESI ruled out after further studies and application of refined mitigation (see Annex C.5 for full AA)
TWU_KEM_HI-TFR_TED_AL-	Teddington to Kempton Conveyance Element	Supply - SRO London Reuse (Teddington DRA)	Bulk transfers within region (raw)	2033	2033	AESI ruled out after application of appropriate

Option ID	Option Name	Type	Category	Year (selected)	Year (first utilised)	HRA Outcome
L_tedd-kempton TWU_KGV_HI - TFR_TED_AL L_teddingtond rated/tlt TWU_TED_HI - RAB_RE1_CN O_teddington dra 75	Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD Teddington Direct River Abstraction (Indirect Water Recycling) 75 MLD - Construction					mitigation (see section 3.3.1)
TWU_KVZ_HI - GRW_ALL_AL L_mortimer recomm	Groundwater Development - Recommission Mortimer Disused Source	Supply	Groundwater sources	2065	2067	No LSE
TWU_KVZ_HI - TFR_T2S_AL L_t2st cul to speen	T2ST Spur to Kennet Valley - Speen	Supply - T2ST	Bulk transfers within region (treated)	2030	2042	AESI ruled out after application of appropriate mitigation (see section 3.3.4)
TWU_KVZ_R E- DRP_ALL_AL L_dp- playhatch-kv	Playhatch Drought Permit	Supply - DP	Drought intervention - Drought permit	2040	2040	No LSE
TWU_LON_HI - GRW_ALL_AL L_addington gw	Groundwater Development - Addington	Supply	Groundwater sources	2056	2059	No LSE
TWU_LON_HI - GRW_ALL_AL L_london conchalk	Groundwater Development - Confined Chalk North London	Supply	Groundwater sources	2065	2070	No LSE
TWU_LON_HI - GRW_ALL_AL L_merton recommission	Groundwater Development - Merton Recommission ing	Supply	Groundwater sources	2070	2072	No LSE
TWU_LON_HI - GRW_ALL_AL L_s'fleet lic disagg	Groundwater Development - Southfleet & Greenhithe	Supply	Groundwater sources	2048	2052	No LSE
TWU_LON_HI - GRW_ALL_C NO_merton ar	Managed Aquifer Recharge - Merton (SLARS3) Construction	Supply	Aquifer recharge /Artificial recharge (AR)	2070	2074	No LSE
TWU_LON_HI -	Manager Aquifer	Supply	Aquifer recharge	2065	2070	No LSE

Option ID	Option Name	Type	Category	Year (selected)	Year (first utilised)	HRA Outcome
GRW_RE1_A LL_asrhortonki rby	Recharge - Horton Kirby ASR		/Artificial recharge (AR)			
TWU_LON_HI - ROC_WT1_C NO_kemptonw tw100 p1	New WTW at Kempton - 100MI/d - Construction	Supply	Increase water treatment works (WTW) capacity	2045	2050	WRMP19 AA review concluded that AESI could be ruled out if the mitigation measures described in the 'Assessment of effects on quantifying features' section can be imposed and implemented (s (see Section 3.4.2 for WRMP19 AA review)
TWU_LON_HI - TFR_LON_AL L_newriverhea d pump 4	Replace New River Head Pump - TWRM	Supply	Bulk transfers within region (treated)	2045	2050	No LSE
TWU_LON_HI - TFR_SES_AL L_chem- merton	Transfer from SES WTW to Merton TWRM shaft	Supply	Bulk transfers within region (treated)	2045	2050	No LSE
TWU_STR_HI - RSR_RE1_CN O_abingdon15 0(lon)	New Reservoir - SESRO 150Mm3 - Construction	Supply - SRO SESRO	New reservoir	2031	2040	No LSE
TWU_SWA_H I- GRW_ALL_AL L_datchet do	Groundwater Development - Datchet Existing Source DO Increase	Supply	Groundwater sources	2047	2051	No LSE
TWU_SWA_H I- ROC_WT1_C NO_medmenh amwtw ph1	New Medmenham Surface Water WTW Ph1 - Construction	Supply	Increase water treatment works (WTW) capacity	2047	2050	No LSE
TWU_SWA_H I- TFR_SWX_AL L_tw(swx)to(s wa)con	SWA to SWOX Transfer - Conveyance Element	Supply - Existing	Bulk transfers within region (treated)	2021	2050	No LSE
TWU_SWA_H I- TFR_UTC_AL L_medmenha m intake 53	New Medmenham Surface Water Intake - 53 MI/d	Supply	Bulk transfers within region (raw)	2045	2050	No LSE
TWU_SWX_H I- GRW_ALL_AL L_moulsford gw	Groundwater Development - Moulsford Groundwater Source	Supply	Groundwater sources	2030	2033	AESI ruled out after application of appropriate mitigation (see Annex C.7 for full AA)

Option ID	Option Name	Type	Category	Year (selected)	Year (first utilised)	HRA Outcome
TWU_SWX_H I-GRW_ALL_AL L_woods farm do	Groundwater Development - Woods Farm Existing Source Increase DO	Supply	Groundwater sources	2036	2040	No LSE
TWU_SWX_H I-IMP_SWX_CN O_oxc-dukes cutswox	Oxford Canal - Duke's Cut (SWOX) - Construction	Supply	Bulk transfers into region (raw)	2037	2040	AESI ruled out after application of appropriate mitigation (see Annex C.3 for full AA)
TWU_SWX_H I-TFR_HEN_AL L_henley-swox2.4	Henley to SWOX Transfer – 2.4 Ml/d	Supply	Bulk transfers within region (treated)	2035	2040	No LSE
TWU_SWX_H I-TFR_STR_AL L_abing-farmoor pipe	Abingdon Reservoir to Farmoor Reservoir pipeline	Supply	Bulk transfers within region (raw)	2035	2040	AESI ruled out after application of appropriate mitigation (see Annex C.8 for full AA)
TWU_SWX_H I-TFR_SWA_AL L_tw(swa)to(s wx)con	SWA to SWOX Transfer - Conveyance Element	Supply - Existing	Bulk transfers within region (treated)	2021	2033	No LSE
TWU_SWX_H I-TFR_SWA_AL L_tw(swa)to(s wx)con b	SWA to SWOX Transfer - Conveyance Element	Supply - Existing	Bulk transfers within region (treated)	2021	2033	No LSE
TWU_SWX_H I-TFR_SWA_AL L_tw(swa)to(s wx)con c	SWA to SWOX Transfer - Conveyance Element	Supply - Existing	Bulk transfers within region (treated)	2021	2021	No LSE
TWU_SWX_H I-TFR_SWX_AL L_dukescut-farmoor	Oxford Canal - Transfer from Duke's Cut to Farmoor	Supply	Bulk transfers within region (raw)	2035	2040	AESI ruled out after application of appropriate mitigation (see Annex C.4 for full AA)
TWU_SWX_R E-DRP_ALL_AL L_dp-gatehampton-swox	Gatehampton Drought Permit	Supply - DP	Drought intervention - Drought permit	2033	2033	No LSE
TWU_WLJ_HI -ROC_NET_C NO_twrn shaft kempton	New shaft on the TWRM at Kempton	Distribution capacity expansion	Supply	2045	2050	AESI ruled out after application of appropriate mitigation (included in Kempton WTW AA, see section 3.4.2)

Option ID	Option Name	Type	Category	Year (selected)	Year (first utilised)	HRA Outcome
TWU_TED_HI - TFR_TED_AL L_teddingtond ramog/ted	Transfer of Treated Effluent from Mogden to Teddington 75M/d	Supply - SRO London Reuse (Teddington DRA)	Bulk transfers within region (raw)	2026	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)

In summary, this plan does not result in overall adverse effects on site integrity for any of the Habitat Sites situated within the plan, provided the recommended mitigation measures are implemented.

Table 5.4: Alternative Plan BESP HRA Outcome

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_GUI_HI-TFR_RZ4_ALL_sewtogui	SouthEast Water to Guildford	Bulk transfers within region (treated)	Supply	2045	2050	AESI ruled out after further studies and application of refined mitigation (see Annex C.5 for full AA)
TWU_GUI_RE-DRP_ALL_ALL_dp-shalford-guild	Shalford Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_HEN_HI-TFR_KVZ_ALL_t w(kv)to(hen)con	Transfer - Kennet Valley to Henley - Conveyance Element	Bulk transfers within region (treated)	Supply - Existing	2021	2050	No LSE
TWU_HEN_RE-DRP_ALL_ALL_dp-sheep/harp-hen	Sheeplands/H arpsden Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_KEM_HI-TFR_TED_ALL_t edd-kempton	Teddington to Kempton Conveyance Element	Bulk transfers within region (raw)	Supply - SRO London Reuse (Teddington DRA)	2033	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_KGV_HI-TFR_TED_ALL_t eddingtond rate d/tit	Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	Bulk transfers within region (raw)	Supply - SRO London Reuse (Teddington DRA)	2026	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm	Groundwater Development - Recommission Mortimer Disused Source	Groundwater sources	Supply	2049	2051	No LSE
TWU_KVZ_HI-TFR_T2S_ALL_t	T2ST Spur to Kennet Valley - Speen	Bulk transfers	Supply - T2ST	2030	2042	AESI ruled out after application of appropriate mitigation (see section 3.3.4)

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
2st cul to speen		within region (treated)				
TWU_KVZ_RE-DRP_ALL_ALL_dp-playhatch-kv	Playhatch Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_LON_HI-DES_ALL_CNO_beckton desal 100p1	Beckton Desalination - Phase 1: 100 MI/d - Construction	Desalination	Supply	2044	2050	AESI ruled out after further studies and application of refined mitigation (see Annex C.1 for full AA)
TWU_LON_HI-GRW_ALL_ALL_addington gw	Groundwater Development - Addington	Groundwater sources	Supply	2060	2063	No LSE
TWU_LON_HI-GRW_ALL_ALL_london conchalk	Groundwater Development - Confined Chalk North London	Groundwater sources	Supply	2065	2070	No LSE
TWU_LON_HI-GRW_ALL_ALL_merton recommissioning	Groundwater Development - Merton Recommissioning	Groundwater sources	Supply	2070	2072	No LSE
TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg	Groundwater Development - Southfleet & Greenhithe	Groundwater sources	Supply	2046	2050	No LSE
TWU_LON_HI-GRW_ALL_CN O_kidbrooke slars	Managed Aquifer Recharge - Kidbrooke (SLARS1) Construction	Aquifer recharge /Artificial recharge (AR)	Supply	2065	2069	No LSE
TWU_LON_HI-GRW_ALL_CN O_merton ar	Managed Aquifer Recharge - Merton (SLARS3) Construction	Aquifer recharge /Artificial recharge (AR)	Supply	2070	2074	No LSE
TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby	Manager Aquifer Recharge - Horton Kirby ASR	Aquifer recharge /Artificial recharge (AR)	Supply	2065	2070	No LSE
TWU_LON_HI-TFR_LON_CNO_beckton-coppermills	Beckton to Coppermills tunnel (treated) - Construction	Bulk transfers within region (raw)	Supply	2044	2050	AESI ruled out after application of appropriate mitigation (see Annex C.2 for full AA)

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_LON_HI-TFR_SES_ALL_chemam-merton	Transfer from SES WTW to Merton TWRM shaft	Bulk transfers within region (treated)	Supply	2048	2053	No LSE
TWU_STR_HI-RSR_RE1_CNO_abingdon75(l on)	New Reservoir - SESRO 75Mm3 - Construction	New reservoir	Supply - SESRO	2032	2040	No LSE
TWU_SWA_HI-GRW_ALL_ALL_datchet do	Groundwater Development - Datchet Existing Source DO Increase	Groundwater sources	Supply	2046	2050	No LSE
TWU_SWA_HI-ROC_WT1_CN O_medmenham mwtw ph1	New Medmenham Surface Water WTW Ph1 - Construction	Increase water treatment works (WTW) capacity	Supply	2047	2050	No LSE
TWU_SWA_HI-TFR_SWX_ALL_tw(swx)to(swa) con	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - Existing	2021	2050	No LSE
TWU_SWA_HI-TFR.UTC_ALL_medmenham intake 53	New Medmenham Surface Water Intake - 53 MI/d	Bulk transfers within region (raw)	Supply	2045	2050	No LSE
TWU_SWX_HI-GRW_ALL_ALL_moulsford gw	Groundwater Development - Moulsford Groundwater Source	Groundwater sources	Supply	2030	2033	AESI ruled out after application of appropriate mitigation (see Annex C.7 for full AA)
TWU_SWX_HI-GRW_ALL_ALL_woods farm do	Groundwater Development - Woods Farm Existing Source Increase DO	Groundwater sources	Supply	2046	2050	No LSE
TWU_SWX_HI-IMP_SWX_CN O_oxc-dukes cutswox	Oxford Canal - Duke's Cut (SWOX) - Construction	Bulk transfers into region (raw)	Supply	2037	2040	AESI ruled out after application of appropriate mitigation (see Annex C.3 for full AA)
TWU_SWX_HI-TFR_HEN_ALL_henley-swox5	Henley to SWOX Transfer - 5 MI/d	Bulk transfers within region (treated)	Supply	2035	2040	No LSE
TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe	Abingdon Reservoir to Farmoor Reservoir pipeline	Bulk transfers within region (raw)	Supply	2035	2040	AESI ruled out after application of appropriate mitigation (see Annex C.8 for full AA)

Option ID	Option Name	Category	Type	Year (selected)	Year (first utilised)	HRA Outcome
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - Existing	2021	2033	No LSE
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con b	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - Existing	2021	2033	No LSE
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con c	SWA to SWOX Transfer - Conveyance Element	Bulk transfers within region (treated)	Supply - Existing	2021	2021	No LSE
TWU_SWX_HI-TFR_SWX_ALL_dukescut-farmoor	Oxford Canal - Transfer from Duke's Cut to Farmoor	Bulk transfers within region (raw)	Supply	2035	2040	AESI ruled out after application of appropriate mitigation (see Annex C.4 for full AA)
TWU_SWX_RE-DRP_ALL_ALL_dp-gatehampton-swox	Gatehampton Drought Permit	Drought intervention - Drought permit	Supply - DP	2031	2031	No LSE
TWU_TED_HI-RAB_RE1_CNO_teddington dra 75	Teddington Direct River Abstraction (Indirect Water Recycling) 75 MLD - Construction	Direct river abstraction	Supply - SRO London Reuse (Teddington DRA)	2029	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)
TWU_TED_HI-TFR_TED_ALL_teddingtondra mog/ted	Transfer of Treated Effluent from Mogden to Teddington 75M/d	Bulk transfers within region (raw)	Supply - SRO London Reuse (Teddington DRA)	2026	2033	AESI ruled out after application of appropriate mitigation (see section 3.3.1)

In summary, this plan does not result in overall adverse effects on site integrity for any of the Habitat Sites, provided the recommended mitigation measures are implemented.

5.3 In-combination assessment for the Alternatives Plans

Within the alternatives plans there are two options, Oxford Canal to Duke's Cut (SWOX) and Oxford Canal - Transfer from Duke's Cut to Farmoor which are likely to have low effects on the Cannock Extension Canal SAC and Oxford Meadows SAC respectively. As the two options do not affect the same Habitats sites there are no in-combination effects between them.

6 Conclusions and Recommendations

The BVP for Thames Water includes supply options that require HRA. Stage 1 screening identified the following options as having LSE, which were taken forward for Stage 2 AA, as follows:

BVP Situation 4:

- South East Water to Guildford
- T2ST Spur to Kennet Valley - Speen New WTW at Kempton - 100ML/d - Construction
Groundwater Development - Moulsoford Groundwater Source
- Oxford Canal - Duke's Cut (SWOX) - Construction
- Abingdon Reservoir to Farmoor Reservoir pipeline
- Oxford Canal - Transfer from Duke's Cut to Farmoor
- Teddington Direct River Abstraction (Indirect Water Recycling) 75 MLD - Construction

Additional options for BVP Situation 1

- Thames-Lee Tunnel extension from Lockwood PS to King George V Reservoir intake Beckton Desalination
- Beckton to Coppermills tunnel (treated) – Construction
- TWRM extension - Coppermills to Honor Oak - Construction
- Deephams Reuse – 46.5 ML/d, to TLT - Construction

These options are likely to have adverse effects on the integrity of the Habitat Sites and their qualifying species in the absence of mitigation through pathways such as, physical and non-physical damage, toxic and non-toxic pollution to the water bodies, and disturbances due to construction machinery, noise and light. These effects are likely to result in habitat degradation, displacement of qualifying bird species from foraging areas, and changes to habitat availability and species abundance or distribution, e.g. changes in natural succession.

However, provided that appropriate mitigation measures are implemented, AESI can be ruled out from all of the BVP options.

Additionally, further investigation is required for all BVP options to understand the extent and distribution of qualifying species and habitats within the Habitats Sites or functionally linked habitats (where relevant) in order to inform the option design and required mitigation at the project stage.

In line with the WRPG, two alternative plans were developed (selected from hundreds of model runs undertaken), Least Cost Plan (LCP) and the Best Environmental and Societal Plan (BESP). Within the BVP, LCP and BESP plans there are two options, Oxford Canal - Duke's Cut (SWOX) – Construction and Oxford Canal - Transfer from Duke's Cut to Farmoor, which are likely to have low effects on the Cannock Extension Canal SAC and Oxford Meadows SAC respectively. As the two options do not affect the same Habitats sites there are no in-combination effects between them.

The assessment also found that there would be no in-combination effects between the BVP, LCP or BESP and other plans and projects. Although the development activities arising from the Local Development Plans may potentially overlap with WRMP activities, there is no pathway for Habitats Sites to be affected either directly or indirectly, alone or in-combination with other projects or plans, and consequently the possibility of in-combination effects is ruled out. This is due to the

distance between the identified Local Development plans and the lack of hydrologically connection.

The required mitigation measures detailed within this document assume a worst-case scenario at this stage, in the absence of detailed survey data or local records. As such, measures are appropriate to avoid adverse effects on the Habitats Sites. The receipt of additional data may provide evidence that there will be no adverse effects on Habitats Sites even in the absence of mitigation; in this scenario this document should be revised accordingly.

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A. HRA Screening Review Results

A.1 South East Water to Guildford

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
ID: TWU_GUI_HI-TFR_RZ5_ALL_sewtogui	South East Water to Guildford	10Ml/d transfer from South East Water (Hogsback) to Mount SR Guildford	Thames Basin Heaths SPA (0.05km)	<p>Article 4.1 Qualification - During the breeding season the SPA regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:</p> <p>A302 Dartford Warbler (<i>Sylvia undata</i>) - 27.8% of the GB population</p> <p>A224 Nightjar (<i>Caprimulgus europaeus</i>) - 7.8% of the GB population</p> <p>A246 Woodlark (<i>Lullula arborea</i>) - 9.9% of the GB population</p> <p>Non-qualifying species of interest:</p> <p>Hen harrier (<i>Circus cyaneus</i>)</p> <p>Merlin (<i>Falco columbarius</i>)</p> <p>Short-eared owl (<i>Asio flammeus</i>)</p> <p>Kingfisher (<i>Alcedo atthis</i>)</p> <p>(all Annex I species) occur in nonbreeding numbers of less than European importance (less than 1% of the GB population).</p>	LSE	<p>The construction of this section of pipeline is likely to have adverse effects on the breeding populations of the qualifying bird species. Although habitat loss upon this site itself might be negligible, disturbance due to noise, vibration, light and disturbance due to human presence are likely to affect breeding pairs during construction.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Thursley, Ash, Pirbright and Chobham SAC (approx. 0.05km)	Annex I habitats that are a primary reason for selection of this site: 4010 Northern Atlantic wet heaths with (<i>Erica tetralix</i>) 4030 European dry heaths 7150 Depressions on peat substrates of the Rhynchosporion	LSE	The construction of these pipelines may adversely affect this site qualifying habitats during construction phase. Excess production of dust during construction could result in dust deposition on habitats, with likely adverse effects. During construction, LSE of the Option (alone) could not be ruled out at the screening stage. During operation, LSE of the option (alone) has been ruled out at the screening stage.
			Thursley, Hankley & Frensham Commons SPA (approx. 5km)	Dartford warbler (<i>Sylvia undata</i>) - A302, b Nightjar (<i>Caprimulgus europaeus</i>) - A224, b Woodlark (<i>Lullula arborea</i>) - A246, b	No LSE	This site is sufficiently distant to not result in effects related to light/ noise/ anthropogenic disturbances during construction phase of this option. This site is not hydrologically connection to the option footprint. No pathways are identified where this option could affect this Habitats Site and/or its qualifying features during construction and/or operational phases. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.
			Thursley & Ockley Bogs Ramsar Site (approx. 7km)	Ramsar Site criterion 2 Supports a community of rare wetland invertebrate species including notable numbers of breeding dragonflies.	No LSE	This site is sufficiently distant to not result in effects related to light/ noise/ anthropogenic disturbances during construction phase of this option. This site is not hydrologically connection to the option footprint.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Ramsar Site criterion 3</p> <p>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 (<i>Caprimulgus europaeus</i>) and woodlark (<i>Lullula arborea</i>)</p>		<p>No pathways are identified where this option could affect this Habitats Site and/or its qualifying features during construction and/or operational phases.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			Windsor Forest & Great Park SAC (approx. 9km)	<p>H9120 Atlantic acidophilous beech forests with (<i>Ilex</i> sp.)</p> <p>H9190 Old acidophilous oak woods with (<i>Q. robur</i>) on sandy plains</p> <p>S1079 Violet click beetle (<i>Limoniscus violaceus</i>)</p>	No LSE	<p>This site is sufficiently distant to not result in effects related to light/ noise/ anthropogenic disturbances during construction phase of this option. This site is not hydrologically connection to the option footprint.</p> <p>No pathways are identified where this option could affect this Habitats Site and/or its qualifying features during construction and/or operational phases.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.2 T2ST Culham to Speen transfer

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_KVZ_HI-TFR_T2S_ALL_t2st cul to speen	T2ST Culham to Speen transfer Option	This option proposes a new pipeline to allow 10MU/d spur connection water transfer from Culham T2ST to Speen WTW.	Kennet & Lambourn Floodplain SAC (approx. 0.1km)	Annex II species that are a primary reason for selection of this site <ul style="list-style-type: none"> 1016 Desmoulin's whorl snail (<i>Vertigo moulinsiana</i>) 	LSE	<p>This SAC is designated for supporting one of the most extensive known populations of desmoulin's whorl snail in the UK and is one of the only two sites representing the species in chalk stream habitats. The integrity of this species population relies on ecological measures, such as habitat creation, to safeguard populations.</p> <p>This site is located at approximately 100m of the proposed works footprint and in the same water catchment area (groundwater and surface) of the option. However, no changes in groundwater levels as well in flows are anticipated. The new proposed pipeline route does not currently cross any immediate waterbody, although it is close to the River Kennet (<200m) which feeds this SAC. Therefore, given the option's close location to this site, temporary and permanent effects related to the construction works are likely to be observed.</p> <p>As a result, the following LSE are identified during the construction of this option:</p> <ul style="list-style-type: none"> Physical damage - supporting habitat loss, edge effects, habitat damage. Non-physical disturbance - anthropogenic disturbance and light disturbances related to the construction of the pipeline and associated structures. Toxic contamination - air pollution (dust) and eventual water quality degradation from potential

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						<p>pollutions events, such as air pollution/pollution events affecting the River Kennet and indirectly this SAC.</p> <ul style="list-style-type: none"> • Non-toxic contamination - air pollution (dust), temporary changes in turbidity, sedimentation and/or silting associated to run-off during construction when crossing waterbodies interconnected to the River Kennet. • Biological disturbances - changes to habitat availability and population reduction due to changes in habitat quality for example. <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			Kennet Valley Alderwoods SAC (approx. 0.6km)	<p>Annex I habitats that are a primary reason for selection of this site</p> <ul style="list-style-type: none"> • 91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, <i>Alnion incanae</i>, <i>Salicion albae</i>) <p>* Priority feature</p>	No LSE	<p>This SAC comprises the largest fragments of alder-ash woodland on the Kennet floodplain, lie on alluvium overlain by a shallow layer of moderately calcareous peat. The wettest areas are dominated by alder (<i>Alnus glutinosa</i>) over tall herbs, sedges and reeds, but dryer patches include a base-rich woodland flora with much dog's mercury (<i>Mercurialis perennis</i>) and also herb-Paris (<i>Paris quadrifolia</i>).</p> <p>This site is located at approximately 600m of the proposed works footprint the new proposed pipeline route does not currently cross any immediate waterbody connected to this site. Therefore, given the distance between the option footprint to this site construction effects related to dust, light and</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						<p>anthropogenic disturbances are unlikely to be observed.</p> <p>No operation effects were identified at this stage.</p> <p>Therefore, no pathways have been identified through which this Habitats Site and its qualifying features could be affected by this option during construction and operation phases.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			River Lambourn SAC (approx. 1km)	S1166 Great crested newt, (<i>Triturus cristatus</i>)	No LSE	<p>This SAC is an example of sub-type 1 in central southern England, a chalk stream discharging into the middle reaches of the Thames system. For part of its length, it is a winterbourne, drying through the summer months. It is one of the least-modified rivers of this type, with a characteristic flora dominated by pond water-crowfoot and stream water-crowfoot. This site is designated for supporting these macrophyte species in addition to important native fish, such as the bullhead and brook lamprey.</p> <p>This site is located at approximately 1km of the proposed works footprint. Given the distance between this site and the option footprint, and as the new proposed pipeline route does not cross any immediate waterbody, potential construction effects are unlikely.</p> <p>Therefore, no pathways have been identified through which this Habitats Site and its qualifying features</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						could be affected by this option during construction and operation phases. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

A.3 River Thames to Fobney Transfer

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_KVZ_HI-TFR.UTC_ALL_thamestofobney	River Thames to Fobney Transfer	40MU/d raw water transfer option from River Thames to Fobney WTW to supply Kennet Valley WRZ.	Hartslock Wood SAC (approx. 8km)	Annex I habitats that are a primary reason for site selection: <ul style="list-style-type: none"> 6210 Semi-natural grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (*important orchid sites) 91J0 (<i>Taxus baccata</i>) woods of the British Isles * Priority feature 	No LSE	This site is located upstream of the proposed works, therefore, potential pollution effects and possible changes in flows on the River Thames due to the new abstraction are unlikely to result in effects upon this site and its qualifying habitats and plant species. In addition, this SAC is sufficiently distant from the option footprint (approximately 8km), that light, dust and human related disturbances during the construction phase are unlikely to be observed. No operation effects are anticipated as this site is located upstream of the proposed works. No pathways have been identified through which this Habitats site and its qualifying features could be affected by this option.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.
			Thames Basin Heaths SPA (approx. 9km)	<p>Article 4.1 Qualification (79/409/EEC)</p> <p>During the breeding season the area regularly supports:</p> <ul style="list-style-type: none"> • (<i>Caprimulgus europaeus</i>) 7.8% of the GB breeding population • (<i>Lullula arborea</i>) 9.9% of the GB breeding population • (<i>Sylvia undata</i>) 27.8% of the GB breeding population 	No LSE	<p>This site is located south of the proposed works at approximately 9km distance of the option footprint and is designated for supporting bird species during breeding season. There is an unclear hydrological connection between this site and the River Thames via the River Whitewater and the River London, however this hydrological connection does not indicate a feasible pathway for eventual pollution effects on this site or on its qualifying features as it is located upstream of the proposed works. Similarly, possible changes in flows on the River Thames due to the new abstraction are unlikely to result in significant effects on the River Whitewater / River London and, consequently on this site. Therefore, potential pollution effects during construction phase due to hydrological connectivity, as well as light, noise and human related disturbances during construction phase are unlikely to be observed.</p> <p>No operation effects are anticipated as this site is located upstream of the proposed works.</p> <p>No pathways have been identified through which this Habitats site and its qualifying features could be affected by this option.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.4 TWRM extension - Hampton to Battersea

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-ROC_NET_CN O_hampton-battersea	TWRM extension - Hampton to Battersea	New ring main tunnel from Hampton to Battersea. The Hampton Battersea TWRM extension will be required when additional resources from the west and/or east of the London water resource zone (WRZ) are increased reach a trigger value. The extension tunnel will be 20km long and connect to the existing shafts at Hampton WTW and Battersea. Permanent land requirement of 2,000m ² for shafts and temporary land requirement 30,000m ² .	Richmond Park SAC (0km)	<p>Annex II species that are a primary reason for selection of this site</p> <ul style="list-style-type: none"> 1083 Stag beetle (<i>Lucanus cervus</i>) <p>Richmond Park has a large number of ancient trees with decaying timber. It is at the heart of the south London centre of distribution for Stag beetle (<i>Lucanus cervus</i>) and is a site of national importance for the conservation of the fauna of invertebrates associated with the decaying timber of ancient trees.</p>	LSE	<p>Construction of the tunnels (not shafts) will not have an impact on the Habitats Site and features due to the depth of the tunnels (30m-70m below the Habitats Site. The tunnel will be situated within the London Clay (an aquiclude) so it is hydrologically isolated from the SAC and therefore no disturbance to the designated features of the site. It is anticipated that no more than 200 HGV movements per day are needed for the shaft construction etc. which is below the threshold for potential air quality impacts. Two shafts are located outside but close to the Habitats site with potential for construction related noise and dust effects.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			Wimbledon Common SAC (0km)	<p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <ul style="list-style-type: none"> 4010 Northern Atlantic wet heaths with (<i>Erica tetralix</i>) 4030 European dry heaths <p>Annex II species that are a primary reason for selection of this site:</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<ul style="list-style-type: none"> 1083 Stag beetle (<i>Lucanus cervus</i>) <p>Wimbledon Common has a large number of old trees and much fallen decaying timber. It is at the heart of the south London centre of distribution for Stag beetle (<i>Lucanus cervus</i>) and a relatively large number of records were received from this site during a recent nationwide survey for the species (Percy <i>et al.</i> 2000). The site supports a number of other scarce invertebrate species associated with decaying timber.</p>		<p>and therefore, LSE are identified due to permanent habitat loss and construction disturbance effects.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			South West London Waterbodies Ramsar Site (approx. 1.2km)	<p>Ramsar Site criterion 6 - species/population occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <ul style="list-style-type: none"> Northern shoveler (<i>Anas clypeata</i>), NW & C Europe 397 individuals, representing an average of 2.6% of the GB population 	No LSE	<p>Option footprint is located at 1.2km distance of this site and it is not hydrologically linked to the option. Construction works and traffic are unlikely to have significant effects upon this Ramsar Site and/or supporting habitat for its qualifying species through air, lighting, and noise pollution. No pathways are identified during the operation of this option.</p> <p>Therefore, no pathways have been identified through which this Habitats Site and its qualifying features could be affected by this option during construction and operation phases.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>(5-year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <ul style="list-style-type: none"> Gadwall (<i>Anas strepera strepera</i>), NW Europe 487 individuals, representing an average of 2.8% of the GB population (5-year peak mean 1998/9-2002/3). 	No LSE	<p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			<p>South West London Waterbodies SPA (approx. 1.2km)</p>	<p>Article 4.2 Qualification (79/409/EEC)</p> <p>It is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex 1), in any season:</p> <ul style="list-style-type: none"> Gadwall (<i>Anas strepera strepera</i>) 710 individuals - wintering (5-year peak mean 1993/94 - 1997/98) 2.4% NW Europe Shoveler (<i>Anas clypeata</i>) 853 individuals - wintering (5-year peak mean 1993/94 - 1997/98) 2.1% NW/Central Europe" 		<p>Option footprint is located at 1.2km distance of this site and it is not hydrologically linked to the option. Construction works and traffic are unlikely to have significant effects upon this SPA and/or supporting habitat for its qualifying species through air, lighting, and noise pollution. No pathways are identified during the operation of this option.</p> <p>Therefore, no pathways have been identified through which this Habitats Site and its qualifying features could be affected by this option during construction and operation phases.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.5 New WTW at Kempton

Option ID Number	Option Title	Option Description	Habitats Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
<p>TWU_LON_HI - ROC_WT1_C NO_kemptonw tw100/150/300</p>	New WTW at Kempton	100/150/300Ml/d new capacity at WTW at Kempton treating raw reservoir water in west London. Purpose is to accommodate additional future demand.	South West London Waterbodies SPA (multiple site units; closest approx. 0.3 km)	<p>ARTICLE 4.2 QUALIFICATION (79/409/EEC)</p> <p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex 1), in any season:</p> <p>Gadwall <i>Anas strepera</i> 710 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.4 % NW Europe</p> <p>Shoveler <i>Anas clypeata</i> 853 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.1 % NW/Central Europe</p>	LSE	<p>South West London Waterbodies has been designated for supporting internationally important populations of gadwall and shoveler.</p> <p>The option is likely to affect this SPA and functionally linked land during construction as the proposed works is less than 0.5km from the Habitats site. Habitats close to the option, located beyond the SPA boundary, may be used by qualifying bird species as feeding grounds, acting as functionally linked habitat and providing an important role for maintaining or restoring the population of these qualifying species at favourable conservation status. Therefore, adverse effects during the construction phase cannot be ruled out at this stage.</p> <p>The site is designated for its populations of gadwall, which feed primarily on aquatic vegetation and may be highly sensitive to changes in water chemistry and water quality. Factors such as high levels of turbidity or siltation may render sites or parts of sites unsuitable if plant beds are affected during pollution events. Shoveler are also present at this site and rely heavily on aquatic invertebrates as a food source and there are also heavily dependent on good water quality. Land clearance and the use of vehicles, machinery and movement of personnel may result in adverse edge effects due to noise and light</p>

Option ID Number	Option Title	Option Description	Habitats Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						<p>pollution potentially displacing these bird species from feeding and overwintering grounds both inside the Habitats site boundary and any areas of adjacent functionally linked land.</p> <p>During construction, this option is likely to result in:</p> <ul style="list-style-type: none"> • Non-physical disturbance – including noise, light and visual disturbance and presence of personnel and vehicles may displace qualifying bird populations from overwintering and feeding grounds. • Biological disturbance – changes in habitat quality and availability (including functionally linked land); potential for SPA populations to be displaced from current overwintering habitat and feeding areas; direct mortality as a result of reduced food availability. <p>During operation, the presence of the operational WTW within 0.5km of this Habitats Site is a material concern to the qualifying bird species. Non-physical disturbance including noise, light and visual disturbance and presence of personnel and vehicles may displace bird species from overwintering and feeding grounds, both inside the site boundary and from any areas of adjacent functionally linked land. Therefore, adverse effects during operation cannot be ruled out at this stage.</p>
			South West London Waterbodies Ramsar (multiple	Ramsar criterion 6 – species/population occurring at levels of international importance.	LSE	South West London Waterbodies has been designated for supporting internationally important populations of gadwall and shoveler.

Option ID Number	Option Title	Option Description	Habitats Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			site units; closest approx. 0.3km)	<p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall , <i>Anas strepera strepera</i>, NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3).</p>		<p>The option is likely to affect this Ramsar and functionally linked land during construction as the proposed works is less than 0.5km from the Habitats site. Habitats close to the option, located beyond the Ramsar boundary, may be used by qualifying bird species as feeding grounds, acting as functionally linked habitat and providing an important role for maintaining or restoring the population of these qualifying species at favourable conservation status. Therefore, adverse effects during the construction phase cannot be ruled out at this stage.</p> <p>The site is designated for its populations of gadwall, which feed primarily on aquatic vegetation and may be highly sensitive to changes in water chemistry and water quality. Factors such as high levels of turbidity or siltation may render sites or parts of sites unsuitable if plant beds are affected during pollution events. Shoveler are also present at this site and rely heavily on aquatic invertebrates as a food source and there are also heavily dependent on good water quality. Land clearance and the use of vehicles, machinery and movement of personnel may result in adverse edge effects due to noise and light pollution potentially displacing these bird species from feeding and overwintering grounds both inside the Habitats site boundary and any areas of adjacent functionally linked land.</p> <p>During construction, this option is likely to result in:</p>

Option ID Number	Option Title	Option Description	Habitats Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						<ul style="list-style-type: none"> • Non-physical disturbance – including noise, light and visual disturbance and presence of personnel and vehicles may displace qualifying bird populations from overwintering and feeding grounds. • Biological disturbance – changes in habitat quality and availability (including functionally linked land); potential for Ramsar populations to be displaced from current overwintering habitat and feeding areas; direct mortality as a result of reduced food availability. <p>During operation, the presence of the operational WTW within 0.5km of this designated site is a material concern to the qualifying bird species. Non-physical disturbance including noise, light and visual disturbance and presence of personnel and vehicles may displace bird species from overwintering and feeding grounds both inside the site boundary and from any areas of adjacent functionally linked land. Therefore, adverse effects during operation cannot be ruled out at this stage.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

A.6 Groundwater Development - Datchet Existing Source DO Increase

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
<p>TWU_SWA_H I-GRW_ALL_AL L_datchet do</p>	<p>Groundwater Development - Datchet Existing Source DO Increase</p>	<p>Replacement of submersible pumps and lower of intake levels in two boreholes (two pumps) and increasing the capacity of the contact tank. DO benefit 5.4Ml/d (peak) and 1.6Ml/d (average).</p>	<p>Windsor Forest & Great Park SAC (approx. 3km)</p>	<p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> 9190 Old acidophilous oak woods with (<i>Quercus robur</i>) on sandy plains. <p>Windsor represents old acidophilous oak woods in the south-eastern part of its UK range. It has the largest number of veteran oaks (<i>Quercus spp.</i>) in Britain (and probably in Europe), a consequence of its management as wood-pasture. It is of importance for its range and diversity of saproxylic invertebrates, including many rare species (e.g., the beetle (<i>Lacan querceus</i>)), some known in the UK only from this site, and has recently been recognised as having rich fungal assemblages. Windsor Forest and Great Park has been identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989).</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p>	<p>No LSE</p>	<p>The proposed option is not hydrologically connected to this SAC. The proposed pump replacement is unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the option and the SAC will also negate any impacts that may arise from dust pollution during the construction phase.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<ul style="list-style-type: none"> 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robur-petraeae</i> or <i>Ilici-Fagenion</i>). <p>Annex II species that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> 1079 Violet click beetle (<i>Limoniscus violaceus</i>). <p>Violet clicks beetle (<i>Limoniscus violaceus</i>) was first recorded at Windsor Forest in 1937. The site is thought to support the largest of the known populations of this species in the UK. There is a large population of ancient trees on the site, which, combined with the historical continuity of woodland cover, has resulted in Windsor Forest being listed as the most important site in the UK for fauna associated with decaying timber on ancient trees (Fowles, Alexander & Key 1999). The site was also identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989).</p>		
			South West London SPA (approx. 3.8km)	<p>Article 4.2 Qualification (79/409/EEC)</p> <p>It is used regularly by 1% or more of the biogeographical populations of</p>	No LSE	Elements of relevance to this option are disturbance and invasive species but both are considered to be of negligible likelihood given the scale, nature and location of the groundwater abstraction. The closest constituent

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>the following regularly occurring migratory species (other than those listed on Annex 1), in any season:</p> <ul style="list-style-type: none"> Gadwall (<i>Anas strepera strepera</i>) 710 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.4% NW Europe Shoveler (<i>Anas clypeata</i>) 853 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.1% NW/Central Europe 	No LSE	<p>SSSI is Wraysbury No.1 Gravel Pit, however, there is no SSSI or potential functional habitat within 1km of the option.</p> <p>As the proposed option abstracts from the confined Chalk aquifer there is no direct hydrological impact of abstraction on surface water features and habitats of the SPA. The option will not require land take from within the SPA boundaries and construction activities are at sufficient distance from the SPA that no impacts on the qualifying features are anticipated during construction.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			<p>South West London Ramsar Site (approx. 3.8km)</p>	<p>The South West London Waterbodies site comprises a series of reservoirs and former gravel pits that support internationally important numbers of wintering (<i>Anas strepera</i>) and shoveler (<i>Anas clypeata</i>).</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <ul style="list-style-type: none"> Northern shoveler (<i>Anas clypeata</i>) <p>Species with peak counts in winter:</p>		<p>Elements of relevance to this option are disturbance and 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 is Wraysbury No.1 Gravel Pit, however, there is no SSSI or potential functional habitat within 1km of the option.</p> <p>As the proposed option abstracts from the confined Chalk aquifer there is no direct hydrological impact of abstraction on surface water features and habitats of the Ramsar site. The option will not require land take from within the Ramsar site boundaries and construction activities are at sufficient distance from the Ramsar site that no impacts on the qualifying features are anticipated during construction.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<ul style="list-style-type: none"> Gadwall (<i>Anas strepera</i>) 		<p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			Burnham Beeches SAC (approx. 7km)	<p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (<i>Quercion robur-petraeae</i> or <i>Ilici-Fagenion</i>). <p>Burnham Beeches is an example of Atlantic acidophilous beech forests in central southern England. It is an extensive area of former beech wood-pasture with many old pollards and associated beech (<i>Fagus sylvatica</i>) and oak (<i>Quercus spp.</i>) high forest. Surveys have shown that it is one of the richest sites for saproxylic invertebrates in the UK, including 14 Red Data Book species. It also retains nationally important epiphytic communities, including the moss (<i>Zygodon forsteri</i>).</p>	No LSE	<p>The proposed option is not hydrologically connected to this SAC. The proposed pump replacement is unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the option and the SAC will also negate any impacts that may arise from dust pollution during the construction phase.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.7 Transfer from WTW in Abingdon to SWA – 48MI/d and 72MI/d

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
<p>TWU_SWA_H I- TFR_SWX_AL L_swoxswa48</p> <p>TWU_SWA_H I- TFR_SWX_AL L_swoxswa72</p>	<p>Transfer from WTW in Abingdon to SWA – 48MI/d and 72MI/d</p>	<p>Abingdon WTW to Long Crendon to supply SWA.</p>	<p>Cothill Fen SAC (approx. 0.05km)</p>	<p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> 7230 Alkaline fens <p>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 (<i>Schoenus nigricans</i> - <i>Juncus subnodulosus</i>) vegetation found here occurs under a wide range of hydrological conditions, with frequent bottle sedge (<i>Carex rostrata</i>), grass-of-Parnassus (<i>Parnassia palustris</i>), common butterwort (<i>Pinguicula vulgaris</i>) and marsh helleborine (<i>Epipactis palustris</i>). The alkaline fen vegetation forms transitions to other vegetation types that are similar to M24 (<i>Molinia caerulea</i> - <i>Cirsium dissectum</i>) fen-meadow and S25 (<i>Phragmites australis</i> - <i>Eupatorium cannabinum</i>) tall-herb fen and wet alder (<i>Alnus spp.</i>) wood.</p> <p>Annex I habitats present as a qualifying feature, but not a</p>	<p>LSE</p>	<p>Due to Habitats site being approximately 50m to the south of the proposed pipeline route, significant effects predicted from construction activities such as dust arisings which have the potential to smother the features thereby impacting on productivity and regrowth. Vehicle emissions and other airborne pollutants have the ability to reduce vigour within the Habitats features. The pipeline will transfer water from the new Abingdon Reservoir and then transfer to Long Crendon. To fill the Abingdon Reservoir, water will be abstracted from the River Thames for storage. Abstraction not likely to affect downstream designations due to the distance between the abstraction point and Habitats Site. The construction of the pipeline in the area of the SAC could alter ground water movements in the area (Upwood Quarry). The altering of ground water movements could have a significant effect on the designated features of the SAC.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>primary reason for selection of this site:</p> <ul style="list-style-type: none"> 91E0 Alluvial forests with (<i>Alnus glutinosa</i>) and (<i>Fraxinus excelsior</i>) (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) <p>* Priority feature</p>		
			Oxford Meadows SAC (approx. 0.2km)	<p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> 6510 Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) <p>Annex II species that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> 1614 Creeping marshwort (<i>Apium repens</i>) <p>Oxford Meadows is selected because Port Meadow is the larger of only two known sites in the UK for creeping marshwort (<i>Apium repens</i>).</p>	LSE	<p>The SAC supports extensive areas of grassland vegetation with is strongly associated with floodplain meadows and creeping marshwort which is a very rare plant found on seasonally flooded habitats. As such, construction activities near the SAC have the potential to impact on the designated features through construction dust, air and chemical pollution and by altering hydrological changes within the SAC which may result in the damage or loss of qualifying grassland habitats and creeping marshwort. Furthermore the pipeline route will cross the River Evenlode which flows downstream connecting the River Isis and River Thames, both of which support the floodplain areas of the SAC. The crossing of the River Evenlode could result in the release of silt sediment and of concrete/hydrocarbon pollutants that could be washed downstream and deposited within the floodplain habitats of the SAC.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

A.8 Groundwater Development - Moulsoford Groundwater Source

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_H I-GRW_ALL_AL L_moulsoford gw	Groundwater Development - Moulsoford Groundwater Source	Construction of an abstraction borehole in the unconfined Chalk north of Streatley on the west bank of the River Thames. Water abstracted from the borehole will be treated at the existing Cleeve water treatment works (WTW) located on the eastern side of the River Thames. The option also includes: Test pumping to support application for a new abstraction licence; 0.6km run to waste pipeline for clearance pumping of the boreholes to the River Thames; and 1.5km raw water pipeline between the boreholes and the WTW including a crossing under the River Thames and the Great Western Railway line. DO benefit is 3.5MI/d peak and 2MI/d average	Hartsock Wood SAC: (approx. 2.75km)	Annex I habitats that are a primary reason for selection of this site: <ul style="list-style-type: none"> 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) <ul style="list-style-type: none"> * Important orchid sites 91J0 (<i>Taxus baccata</i>) woods of the British Isles <ul style="list-style-type: none"> * Priority feature 	LSE	Abstraction from the new borehole may impact on designated features of the site which is located downstream of the option point. The pipeline crossing under the River Thames may release silt or pollutants into the river which may have adverse effects on the designated features. During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.

A.9 Abingdon Reservoir to Farmoor Reservoir pipeline

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
<p>TWU_SWX_H I-TFR_STR_AL L_abing-farmoor pipe</p>	<p>Abingdon Reservoir to Farmoor Reservoir pipeline</p>	<p>Raw Water Conveyance: Construction of a transfer pipeline to convey 24 Ml/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir, in the SWOX WRZ. (Note: Abingdon reservoir creation is not part of this option). The engineering scope includes the provision of a booster pump station at the proposed Abingdon Reservoir site to facilitate the transfer. Treatment would be provided at the existing WTW.</p>	<p>Cothill Fen SAC (approx. 0.1km)</p>	<p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> • 7230 Alkaline fens <p>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 (<i>Schoenus nigricans</i> - <i>Juncus subnodulosus</i>) vegetation found here occurs under a wide range of hydrological conditions, with frequent bottle sedge (<i>Carex rostrata</i>), grass-of-Parnassus (<i>Parnassia palustris</i>), common butterwort (<i>Pinguicula vulgaris</i>) and marsh helleborine (<i>Epipactis palustris</i>). The alkaline fen vegetation forms transitions to other vegetation types that are similar to M24 (<i>Molinia caerulea</i> - <i>Cirsium dissectum</i>) fen-meadow and S25 (<i>Phragmites australis</i> - <i>Eupatorium cannabinum</i>) tall-herb fen and wet alder (<i>Alnus spp.</i>) wood.</p> <p>Annex I habitats present as a qualifying feature, but not a</p>	<p>LSE</p>	<p>Due to the Habitats Site being approximately 100m to the south of the proposed pipeline route, significant effects predicted from construction activities such as dust arisings which have the potential to smother the features thereby impacting on productivity and regrowth. Vehicle emissions and other airborne pollutants have the ability to reduce vigour within the designated features. The pipeline will abstract water from the River Thames for storage within the new Abingdon Reservoir and then transfer to Farmoor Reservoir. Abstraction not likely to affect downstream designations due to the distance between the abstraction point and Habitats Sites. The construction of the pipeline in the area of the SAC could alter ground water movements in the area (Upwood Quarry). The altering of ground water movements could have a significant effect on the designated features of the SAC.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>primary reason for selection of this site:</p> <ul style="list-style-type: none"> 91E0 Alluvial forests with (<i>Alnus glutinosa</i>) and (<i>Fraxinus excelsior</i>) (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) <p>* Priority feature</p>		
			Oxford Meadows SAC (approx. 4.8km)	<p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> 6510 Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) <p>Annex II species that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> 1614 Creeping marshwort (<i>Apium repens</i>) <p>Oxford Meadows is selected because Port Meadow is the larger of only two known sites in the UK for creeping marshwort (<i>Apium repens</i>).</p>	No LSE	<p>The proposed option is not hydrologically connected to this SAC and construction activities unlikely to have an impact on the designated features.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			Little Wittenham SAC (approx. 8km)	S1166 Great crested newt, (<i>Triturus cristatus</i>)	No LSE	<p>The river abstraction along the Thames for this option is not thought to effect water levels downstream near the SAC. Therefore, water draw down within waterbodies associated with the features of this SAC are not thought to have a significant effect upon the GCN within the SAC. Should pollution or sediment be released into the</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						<p>River Thames at the abstraction point, it is thought that it would be diffused enough to not have a permanent effect on the population within the SAC or the meta-population in the area, thereby maintaining a positive conservation status. The proposed pipeline crosses several watercourses which in turn join to form tributaries of the River Thames. Any pollution or silt within these watercourses will have local effects but will diffuse along the length of the watercourses before entering the River Thames.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.10 Henley to SWOX Transfer– 2.4MI/d and 5MI/d

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
<p>TWU_SWX_HI-TFR_HEN_ALL_henley-swox2.4</p> <p>TWU_SWX_HI-TFR_HEN_ALL_henley-swox5</p>	<p>Henley to SWOX Transfer – 2.4MI/d and 5MI/d</p>	<p>The option is for one new main from New Farm service reservoir (Henley) to Nettlebed service reservoir (SWOX). This will require a new 5.9km, 350mm diameter main from New Farm to Nettlebed and a new pumping station at New</p>	<p>Aston Rowant SAC (approx. 8.4km)</p>	<p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> 5130 (<i>Juniperus communis</i>) formations on heaths or calcareous grasslands <p>Annex I habitats present as a qualifying feature, but not a</p>	No LSE	<p>This option is not hydrologically connected to the site. The pipeline mostly follows infrastructure and will not be constructed in any source protection zone or near any PW abstraction points, therefore no significant effects predicted.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
		Farm. 2.4MU/d and 5MU/d capacities		<p>primary reason for selection of this site:</p> <ul style="list-style-type: none"> 9130 (<i>Asperulo-Fagetum</i>) beech forests 		
			Chilterns Beechwoods SAC (approx. 11.7 km)	<p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> 9130 (<i>Asperulo-Fagetum</i>) beech forests <p>The Chilterns Beechwoods represent a very extensive tract of (<i>Asperulo-Fagetum</i>) beech forests in the centre of the habitat's UK range. The woodland is an important part of a grassland-scrub-woodland mosaic. A distinctive feature in the woodland flora is the occurrence of the rare coralroot (<i>Cardamine bulbifera</i>)</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <ul style="list-style-type: none"> 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) <p>* Important orchid sites</p>	No LSE	<p>This option is not hydrologically connected to the site. The pipeline mostly follows infrastructure and will not be constructed in any source protection zone or near any PW abstraction points, therefore no significant effects predicted.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Annex II species present as a qualifying feature, but not a primary reason for site selection: <ul style="list-style-type: none"> 1083 Stag beetle (<i>Lucanus cervus</i>) 		

A.11 SWA to SWOX Transfer - Conveyance Element

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx) con	SWA to SWOX Transfer - Conveyance Element	Potable Water Transfer - Thames Water (SWA) to Thames Water (SWOX) - Conveyance	N/A	N/A	No LSE	This is an existing transfer with no new construction impacts and no operational impacts as this is an existing pipeline infrastructure. No significant impacts predicted.
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx) con b						During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx) con c						

A.12 Transfer - Kennet Valley to Henley - Conveyance Element

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_HEN_HI-TFR_KVZ_ALL_t w(kv)to(hen)con	Transfer - Kennet Valley to Henley - Conveyance Element	Potable Water Transfer - Thames Water (Henley) to Thames Water (Kennet Valley) - Conveyance	N/A	N/A	No LSE	This is an existing transfer with no new construction impacts and no operational impacts as this is an existing pipeline infrastructure. No significant impacts predicted. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

A.13 Groundwater Development Addington

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_ALL_addington gw	Groundwater Development Addington	New abstraction borehole & upgrade to WTW. DO benefit 1 ML/d average, 1.5 ML/d peak	Mole Gap to Reigate Escarpment (approx. 15.3km)	Annex I habitats that are a primary reason for selection of this site <ul style="list-style-type: none"> 5110 (<i>Stable xerothermophilous</i>) formations with (<i>Buxus sempervirens</i>) on rock slopes (<i>Berberidion</i> p.p.) <p>Mole Gap in south-east England supports the only area of stable box scrub in the UK, on steep chalk slopes where the River Mole has cut into the North Downs Escarpment, creating the Mole</p>	No Likely Significant Effect	This Habitats Site is 15.3km away from the option site, it is not hydrologically connected and there are no pathways, therefore no impacts are predicted. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Gap. Here natural erosion maintains the open conditions required for the survival of this habitat type. The site therefore supports a stable formation and has good conservation of habitat structure and function.</p> <ul style="list-style-type: none"> 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) <p>* Important orchid sites</p> <p>This site hosts the priority habitat type "orchid rich sites". This large but fragmented site on the North Downs escarpment supports a wide range of calcareous grassland types on steep slopes, including CG2 (<i>Festuca ovina - Avenula pratensis</i>), CG3 (<i>Bromus erectus</i>), CG4 (<i>Brachypodium pinnatum</i>), CG5 (<i>Brachypodium pinnatum – Bromus erectus</i>) and CG6 (<i>Avenula pubescens</i>) grasslands. It exhibits a wide range of structural conditions ranging from short turf through to scrub margins, and is particularly important for rare vascular plants, including orchids. It is also significant in exhibiting transitions to scarce scrub, woodland and dry heath types,</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>notably 5110 (<i>Stable xerothermophilous</i>) formations with (<i>Buxus sempervirens</i>) on rock slopes, 91J0 yew (<i>Taxus baccata</i>) woods, and chalk heath (4030 European dry heaths).</p> <ul style="list-style-type: none"> 91J0 (<i>Taxus baccata</i>) woods of the British Isles <p>* Priority feature</p> <p>At Mole Gap to Reigate Escarpment yew <i>Taxus baccata</i> woodland has been formed both by invasion of chalk grassland and from development within beech <i>Fagus sylvatica</i> woodland following destruction of the beech overstorey. Yew occurs here in extensive stands, with, in places, an understorey of box <i>Buxus sempervirens</i> at one of its few native locations.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <ul style="list-style-type: none"> 4030 European dry heaths 9130 (<i>Asperulo-Fagetum</i>) beech forests <p>Annex II species present as a qualifying feature, but not a primary reason for site selection</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<ul style="list-style-type: none"> 1166 Great crested newt (<i>Triturus cristatus</i>) 1323 Bechstein's bat (<i>Myotis bechsteinii</i>) 		

A.14 Groundwater Development - Southfleet/Greenhithe

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg	Groundwater Development - Southfleet & Greenhithe	Southfleet-Greenhithe licence disaggregation and new headworks and pumping station at borehole sites and new 3km main from Greenhithe to new WTW. DO benefit is 8 MI/d average, 9 MI/d peak	Thames Estuary and Marshes Ramsar Site (approx. 6km)	<p>Ramsar Site criterion 2:</p> <ul style="list-style-type: none"> The site supports more than 20 British Red Data Book invertebrates and populations of the GB Red Book endangered least lettuce (<i>Lactuca saligna</i>) as well as the vulnerable slender hare's-ear (<i>Bupleurum tenuissimum</i>), divided sedge (<i>Carex divisa</i>), sea barley (<i>Hordeum marinum</i>), Norrer's saltmarsh-grass (<i>Puccinellia fasciculata</i>) and dwarf eelgrass (<i>Zoostera noltei</i>). <p>Ramsar Site criterion 5 - Assemblages of international importance:</p>	No Significant Effect	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 Site 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 affect the ability to achieve the various sites conservation objectives. The remainder of this assessment considers the likely

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Species with peak counts in winter:</p> <ul style="list-style-type: none"> 45,118 waterfowl (5 year peak mean 1998/99-2002/2003) <p>Ramsar Site criterion 6 - Species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <ul style="list-style-type: none"> Black-tailed godwit (<i>Limosa islandica</i>), Iceland/W Europe 1,640 individuals, representing an average of 4.5% of the population (5 year peak mean 1998/9-2002/3) <p>Species with peak counts in winter:</p> <ul style="list-style-type: none"> Dunlin, (<i>Calidris alpina alpina</i>), W Siberia/W Europe 15,171 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3) Red knot, (<i>Calidris canutus islandica</i>), W & Southern Africa (wintering) 7,279 		<p>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 Site 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 Habitats Sites - the change in flow contribution due to the abstraction is unlikely to significantly affect qualifying features of the SPA and Ramsar Site. No construction impacts (e.g. disturbance of birds and air quality degradation) are likely to arise as the option is located at a sufficient distance from the sites and the commonly applied threshold for potential air quality impacts of 1000AADT or 200HGV movements per day (within 200m of a Habitats Site) will not be exceeded (in total construction will involve 1000HGV movements).</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				individuals, representing an average of 1.6% of the population (5 year peak mean 1998/9-2002/3).		
	Thames Estuary and Marshes SPA (approx. 6.8km)			<p>Article 4.1 Qualification:</p> <p>Over winter the area regularly supports:</p> <ul style="list-style-type: none"> • (<i>Circus cyaneus</i>) (Europe - breeding) 1% of the GB population 5-year peak count, 1993/94 to 1997/98 • (<i>Recurvirostra avosetta</i>) 28% of the GB population 5-year peak count, 1992/93 to 1997/98 <p>Article 4.2 Qualification:</p> <p>Over winter the area regularly supports:</p> <ul style="list-style-type: none"> • (<i>Calidris alpina alpina</i>) (Northern Siberian / Europe / Western Africa) 2.1% of the population in Great Britain 5-year peak mean 1993/94-1997/98 • (<i>Calidris canutus</i>) (North-eastern Canada /Greenland /Iceland/ North-western Europe) 1.8% of the population in Great Britain 5- 	No Significant Effect	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 Site 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 affect 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

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>year peak mean 1991/92-1995/96</p> <ul style="list-style-type: none"> • (<i>Limosa limosa</i>) (Iceland – breeding) 2.4% of the population 5 year peak mean for 1993/94 to 1997/98 • (<i>Pluvialis squatarola</i>) (Eastern Atlantic – wintering) 17% of the population 5 year peak mean for 1993/94 to 1997/98 • (<i>Tringa tetanus</i>) (Eastern Atlantic – wintering) 2.2% of the population 5 year peak for 1993/94 to 1997/97 <p>On passage the area regularly supports:</p> <ul style="list-style-type: none"> • (<i>Charadrius hiatiula</i>) (Europe / Northern Africa – wintering) 2.6% of the population 5 year peak mean for 1993/94 to 1997/98 <p>Internationally Important Assemblage of Birds:</p> <ul style="list-style-type: none"> • 75019 waterfowl (5-year peak mean 21/03/2000) Including: (<i>Recurvirostra avosetta</i>, <i>Pluvialis squatarola</i>, <i>Calidris canutus</i>, <i>Calidris alpina alpina</i>, <i>Limosa limosa islandica</i>, <i>Tringa totanus</i>) 		<p>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 Site 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 Habitats Sites - the change in flow contribution due to the abstraction is unlikely to significantly affect qualifying features of the SPA and Ramsar Site. No construction impacts (e.g., disturbance of birds and air quality degradation) are likely to arise as the option 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 Habitats Site) will not be exceeded (in total construction will involve 1000 HGV movements).</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.15 Groundwater Development - Woods Farm Existing Source Increase DO

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-GRW_ALL_ALL_woods farm do	Groundwater Development - Woods Farm Existing Source Increase DO	New borehole to be constructed on site to bring DO up to licence (this is an additional 2.4 MI/d to average licence of 4.99 MI/d or an additional 2.91 MI/d to peak licence of 5.5 MI/d). Currently the site is only able to produce up to 2.59 MI/d constrained by turbidity. Woods Farm WRMP24 option comprises: - Retaining the current abstraction licence with construction of a new abstraction borehole in the unconfined Chalk, 1.4km east of the existing Woods Farm boreholes;- The option also includes a new 1.4km raw water pipeline from the new satellite borehole to Woods Farm WTW.	Hartslock Wood SAC (approx. 1.1km)	Annex I habitats that are a primary reason for selection of this site <ul style="list-style-type: none"> 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) <ul style="list-style-type: none"> * Important orchid sites 91J0 (<i>Taxus baccata</i>) woods of the British Isles <ul style="list-style-type: none"> * Priority feature 	No LSE	The proposed option is potentially hydrologically connected to Hartslock Wood SAC. The SAC runs along the bank of the River Thames. The habitats in the SAC are not groundwater dependent; any groundwater needs are likely to come indirectly from the adjacent river, and the proposed abstraction is unlikely to affect this. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

A.16 Groundwater Development - Dapdune Licence Disaggregation

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_GUI_HI-GRW_ALL_ALL_dapdune lic disagg	Groundwater Development - Dapdune Licence Disaggregation	Upgrade of pumps and pump control to increase DO. DO benefit 1 ML/d peak	Thames Basin Heaths SPA (approx. 2.5km)	<p>Article 4.1 Qualification</p> <p>During the breeding season the SPA regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:</p> <ul style="list-style-type: none"> • A302 Dartford Warbler (<i>Sylvia undata</i>) – 27.8% of the GB population • A224 Nightjar (<i>Caprimulgus europaeus</i>) – 7.8% of the GB population • A246 Woodlark (<i>Lullula arborea</i>) – 9.9% of the GB population <p>Non-qualifying species of interest:</p> <ul style="list-style-type: none"> • Hen harrier (<i>Circus cyaneus</i>) • Merlin (<i>Falco columbarius</i>) • Short-eared owl (<i>Asio flammeus</i>) • Kingfisher (<i>Alcedo atthis</i>) <p>(all Annex I species) occur in nonbreeding numbers of less than European importance (less than 1% of the GB population).</p>	No Likely Significant Effect	<p>The SPA is located to the north of the pump upgrades. The site is not hydrologically connected to the River Wey which will see an increase in abstraction as a result of the works and as such will not be impacted by the increase in abstraction. While the SPA is situated on a GWDTE it is not fed by the River Wey or its tributaries. The option will see small scale upgrades to two pump locations, works will be localised to these locations which are on hardstanding areas and as such are not suitable for any of the qualifying features.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.17 Groundwater Development - Recommission Mortimer Disused Source

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_KVZ_HI-GRW_ALL_ALL_mortimer_recomm	Groundwater Development - Recommission Mortimer Disused Source	N/A	Thames Basin Heaths (approx. 7.2km)	<p>Article 4.1 Qualification</p> <p>During the breeding season the SPA regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:</p> <ul style="list-style-type: none"> • A302 Dartford Warbler (<i>Sylvia undata</i>) – 27.8% of the GB population • A224 Nightjar (<i>Caprimulgus europaeus</i>) – 7.8% of the GB population • A246 Woodlark (<i>Lullula arborea</i>) – 9.9% of the GB population <p>Non-qualifying species of interest:</p> <ul style="list-style-type: none"> • Hen harrier (<i>Circus cyaneus</i>) • Merlin (<i>Falco columbarius</i>) • Short-eared owl (<i>Asio flammeus</i>) • Kingfisher (<i>Alcedo atthis</i>) <p>(all Annex I species) occur in nonbreeding numbers of less than European importance (less than 1% of the GB population).</p>	No Likely Significant Effect	<p>The Habitats site is sufficiently distanced from the works to negate impacts from noise and air pollution. Furthermore, is it not hydrologically linked to the Habitats site and as such will not be impacted in the event of run-off or pollution events.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.18 Manager Aquifer Recharge - Horton Kirby ASR

Option ID Number	Option Title	Option Description	Designated Sites Assessed (incl. distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI - GRW_RE1_A LL_asrhortonkirby	Manager Aquifer Recharge - Horton Kirby ASR	Construction of pipelines between two existing ASR boreholes in the Lower Greensand aquifer to an existing WTW at Horton Kirby in Kent. Water abstracted from existing Chalk aquifer boreholes (via the mains supply) will be recharged into the two ASR boreholes during periods of water surplus and abstracted when needed and treated at the WTW. Screening information to be added to the next version of this HRA.	Thames Estuary & Marshes SPA (approx.. 12km)	<p>Article 4.1 Qualification:</p> <p>Over winter the area regularly supports:</p> <ul style="list-style-type: none"> • (<i>Circus cyaneus</i>) (Europe - breeding) 1% of the GB population 5-year peak count, 1993/94 to 1997/98 • (<i>Recurvirostra avosetta</i>) 28% of the GB population 5-year peak count, 1992/93 to 1997/98 <p>Article 4.2 Qualification:</p> <p>Over winter the area regularly supports:</p> <ul style="list-style-type: none"> • (<i>Calidris alpina alpina</i>) (Northern Siberian / Europe / Western Africa) 2.1% of the population in Great Britain 5-year peak mean 1993/94-1997/98 • (<i>Calidris canutus</i>) (North-eastern Canada /Greenland /Iceland/ North-western Europe) 1.8% of the population in Great Britain 5- 	No Likely Significant Effect	<p>This option proposes an aquifer recharge /artificial recharge with construction of pipelines between two existing ASR boreholes in the Lower Greensand aquifer to an existing WTW at Horton Kirby in Kent. Water abstracted from existing Chalk aquifer boreholes (via the mains supply) will be recharged into the two ASR boreholes during periods of water surplus and abstracted when needed and treated at the WTW. A new licence and discharge consent will be required from the Environment Agency to allow abstraction/recharge from the Lower Greensand aquifer.</p> <p>The proposed option is located about 12km northeast of this site. Given the distance between the two, no effects during construction are expected due to dust pollution and vehicle emissions (increased nitrogen from numerous vehicle movements). Potential for effects due to changes in the water table and/or water pollution events are also unlikely given the pipeline route does not cross any waterbodies hydrologically linked to this SPA.</p> <p>No pathways have been identified through which this Habitats Site and its qualifying features could be affected during the operation phase of this option.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (incl. distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>year peak mean 1991/92-1995/96</p> <ul style="list-style-type: none"> • (<i>Limosa limosa</i>) (Iceland – breeding) 2.4% of the population 5 year peak mean for 1993/94 to 1997/98 • (<i>Pluvialis squatarola</i>) (Eastern Atlantic – wintering) 17% of the population 5 year peak mean for 1993/94 to 1997/98 • (<i>Tringa tetanus</i>) (Eastern Atlantic – wintering) 2.2% of the population 5 year peak for 1993/94 to 1997/97 <p>On passage the area regularly supports:</p> <ul style="list-style-type: none"> • (<i>Charadrius hiatiula</i>) (Europe / Northern Africa – wintering) 2.6% of the population 5 year peak mean for 1993/94 to 1997/98 <p>Internationally Important Assemblage of Birds:</p> <p>75019 waterfowl (5-year peak mean 21/03/2000) Including: (<i>Recurvirostra avosetta</i>, <i>Pluvialis squatarola</i>, <i>Calidris canutus</i>, <i>Calidris alpina alpina</i>, <i>Limosa limosa islandica</i>, <i>Tringa totanus</i>)</p>		<p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (incl. distances)	Qualifying Features	Screening Result	Justification for Assessment
			Thames Estuary & Marshes Ramsar (approx. 12km)	<p>Ramsar Site criterion 2 – this 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.</p> <p>Assemblages of international importance:</p> <ul style="list-style-type: none"> • Species with peak counts in winter = 45118 waterfowl <hr/> <p>Ramsar Site criterion 6 – species with peak counts in spring/autumn:</p> <ul style="list-style-type: none"> • Ringed plover (<i>Charadrius haiticula</i>) • Black-tailed godwit (<i>limosa islandica</i>) • Grey plover (<i>pluvialis squatarola</i>) • Red knot (<i>calidris canutus islandica</i>) • Dunlin (<i>calidris alpina alpina</i>) • Common redshank (<i>tringa totanus totanus</i>) 	No Likely Significant Effect	<p>The proposed option is located about 12km northeast of this site. Given the distance between the two, no effects during construction are expected due to dust pollution and vehicle emissions (increased nitrogen from numerous vehicle movements). Potential for effects due to changes in the water table and/or water pollution events are also unlikely given the pipeline route does not cross any waterbodies hydrologically linked to this Ramsar site.</p> <p>No pathways have been identified through which this Habitats Site and its qualifying features could be affected during the operation phase of this option.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (incl. distances)	Qualifying Features	Screening Result	Justification for Assessment
			Norths Downs Woodlands SAC (approx. 11km)	<p>Annex I habitats that are a primary reason for selection of this site</p> <ul style="list-style-type: none"> • 9130 (<i>Asperulo-Fagetum</i>) beech forests • 91J0 Yew (<i>Taxus baccata</i>) of the British Isles * Priority feature <hr/> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of the site:</p> <ul style="list-style-type: none"> • 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festsuco-Bromatalia</i>) (*important orchid sites) 	No Likely Significant Effects	<p>The proposed option is located about 11km southeast from this site and works in the scheme are unlikely to have a significant effect upon the SAC and its qualifying features. The sites are not hydrologically connected (as in different groundwater bodies), therefore any effects as a result of hydrological connection are unlikely. During construction effects due to dust arisings and vehicle emissions (i.e. increased nitrogen from numerous vehicle movements) are not expected given the distance between the two. Similarly, changes in water table are not foreseen during operation phase.</p> <p>Therefore, no pathways have been identified through which this Habitats Site and its qualifying features could be affected by this option during construction and operation phases.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.19 Thames-Lee Tunnel extension from Lockwood PS to King George V Reservoir intake

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
<p>TWU_KGV_HI - TFR_KGV_AL L_lockwood ps-kgv res</p>	<p>Thames-Lee Tunnel extension from Lockwood PS to King George V Reservoir intake</p>	<p>Tunnel from Lockwood to KGV reservoir.</p>	<p>Epping Forest SAC (1.7km east)</p>	<p>Annex I habitats that are a primary reason for selection of this site</p> <ul style="list-style-type: none"> 9120 Atlantic acidophilous beech forests with <i>Ilex</i> and sometimes also <i>Taxus</i> in the shrub layer (<i>Quercion robur-petraeae</i> or <i>Ilici-Fagenion</i>) <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <ul style="list-style-type: none"> 4010 Northern Atlantic wet heaths with (<i>Erica tetralin</i>) 4030 European dry heaths <p>Annex II species that are a primary reason for selection of this site</p> <ul style="list-style-type: none"> 1083 Stag beetle (<i>Lucanus cervus</i>) 	<p>No Likely Significant Effect</p>	<p>SAC is located east of the pipeline option. This SAC is considered sufficiently far enough from the option that there are no likely significant impacts to occur during construction and operational phases.</p> <p>The Site Improvement Plan indicates that atmospheric nitrogen deposition is likely to have adverse effects on three key habitats - wet heathland with cross-leaved heath, European dry heaths and Beech forests on acid soils. This option is not predicted to affect these habitats due to nitrogen deposition, due primarily to the distance between the option and the Habitats Site.</p> <p>Noise and vibration generated during the construction and operational phases will likely dissipate across the 1.7km distance between the SAC and the option site, due to the mostly-urbanised surroundings of the option.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Lee Valley SPA (UK9012111) Option located partly within the Habitats Site	<ul style="list-style-type: none"> • A021 <i>Botaurus stellaris</i>; Great bittern (Non-breeding) • A051 <i>Anas strepera</i>; Gadwall (Non-breeding) • A056 <i>Anas clypeata</i>; Northern shoveler (Non-breeding) 	Likely Significant Effect	<p>The option proposes a tunnel from Lockwood Reservoir (located within the SPA) to the King George V Reservoir intake.</p> <p>The Lee Valley SPA comprises a series of embanked water supply reservoirs, sewage treatment lagoons and former gravel pits that display a range of man-made and semi-natural wetland and valley bottom habitats. The site is important for overwintering great bittern as well as an internationally important population of two duck species: gadwall and Northern shoveler.</p> <p>Land clearance and the use of vehicles, machinery and movement of personnel may result in adverse edge effects due to noise and light pollution potentially displacing these bird species from feeding and overwintering grounds both inside the Habitats Site boundary and any areas of adjacent functionally linked land.</p> <p>During construction, this option is likely to result in:</p> <ul style="list-style-type: none"> • Non-physical disturbance – including temporary noise, light and visual disturbance and presence of personnel and vehicles may displace qualifying bird populations from overwintering and feeding grounds. • Biological disturbance – potential for populations to be temporarily displaced from current overwintering habitat and feeding areas (including functionally linked land)

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						<p>During operation, there is potential for INNS to be spread due to abstraction from the TLT to the River Lee, which is hydrologically connected to the Habitats Site.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>
			<p>Lee Valley Ramsar (UK11034) Option located partly within the Habitats Site</p>	<p>Ramsar Criterion 2</p> <p>The site supports the nationally scarce plant species whorled water-milfoil <i>Myriophyllum verticillatum</i> and the rare or vulnerable invertebrate <i>Micronecta minutissima</i> (a water-boatman).</p> <p>Ramsar criterion 6 – species/populations occurring at levels of international importance. Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler, <i>Anas clypeata</i>, NW & C Europe; 287 individuals, representing an average of 1.9% of the GB population (5 year peak mean 1998/9- 2002/3).</p>	<p>Likely Significant Effect</p>	<p>The option proposes a tunnel from Lockwood Reservoir (located within the Ramsar) to the King George V Reservoir intake.</p> <p>The Lee Valley Ramsar comprises a series of embanked water supply reservoirs, sewage treatment lagoons and former gravel pits that display a range of man-made and semi-natural wetland and valley bottom habitats. The site is important for overwintering great bittern as well as an internationally important population of two duck species: gadwall and Northern shoveler.</p> <p>Land clearance and the use of vehicles, machinery and movement of personnel may result in adverse edge effects due to noise and light pollution potentially displacing these bird species from feeding and overwintering grounds both inside the Habitats Site boundary and any areas of adjacent functionally linked land.</p> <p>During construction, this option is likely to result in:</p> <ul style="list-style-type: none"> • Non-physical disturbance – including temporary noise, light and visual disturbance and presence

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Species with peak counts in winter:</p> <p>Gadwall, <i>Anas strepera strepera</i>, NW Europe; 445 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9- 2002/3).</p>		<p>of personnel and vehicles may displace qualifying bird populations from overwintering and feeding grounds.</p> <ul style="list-style-type: none"> • Biological disturbance – potential for populations to be temporarily displaced from current overwintering habitat and feeding areas (including functionally linked land) <p>During operation, there is potential for INNS to be spread due to abstraction from the TLT to the River Lee, which is hydrologically connected to the Habitats Site.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

A.20 Oxford Canal - Transfer from Duke's Cut to Farmoor

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-TFR_SWX_ALL_duk escut-farmoor	Oxford Canal - Transfer from Duke's Cut to Farmoor	15 Ml/d conveyance option from the Oxford Canal to Farmoor Reservoir, with abstraction from a point approximately 800m north of Dukes Cut on the Oxford Canal,	Oxford Meadows SAC is located approx. 900m south of the pipeline route	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>6510 Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>)</p> <p>Together with North Meadow and Clattinger Farm, also in southern</p>	LSE	<p>The works will involve an abstraction on the Oxford Canal, the Oxford Canal connects with the Wolvercote Stream which runs through the SAC area. The SAC supports extensive areas of grassland vegetation with is strongly associated with floodplain meadows and creeping marshwort which is a very rare plant found on seasonally flooded habitats. As such an abstraction from the Oxford Canal could result in</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
		<p>discharging into the River Thames for subsequent re-abstraction at the existing Farmoor Reservoir intake. Resource to be provided by CRT - refer to separate F909 (RES-RWTS-OXC-DKC-15) for resource costs. This scheme has been developed with the following assumptions: It has been assumed that, as the transfer will only be used in periods of low flow, no works will be required to upgrade the existing intake structure at Farmoor Reservoir. It has been assumed that, as the transfer will only be used in periods of low flow, no works will be required to upgrade the existing treatment facilities at Farmoor Reservoir.</p>		<p>England, Oxford Meadows represents lowland hay meadows in the Thames Valley centre of distribution. The site includes vegetation communities that are perhaps unique in the world in reflecting the influence of long-term grazing and hay-cutting on lowland hay meadows. The site has benefited from the survival of traditional management, which has been undertaken for several centuries, and so exhibits good conservation of structure and function.</p> <p>Annex II species that are a primary reason for selection of this site</p> <p>1614 Creeping marshwort <i>Apium repens</i></p>		<p>hydrological changes within the SAC which may result in the damage or loss of qualifying grassland habitats and creeping marshwort. Furthermore, the pipeline route will cross the River Evenlode which flows downstream connecting the River Isis and River Thames, both of which support the floodplain areas of the SAC. The crossing of the River Evenlode could result in the release of sediment of concrete / hydrocarbon pollutants that could be washed downstream and deposited within the floodplain habitats of the SAC.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

A.21 Coppermills WTW - filtration pre-treatment 680Ml/d

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-LRE_WT1_ALL_cop perwtwmecana200/480/680	Coppermills WTW - filtration pre-treatment 680Ml/d	Either a 200/480/680Ml/d Mecana filtration system for primary filtration of surface water at the Coppermills Water Treatment Works (WTW), including three new shaft connections, inlet pipework diversions, inlet pumping station (PS) and pipe bridge for return pipework.	Lee Valley SPA (UK9012111) (Approximately 0.01km)	A021 <i>Botaurus stellaris</i> ; Great bittern (Non-breeding) A051 <i>Anas strepera</i> ; Gadwall (Non-breeding) A056 <i>Anas clypeata</i> ; Northern shoveler (Non-breeding)	LSE	<p>The option proposes an upgrade to existing infrastructure at the existing Coppermills site and near William Girling Reservoir.</p> <p>The Lee Valley SPA comprises a series of embanked water supply reservoirs, sewage treatment lagoons and former gravel pits that display a range of man-made and semi-natural wetland and valley bottom habitats. The site is important for overwintering great bittern as well as an internationally important population of two duck species: gadwall and Northern shoveler.</p> <p>Land clearance and the use of vehicles, machinery and movement of personnel may result in adverse edge effects due to noise and light pollution potentially displacing these bird species from feeding and overwintering grounds both inside the designated site boundary and any areas of adjacent functionally linked land.</p> <p>During construction, this option is likely to result in:</p> <ul style="list-style-type: none"> • Non-physical disturbance – including temporary noise, light and visual disturbance and presence of personnel and vehicles may displace qualifying bird populations from overwintering and feeding grounds. • Biological disturbance – potential for populations to be temporarily displaced from current overwintering habitat and feeding areas (including functionally linked land)

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						<p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			Lee Valley Ramsar (UK11034) (Approximately 0.01km)	<p>Ramsar Criterion 2</p> <p>The site supports the nationally scarce plant species whorled water-milfoil <i>Myriophyllum verticillatum</i> and the rare or vulnerable invertebrate <i>Micronecta minutissima</i> (a water-boatman).</p> <p>Ramsar criterion 6 – species/populations occurring at levels of international importance. Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler, <i>Anas clypeata</i>, NW & C Europe; 287 individuals, representing an average of 1.9% of the GB population (5 year peak mean 1998/9- 2002/3).</p> <p>Species with peak counts in winter:</p> <p>Gadwall, <i>Anas strepera strepera</i>, NW Europe; 445 individuals, representing an average of 2.6% of</p>	LSE	<p>The Lee Valley Ramsar comprises a series of embanked water supply reservoirs, sewage treatment lagoons and former gravel pits that display a range of man-made and semi-natural wetland and valley bottom habitats. The site is important for overwintering great bittern as well as an internationally important population of two duck species: gadwall and Northern shoveler.</p> <p>Land clearance and the use of vehicles, machinery and movement of personnel may result in adverse edge effects due to noise and light pollution potentially displacing these bird species from feeding and overwintering grounds both inside the designated site boundary and any areas of adjacent functionally linked land.</p> <p>During construction, this option is likely to result in:</p> <ul style="list-style-type: none"> • Non-physical disturbance – including temporary noise, light and visual disturbance and presence of personnel and vehicles may displace qualifying bird populations from overwintering and feeding grounds. • Biological disturbance – potential for populations to be temporarily displaced from current overwintering habitat and feeding areas (including functionally linked land)

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				the GB population (5 year peak mean 1998/9- 2002/3).		<p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			Epping Forest SAC (UK0012720) (Multiple sites; closest approximately 2.5km)	<p>"H4010. Northern Atlantic wet heaths with <i>Erica tetralix</i>; Wet heathland with cross-leaved heath</p> <p>H4030. European dry heaths</p> <p>H9120. Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (<i>Quercion robur-petraeae</i> or <i>Illici-Fagenion</i>); Beech forests on acid soils</p> <p>S1083. <i>Lucanus cervus</i>; Stag beetle"</p>	No LSE	<p>The site is designated for supporting large ancient wood-pasture with habitats of high nature conservation value including ancient semi-natural woodland, old grassland plains, wet and dry heathland and scattered wetland. The semi-natural woodland is particularly extensive but the forest plains are also a major feature and contain a variety of unimproved acid grasslands.</p> <p>This option is sufficiently distant to the designated site boundary (>2.5 km) and so, impacts from light and dust are not expected. There is also no direct hydrological connection between the habitat site and this option.</p> <p>No pathways have been identified through which this designated site and its qualifying features could be affected by this option during construction and operation phases.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.22 Beckton Desalination

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-DES_ALL_CNO_be ckton desal 50/100/150	Beckton Desalination	Abstraction of 187Ml/d raw water for production of 150Ml/d desalinated water (conveyance within option below). DO 142Ml/d for 150Ml/d capacity. The 50 and 100 options involve raw water abstraction for production of 50Ml/d and 100Ml/d desalinated water.	Epping Forest SAC is located approx. 7km north.	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i>)</p> <p>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 <i>Zygodon forsteri</i>. 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.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p>	No LSE	<p>The Habitats site is located a significant distance from the works which will likely negate any impacts from noise or air pollution. Furthermore, the works are not hydrologically linked to the Habitats site and as such no impacts as a result of pollution or run-off are likely. No pathways have been identified during the operation of this option that could lead to LSE on this designated site and its qualifying features.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Annex II species that are a primary reason for selection of this site</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p> <p>Epping Forest is a large woodland area in which records of stag beetle <i>Lucanus cervus</i> 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.</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection</p> <p>Not Applicable</p>		
			Thames Estuary & Marshes SPA is located approx. 24.7km east.	<p>Article 4.1 Qualification</p> <p>Over winter the area regularly supports:</p> <p><i>Circus cyaneus</i> (Europe - breeding) 1% of the GB population 5 year peak count, 1993/94 to 1997/98</p>	LSE	Potential impacts arising from increase in salinity from brine waste water being discharged into the River Thames. This could lead to an altering of habitats and foraging sources on which the designated features rely. Land clearance and the use of vehicles, machinery and movement of personnel may result in adverse edge effects due to noise and light pollution potentially displacing these bird species from feeding and overwintering grounds both inside the designated

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p><i>Recurvirostra avosetta</i> 28% of the GB population 5 year peak count, 1992/93 to 1997/98</p> <p>Article 4.2 Qualification</p> <p>Over winter the area regularly supports:</p> <p><i>Calidris alpina alpina</i> (Northern Siberian / Europe / Western Africa) 2.1% of the population in Great Britain 5 year peak mean 1993/94-1997/98</p> <p><i>Calidris canutus</i>(North-eastern Canada/Greenland/Iceland/North-western Europe) 1.8% of the population in Great Britain 5 year peak mean 1991/92-1995/96</p> <p><i>Limosa limosa limosa</i> (Iceland – breeding) 2.4% of the population 5 year peak mean for 1993/94 to 1997/98</p> <p><i>Pluvialis squatarola</i> (Eastern Atlantic – wintering) 17% of the population 5 year peak mean for 1993/94 to 1997/98</p> <p><i>Tringa totanus</i> (Eastern Atlantic – wintering) 2.2% of the population 5 year peak for 1993/94 to 1997/97</p>		<p>site boundary and any areas of adjacent functionally linked land.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>On passage the area regularly supports</p> <p><i>Charadrius hiatiula</i> (Europe / Northern Africa – wintering) 2.6% of the population 5 year peak mean for 1993/94 to 1997/98</p> <p>INTERNATIONALLY IMPORTANT ASSEMBLAGE OF BIRDS</p> <p>75019 waterfowl (5 year peak mean 21/03/2000)</p> <p>Including: <i>Recurvirostra avosetta</i> , <i>Pluvialis squatarola</i> , <i>Calidris canutus</i> , <i>Calidris alpina alpina</i> , <i>Limosa limosa islandica</i> , <i>Tringa totanus</i></p>		
			<p>Thames Estuary & Marshes Ramsar is located approx. 24.7km east.</p>	<p>Ramsar criterion 2</p> <p>The site supports more than 20 British Red Data Book invertebrates and populations of the GB Red Book endangered least lettuce (<i>Lactuca saligna</i>) as well as the vulnerable slender hare's-ear (<i>Bupleurum tenuissimum</i>), divided sedge (<i>Carex divisa</i>), sea barley (<i>Hordeum marinum</i>), Norrer's saltmarsh-grass (<i>Puccinellia fasciculata</i>) and dwarf eelgrass (<i>Zoostera noltei</i>).</p>	LSE	<p>Potential impacts arising from increase in salinity from brine waste water being discharged into the River Thames. This could lead to an altering of habitats and foraging sources on which the designated features rely.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Ramsar criterion 5</p> <p>Assemblages of international importance:</p> <p>Species with peak counts in winter:</p> <p>45,118 waterfowl (5 year peak mean 1998/99-2002/2003)</p> <p>Ramsar criterion 6</p> <p>Species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Black-tailed godwit , <i>Limosa limosa islandica</i>, Iceland/W Europe 1,640 individuals, representing an average of 4.5% of the population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Dunlin , <i>Calidris alpina alpina</i>, W Siberia/W Europe 15,171 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3)</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Red knot , <i>Calidris canutus islandica</i> , W & Southern Africa (wintering) 7,279 individuals, representing an average of 1.6% of the population (5 year peak mean 1998/9-2002/3)		

A.23 Beckton to Coppermills tunnel (treated) - Construction

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-TFR_LON_CNO_beckton-coppermills	Beckton to Coppermills tunnel (treated) - Construction	Treated water is to be conveyed via a tunnel from the Beckton Desalination Plant to Coppermills WTW.	Lee Valley SPA is located approx. 160m	<p>Article 4.1 Qualification</p> <p>it is used regularly by 1% or more of the Great Britain population of a species listed on Annex I, in any season:</p> <p>Bittern <i>Botaurus stellaris</i> 6 individuals - wintering 6% (5 year peak mean 1992/93 - 1996/97)</p> <p>Article 4.2 Qualification</p> <p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex I), in any season:</p>	LSE	<p>The works are located directly south of the Habitats site and as such will have the potential to result in impacts to the SPA as a result of noise disturbance, air pollution and pollution run-off.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Shoveler <i>Anas clypeata</i> 406 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.0% NW/Central Europe</p> <p>Gadwall <i>Anas strepera</i> 456 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.5% NW Europe</p>		
			Lee Valley Ramsar site is located approx. 160m	<p>Ramsar criterion 6</p> <p>species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall , <i>Anas strepera strepera</i>, NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)</p>	LSE	<p>The works are located directly south of the Habitats site and as such will have the potential to result in impacts to the Ramsar Site as a result of noise disturbance, air pollution and pollution run-off.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Epping Forest SAC is located approx. 2.9km east	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i>)</p> <p>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 <i>Zygodon forsteri</i>. 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.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p>	No LSE	<p>The site is sufficiently distanced to negate impacts for air pollution. There is no hydrological connection between the works and the SAC and as such no impacts as a result of pollution run off are expected.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Annex II species that are a primary reason for selection of this site</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p> <p>Epping Forest is a large woodland area in which records of stag beetle <i>Lucanus cervus</i> 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.</p>		

A.24 Woodmansterne WTW to Epsom Downs

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-TFR_SES_ALL_woodwtw-epsomdowns	Woodmansterne WTW to Epsom Downs	Proposed new transfer from Woodmansterne WTW (SES) to Epsom Downs (TWS). 10MLD transfer flow rate	Mole Gap to Reigate Escarpment SAC: located 4.98 km to the south	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>5110 Stable xerothermophilous formations with <i>Buxus sempervirens</i> on rock slopes (Berberidion p.p.)</p> <p>6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-</i></p>	LSE	Given the distance separating the works from the Habitats Site no impacts are predicted as a result of noise or air pollution. The works are not hydrologically connected to the Habitats site and as such are not at risk of run-off or pollution events. While Bechstein bats are a qualifying feature of this SAC and are mobile, but unlikely to be in close proximity to the option due to the distance involved and the illumination impact from nearby dwellings. Construction works involve the creation of a new pipeline which will sever some habitat used by bats

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p><i>Brometalia</i>) (* important orchid sites)</p> <p>91J0 <i>Taxus baccata</i> woods of the British Isles * Priority feature</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>4030 European dry heaths</p> <p>9130 <i>Asperulo-Fagetum</i> beech forests</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection</p> <p>1166 Great crested newt <i>Triturus cristatus</i></p> <p>1323 Bechstein's bat <i>Myotis bechsteinii</i></p>		<p>but it is unclear if the designated features of the SAC use these habitats.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

A.25 Groundwater Development - Ashton Keynes borehole pumps - Removal of Constraints to DO

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-GRW_ALL_ALL_ash-ton keynes roc	Groundwater Development - Ashton Keynes borehole pumps - Removal of Constraints to DO	Installation of larger pumps and/or lowering of the pumps in some or all of five existing boreholes, abstracting from the confined Great Oolite aquifer. Change in operational philosophy to improve peak source output. An investigation into the potential impact of the proposed option on the Water Framework Directive status of the waterbody is included in the option.	North Meadow and Clattinger Farm SAC: approx. 2.4km west of the option and additionally 4.5km east of the option.	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>6510 Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>)</p> <p>North Meadow and Clattinger Farm in the Thames Valley in southern England is one of two sites representing lowland hay meadows near the centre of its UK range. As in the case of the Oxford Meadows, this site represents an exceptional survival of the traditional pattern of management and so exhibits a high degree of conservation of structure and function. This site also contains a very high proportion (>90%) of the surviving UK population of fritillary <i>Fritillaria meleagris</i>, a species highly characteristic of damp lowland meadows in Europe and now rare throughout its range.</p>	No LSE	<p>Although this option proposes increased abstraction from the confined aquifer at the option site, no LSE are predicted on the SAC as it lies on impermeable geology (Oxford Clay formation) so is not connected to the aquifer from which the abstraction occurs.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.26 New River Head Ground Improvements

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-TFR_LON_ALL_nrv-groundimprov	New River Head -Ground Improvements	<p>Rehabilitation and recommissioning of disused groundwater source. This option comprises:</p> <ul style="list-style-type: none"> - ground stabilisation around the New River Head borehole, comprising the grouting of the potential voids created by sand migration; - installation of four near surface ground anchors placed at convenient locations around the borehole; installation of a turbidity meter; and - recommissioning of the licensed but currently disused groundwater source. 	Lee Valley SPA (approx. 6km)	<p>A021 <i>Botaurus stellaris</i>; Great bittern (Non-breeding)</p> <p>A051 <i>Anas strepera</i>; Gadwall (Non-breeding)</p> <p>A056 <i>Anas clypeata</i>; Northern shoveler (Non-breeding)</p>	No LSE	<p>The Habitats site is sufficient distance to avoid construction effects from noise and dust. The site is not hydrologically connected to option.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			Lee Valley Ramsar (approx. 6km)	<p>Ramsar Criterion 2</p> <p>The site supports the nationally scarce plant species whorled water-milfoil <i>Myriophyllum verticillatum</i> and the rare or vulnerable invertebrate <i>Micronecta minutissima</i> (a water-boatman).</p> <p>Ramsar criterion 6 – species/populations occurring at levels of international importance. Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler, <i>Anas clypeata</i>, NW & C Europe; 287 individuals, representing an average of 1.9% of the GB population (5 year peak mean 1998/9- 2002/3).</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Species with peak counts in winter: Gadwall, <i>Anas strepera</i> , NW Europe; 445 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9- 2002/3).		

A.27 Kennet Valley to SWOX Transfer 2.3MI/d and 6.7MI/d

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-TFR_KVZ_ALL_kennet-swox2.3	Kennet Valley to SWOX Transfer - 2.3 MI/d and	The Works proposed include: Treated water pipeline from Pangbourne WTW to Cleeve WTW 9.4km, A pumping station at Pangbourne WTW (60kW), Balance tank at Cleeve WTW (2 x the pipe volume), 800m (700dia) of replacement pipeline at the end of the Fobney WTW to Tilehurst SR main, to increase flow, Increased pump capacity at Fobney WTW treated water pump station.	Hartslock Wood SAC: 236m south-east from the closest point of the pipeline.	Annex I habitats that are a primary reason for selection of this site: 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) 91J0 <i>Taxus baccata</i> woods of the British Isles * Priority feature	Likely Significant Effect	The proposed new pipeline crosses the River Thames 236m upstream from the designated site. Construction activities have the possibility of impacting those pathways on which the designated features of the site rely i.e. water and air. This could be through pollution or sediments directly into the water course or construction dust and vehicle emissions affecting the ability of the features to photosynthesize and reproduce. No significant effects predicted for the replacement pipeline and increased pump capacity at Fobney WTW. During construction, LSE of the Option (alone) could not be ruled out at the screening stage. During operation, LSE of the option (alone) has been ruled out at the screening stage.

A.28 Oxford Canal to Duke's Cut (SWOX)

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
<p>TWU_SWX_HI-IMP_SWX_CN O_oxc-dukes cutswox</p> <p>TWU_UTC_HI-IMP_UTC_CNO _oxcanal- cropreddy</p>	<p>Oxford Canal to Duke's Cut (SWOX)</p> <p>Oxford Canal to Cropreddy</p>	<p>Upgrades to the canal network to transfer 15M/d surplus from the Wolverhampton Levels to upstream of Duke's Cut.</p> <p>15M/d resource option for Oxford Canal to the River Thames transfer. Option includes transfer of water to canal at Cropreddy for discharge to River Cherwell and subsequent discharge into the River Thames.</p>	<p>Oxford Meadows SAC: Located approximately 0.3km south</p>	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>6510 Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>)</p> <p>Together with North Meadow and Clattinger Farm, also in southern England, Oxford Meadows represents lowland hay meadows in the Thames Valley centre of distribution. The site includes vegetation communities that are perhaps unique in the world in reflecting the influence of long-term grazing and hay-cutting on lowland hay meadows. The site has benefited from the survival of traditional management, which has been undertaken for several centuries, and so exhibits good conservation of structure and function.</p> <p>Annex II species that are a primary reason for selection of this site</p>	<p>Likely Significant Effect</p>	<p>Effects during construction and operation are uncertain; the extent of any works to the canal are unknown at this stage. Similarly, any changes to hydrology, and their associated effects on the nearby qualifying habitats of this SAC, are also unknown.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>1614 Creeping marshwort <i>Apium repens</i></p> <p>Oxford Meadows is selected because Port Meadow is the larger of only two known sites in the UK for creeping marshwort <i>Apium repens</i>.</p>		
			<p>Little Wittenham SAC: Located approximately 18km south.</p>	<p>Annex II species that are a primary reason for selection of this site</p> <p>1166 Great crested newt <i>Triturus cristatus</i></p> <p>One of the best-studied great crested newt sites in the UK, Little Wittenham comprises two main ponds set in a predominantly woodland context (broad-leaved and conifer woodland is present). There are also areas of grassland, with sheep grazing and arable bordering the woodland to the south and west. The River Thames is just to the north of the site, and a hill fort to the south. Large numbers of great crested newts <i>Triturus cristatus</i> have been recorded in the two main ponds, and research has revealed that they range several hundred metres into the woodland blocks.</p>	No LSE	<p>During construction, no effects are predicted as no pathways exist. During operation, changes to the habitats in which the GCN qualifying feature species exist, are not predicted.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Hartslock Wood SAC: Located approximately 34km south.	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites)</p> <p>This site hosts the priority habitat type "orchid rich sites". The steep slopes of this site on the chalk of the Chilterns comprise a mosaic of chalk grassland, chalk scrub and broadleaved woodland. The chalk grassland mostly consists of a mosaic of shorter-turf NVC type CG2 <i>Festuca ovina</i>-<i>Avenula pratensis</i> grassland and taller CG3 <i>Bromus erectus</i> grassland. The site supports one of only three UK populations of monkey orchid <i>Orchis simia</i>, a nationally rare Red Data Book species.</p> <p>91J0 <i>Taxus baccata</i> woods of the British Isles * Priority feature</p> <p>The bulk of this site lies on a steep slope above the River Thames. Recent storms and landslips have resulted in a diverse age-structure for the yew</p>	No LSE	<p>During construction, no effects are predicted as no pathways exist. During operation, changes to the qualifying habitats are not predicted.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				population. Open patches show a rich flora including local species such as southern wood-rush <i>Luzula forsteri</i> , wood barley <i>Hordelymus europaeus</i> and narrow-lipped helleborine <i>Epipactis leptochila</i> .		
			Chilterns Beechwoods SAC: Located approximately 44km south-east.	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>9130 <i>Asperulo-Fagetum</i> beech forests</p> <p>The Chilterns Beechwoods represent a very extensive tract of <i>Asperulo-Fagetum</i> beech forests in the centre of the habitat's UK range. The woodland is an important part of a grassland-scrub-woodland mosaic. A distinctive feature in the woodland flora is the occurrence of the rare coralroot <i>Cardamine bulbifera</i>.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site.</p> <p>6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-</i></p>	No LSE	<p>During construction, no effects are predicted as no pathways exist. During operation, changes to the qualifying habitats are not predicted.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p><i>Brometalia</i> (* important orchid sites)</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p>		
			Fen Pools SAC: (located 4km to the west)		No LSE	<p>During construction, no effects are predicted as no pathways exist. During operation, changes to the qualifying habitats are not predicted.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			Cannock Extension Canal SAC: Located 0 km	<p>Annex II species that are a primary reason for selection of this site</p> <p>1831 Floating water-plantain <i>Luronium natans</i></p> <p>Cannock Extension Canal in central England is an example of anthropogenic, lowland habitat supporting floating water-plantain <i>Luronium natans</i> at the eastern limit of the plant's natural distribution in England. A very large population of the species occurs in the Canal, which has a diverse aquatic flora and rich dragonfly fauna, indicative of</p>	LSE	<p>This option includes this section of canal. Construction phase effects are therefore likely, as are operational phase effects when the volume and flow of water may be altered.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				good water quality. The low volume of boat traffic on this terminal branch of the Wyrley and Essington Canal has allowed open-water plants, including floating water-plantain, to flourish, while depressing the growth of emergent vegetation.		

A.29 Crossness to Beckton tunnel (treated) - Construction

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-TFR_LON_ALL_crossness to beckton	Crossness to Beckton tunnel (treated) - Construction	Transfer of 190MI/d desalinated water to Beckton site	Thames Estuary & Marshes SPA is located approx. 21.8km east	<p>Article 4.1 Qualification</p> <p>During the breeding season the SPA regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:</p> <ul style="list-style-type: none"> • A302 Dartford Warbler (<i>Sylvia undata</i>) – 27.8% of the GB population • A224 Nightjar (<i>Caprimulgus europaeus</i>) – 7.8% of the GB population 	Likely Significant Effect	<p>The tunnel will require a crossing of the River Thames, given the construction of a tunnel within the boundary of the River Thames there is increased risk of pollution to the watercourse and as such there is potential for pollution to be washed downstream and impact habitats within the SPA.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<ul style="list-style-type: none"> • A246 Woodlark (<i>Lullula arborea</i>) – 9.9% of the GB population <p>Non-qualifying species of interest</p> <p>Hen harrier <i>Circus cyaneus</i>, merlin <i>Falco columbarius</i>, short-eared owl <i>Asio flammeus</i> and kingfisher <i>Alcedo atthis</i> (all Annex I species) occur in nonbreeding numbers of less than European importance (less than 1% of the GB population).</p>		
			Thames Estuary & Marshes Ramsar is located approx. 21.8km east	<p>Ramsar criterion 2</p> <p>The site supports more than 20 British Red Data Book invertebrates and populations of the GB Red Book endangered least lettuce (<i>Lactuca saligna</i>) as well as the vulnerable slender hare's-ear (<i>Bupleurum tenuissimum</i>), divided sedge (<i>Carex divisa</i>), sea barley (<i>Hordeum marinum</i>), Norrer's saltmarsh-grass (<i>Puccinellia fasciculata</i>) and dwarf eelgrass (<i>Zoostera noltei</i>).</p> <p>Ramsar criterion 5</p> <p>Assemblages of international importance:</p>	Likely Significant Effect	<p>The tunnel will require a crossing of the River Thames, given the construction of a tunnel within the boundary of the River Thames there is increased risk of pollution to the watercourse and as such there is potential for pollution to be washed downstream and impact habitats within the Ramsar.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Species with peak counts in winter:</p> <p>45,118 waterfowl (5 year peak mean 1998/99-2002/2003)</p> <p>Ramsar criterion 6</p> <p>Species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Black-tailed godwit , <i>Limosa limosa islandica</i>, Iceland/W Europe 1,640 individuals, representing an average of 4.5% of the population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Dunlin , <i>Calidris alpina alpina</i>, W Siberia/W Europe 15,171 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3)</p> <p>Red knot , <i>Calidris canutus islandica</i>, W & Southern Africa</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				(wintering) 7,279 individuals, representing an average of 1.6% of the population (5 year peak mean 1998/9-2002/3)"		

A.30 Beckton to Crossness tunnel (raw) - Construction

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-TFR_LON_ALL_beckton-crossness	Beckton to Crossness tunnel (raw) - Construction	Thames River water conveyance via a 3.5m diameter tunnel from river abstraction to Crossness STW. The total length approximately 4.2km.	Thames Estuary & Marshes SPA is located approx. 21.8km east	<p>Article 4.1 Qualification</p> <p>During the breeding season the SPA regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:</p> <ul style="list-style-type: none"> • A302 Dartford Warbler (<i>Sylvia undata</i>) – 27.8% of the GB population • A224 Nightjar (<i>Caprimulgus europaeus</i>) – 7.8% of the GB population • A246 Woodlark (<i>Lullula arborea</i>) – 9.9% of the GB population <p>Non-qualifying species of interest</p>	Likely Significant Effect	<p>The tunnel will require a crossing of the River Thames, given the construction of a tunnel within the boundary of the River Thames there is increased risk of pollution to the watercourse and as such there is potential for pollution to be washed downstream and impact habitats within the SPA.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Hen harrier <i>Circus cyaneus</i> , merlin <i>Falco columbarius</i> , short-eared owl <i>Asio flammeus</i> and kingfisher <i>Alcedo atthis</i> (all Annex I species) occur in nonbreeding numbers of less than European importance (less than 1% of the GB population).		
			Thames Estuary & Marshes Ramsar is located approx. 21.8km east	<p>Ramsar criterion 2</p> <p>The site supports more than 20 British Red Data Book invertebrates and populations of the GB Red Book endangered least lettuce (<i>Lactuca saligna</i>) as well as the vulnerable slender hare's-ear (<i>Bupleurum tenuissimum</i>), divided sedge (<i>Carex divisa</i>), sea barley (<i>Hordeum marinum</i>), Norrer's saltmarsh-grass (<i>Puccinellia fasciculata</i>) and dwarf eelgrass (<i>Zoostera noltei</i>).</p> <p>Ramsar criterion 5</p> <p>Assemblages of international importance:</p> <p>Species with peak counts in winter:</p> <p>45,118 waterfowl (5 year peak mean 1998/99-2002/2003)</p>	Likely Significant Effect	<p>The tunnel will require a crossing of the River Thames, given the construction of a tunnel within the boundary of the River Thames there is increased risk of pollution to the watercourse and as such there is potential for pollution to be washed downstream and impact habitats within the Ramsar.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Ramsar criterion 6</p> <p>Species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Black-tailed godwit , <i>Limosa limosa islandica</i>, Iceland/W Europe 1,640 individuals, representing an average of 4.5% of the population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Dunlin , <i>Calidris alpina alpina</i>, W Siberia/W Europe 15,171 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3)</p> <p>Red knot , <i>Calidris canutus islandica</i>, W & Southern Africa (wintering) 7,279 individuals, representing an average of 1.6% of the population (5 year peak mean 1998/9-2002/3)"</p>		

A.31 Groundwater Development - Merton Recommissioning

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_ALL_merton_recommission	Groundwater Development - Merton Recommissioning	The option comprises the recommissioning and upgrade of the Merton Abbey WTW in order to treat the maximum peak DO of 8MI/d from the Merton Abbey Well. DO benefit 7.86 MI/d peak 2 MI/d average	Richmond Park SAC: located 5.7km west	Annex II species that are a primary reason for selection of this site: 1083 Stag beetle <i>Lucanus cervus</i>	No Likely Significant Effect	Construction effects from noise and disturbance not considered to affect the Habitats site due to distance. The designated features of this site are not reliant on GW systems and therefore no significant effects predicted. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

A.32 Deephams Reuse – 46.5 MI/d, direct to KGV - Construction

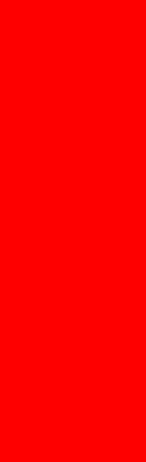
Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_KGV_HI-REU_RE1_CNO_deephams_reuse_46.5	Deephams Reuse – 46.5 MI/d, direct to KGV - Construction	Transfer of Deephams STW Final effluent to the new water reuse works with the following technology: pre-screens, UF (different from the MF used in Atkins), RO, UV treatment, inter-process pumping, buildings and disinfection, pH adjustment chemicals. Conveyance of treated water from Deephams to the discharge location at KGV intake.	Lee Valley Ramsar - 2.6km to the south	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: Northern shoveler, <i>Anas clypeata</i> , NW & C Europe 397 individuals, representing an average of 2.6% of the GB	LSE	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 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 Ramsar and/or its 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 the Ramsar Site.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				population (5 year peak mean 1998/9-2002/3)		<p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
		Lee Valley SPA - 2.6km to the south		<p>Article 4.1 Qualification:</p> <p>it is used regularly by 1% or more of the Great Britain population of a species listed on Annex I, in any season:</p> <p>Bittern <i>Botaurus stellaris</i> 6 individuals - wintering 6% (5 year peak mean 1992/93 - 1996/97)</p> <p>Article 4.2 Qualification:</p> <p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex I), in any season:</p> <p>Shoveler <i>Anas clypeata</i> 406 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.0% NW/Central Europe</p> <p>Gadwall <i>Anas strepera</i> 456 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.5% NW Europe</p>	LSE	<p>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. 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 SPA and/or its 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 the SPA.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Epping Forest SAC - 1.2km to the east of the pipeline	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i>)</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p> <p>Annex II species that are a primary reason for selection of this site:</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p>	No LSE	<p>The proposed option has no hydrological link to Epping Forest SAC and it's qualifying features are unlikely to be impacted from any construction activities.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.33 Deephams Reuse – 46.5 MI/d, to TLT - Construction

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_KGV_HI-REU_RE1_CNO_deephams_reuse 46.5b	Deephams Reuse – 46.5 MI/d, to TLT - Construction	Transfer of Deephams STW final effluent to the new water reuse works with the following technology: pre-screens, UF, RO, UV treatment, inter-process pumping, buildings and disinfection, pH adjustment chemicals. Includes conveyance to TLT extension.	Lee Valley Ramsar - 2.8km to the south	<p>Ramsar criterion 6:</p> <p>species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler, <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p>	LSE	<p>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 Ramsar. The Deephams to TLT conveyance also runs along the western edge of the Chingford Reservoirs SSSI. As such, the proposals carry a risk of impacting upon the Ramsar and/or its 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 the Ramsar Site.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			Lee Valley SPA - 2.8km to the south	<p>Article 4.1 Qualification:</p> <p>The site is used regularly by 1% or more of the Great Britain population of a species listed on Annex I, in any season:</p> <p>Bittern <i>Botaurus stellaris</i> 6 individuals - wintering 6% (5 year peak mean 1992/93 - 1996/97)</p> <p>Article 4.2 Qualification:</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex I), in any season:</p> <p>Shoveler <i>Anas clypeata</i> 406 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.0% NW/Central Europe</p> <p>Gadwall <i>Anas strepera</i> 456 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.5% NW Europe</p>		<p>shoveler) that forms a qualifying feature of the SPA.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			<p>Epping Forest SAC - 1.2km to the east of the pipeline</p>	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i>)</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				4030 European dry heaths Annex II species that are a primary reason for selection of this site: 1083 Stag beetle <i>Lucanus cervus</i>		

A.34 Groundwater Development - Confined Chalk North London

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_ALL_london_conchalk	Groundwater Development - Confined Chalk North London	New abstraction borehole. DO benefit 2MI/d average and peak.	Richmond Park SAC: located 9.2km to the south south-east	Annex II species that are a primary reason for selection of this site: 1083 Stag beetle <i>Lucanus cervus</i>	No Likely Significant Effect	The Habitats site is of a sufficient distance away as to not be impacted upon from construction or operational activities. No direct hydrological pathway noted. Any abstraction will not have an impact on Habitats site. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

A.35 Transfer - Reigate (SES) to Guildford 20MI/d

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_GUI_HI-TFR_SES_ALL_reigatetoguildford5/20	Transfer - Reigate (SES) to Guildford 20MI/d	Either a 5MI/d or 20MI/d transfer from Reigate (SES) to Guildford.	Thames Basin Heath SPA located at approx.4 km north west	<p>Article 4.1 Qualification - During the breeding season the SPA regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:</p> <p>A302 Dartford Warbler (<i>Sylvia undata</i>) - 27.8% of the GB population</p> <p>A224 Nightjar (<i>Caprimulgus europaeus</i>) - 7.8% of the GB population</p> <p>A246 Woodlark (<i>Lullula arborea</i>) - 9.9% of the GB population</p> <p>Non-qualifying species of interest:</p> <p>Hen harrier (<i>Circus cyaneus</i>)</p> <p>Merlin (<i>Falco columbarius</i>)</p> <p>Short-eared owl (<i>Asio flammeus</i>)</p> <p>Kingfisher (<i>Alcedo atthis</i>)</p> <p>(all Annex I species) occur in nonbreeding numbers of less than European importance (less</p>	No Likely Significant Effect	<p>This Habitats Site is 4km away from the option site, it is not hydrologically connected and there are no pathways, therefore no impacts are predicted. No direct hydrological pathway noted.</p> <p>Any transfer will not have an impact on Habitats site.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Thursley, Ash, Pirbright and Chobham SAC approx. 10 km south west	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>4010 Northern Atlantic wet heaths with (<i>Erica tetralix</i>)</p> <p>4030 European dry heaths</p> <p>7150 Depressions on peat substrates of the Rhynchosporion</p>	No Likely Significant Effect	<p>The Habitats site is of a sufficient distance away as to not be impacted upon from construction or operational activities. No direct hydrological pathway identified. Any transfer will not have an impact on Habitats site.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			Mole Gap to Reigate Escarpment SAC approx. 5 km north	<p>Annex I habitats that are a primary reason for selection of this site</p> <ul style="list-style-type: none"> 5110 (<i>Stable xerothermophilous</i>) formations with (<i>Buxus sempervirens</i>) on rock slopes (<i>Berberidion</i> p.p.) Mole Gap in south-east England supports the only area of stable box scrub in the UK, on steep chalk slopes where the River Mole has cut into the North Downs Escarpment, creating the Mole Gap. Here natural erosion maintains the open conditions required for the survival of this habitat type. The site therefore supports a 	No Likely Significant Effect	<p>This Habitats Site is 5.km away from the option site, it is not hydrologically connected and there are no pathways, therefore no impacts are predicted. No direct hydrological pathway noted</p> <p>Any transfer will not have an impact on Habitats site</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>stable formation and has good conservation of habitat structure and function.</p> <ul style="list-style-type: none"> • 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) • * Important orchid sites • This site hosts the priority habitat type "orchid rich sites". This large but fragmented site on the North Downs escarpment supports a wide range of calcareous grassland types on steep slopes, including CG2 (<i>Festuca ovina</i> - <i>Avenula pratensis</i>), CG3 (<i>Bromus erectus</i>), CG4 (<i>Brachypodium pinnatum</i>), CG5 (<i>Brachypodium pinnatum</i> – <i>Bromus erectus</i>) and CG6 (<i>Avenula pubescens</i>) grasslands. It exhibits a wide range of structural conditions ranging from short turf through to scrub margins, and is particularly important for rare vascular plants, including orchids. It is also significant in exhibiting transitions to scarce scrub, woodland and dry heath types, notably 5110 (<i>Stable</i> 		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p><i>xerothermophilous</i>) formations with (<i>Buxus sempervirens</i>) on rock slopes, 91J0 yew (<i>Taxus baccata</i>) woods, and chalk heath (4030 European dry heaths).</p> <ul style="list-style-type: none"> • 91J0 (<i>Taxus baccata</i>) woods of the British Isles • * Priority feature • At Mole Gap to Reigate Escarpment yew <i>Taxus baccata</i> woodland has been formed both by invasion of chalk grassland and from development within beech <i>Fagus sylvatica</i> woodland following destruction of the beech overstorey. Yew occurs here in extensive stands, with, in places, an understorey of box <i>Buxus sempervirens</i> at one of its few native locations. <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <ul style="list-style-type: none"> • 4030 European dry heaths • 9130 (<i>Asperulo-Fagetum</i>) beech forests 		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Annex II species present as a qualifying feature, but not a primary reason for site selection</p> <ul style="list-style-type: none"> • 1166 Great crested newt (<i>Triturus cristatus</i>) • 1323 Bechstein's bat (<i>Myotis bechsteinii</i>) 		

A.36 TWRM Extension Coppermills to Honor Oak

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_HON_HI-ROC_NET_CN O_cop'mills-honor oak	TWRM extension - Coppermills to Honor Oak	New ring main tunnel from Coppermills to Honor Oak.	Lee Valley SPA is approx. 200m north of the works.	<p>Article 4.1 Qualification</p> <p>it is used regularly by 1% or more of the Great Britain population of a species listed on Annex I, in any season:</p> <p>Bittern <i>Botaurus stellaris</i> 6 individuals - wintering 6% (5 year peak mean 1992/93 - 1996/97)</p> <p>Article 4.2 Qualification</p> <p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory</p>	Likely Significant Effect	<p>The works are located directly south of the Habitats Site and as such will have the potential to result in impacts to the SPA as a result of noise disturbance, air pollution and pollution run-off.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>species (other than those listed on Annex I), in any season:</p> <p>Shoveler <i>Anas clypeata</i> 406 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.0% NW/Central Europe</p> <p>Gadwall <i>Anas strepera</i> 456 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.5% NW Europe</p>		
			<p>Lee Valley Ramsar Site is approx. 200m north of the works</p>	<p>Ramsar criterion 6</p> <p>species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p>	<p>Likely Significant Effect</p>	<p>The works are located directly south of the Habitats Site and as such will have the potential to result in impacts to the Ramsar site as a result of noise disturbance, air pollution and pollution run-off.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Gadwall, <i>Anas strepera strepera</i> , NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)		

A.37 Groundwater Development - East Woodhay borehole pumps Removal of Constraints to DO

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_KVZ_HI-GRW_ALL_ALL-east woodhay roc	Groundwater Development - East Woodhay borehole pumps Removal of Constraints to DO	Upgrade of pumps and pump control to increase DO. DO benefit 2.1 MU/d peak, 0 average	Kennet Valley Alderwoods SAC is located 3.2km north of the works	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) * Priority feature</p> <p>These, the largest fragments of alder-ash woodland on the Kennet floodplain, lie on alluvium overlain by a shallow layer of moderately calcareous peat. The wettest areas are dominated by alder <i>Alnus glutinosa</i> over tall herbs, sedges and reeds, but dryer patches include a base-rich woodland flora with much dog's mercury <i>Mercurialis perennis</i> and also herb-Paris <i>Paris quadrifolia</i>.</p>	No Likely Significant Effect	<p>The works will be localised around the pump locations and given the distance to the SAC will not result in impacts from air pollution of run-off. Furthermore, while the SAC is a GWDTE it is not hydrologically connected to the works location and as such will not be impacted by any increases to water abstraction.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				The occurrence of the latter is unusual, as it is more typically associated with ancient woodland, whereas the evidence suggests that these stands have largely developed over the past century.		
			Kennet and Lambourn Floodplain SAC is located 3.9km north of the works	<p data-bbox="1106 520 1391 600">Annex II species that are a primary reason for selection of this site</p> <p data-bbox="1106 632 1379 679">1016 Desmoulin's whorl snail <i>Vertigo moulinsiana</i></p> <p data-bbox="1106 711 1413 1248">The cluster of sites selected in the Kennet and Lambourn valleys supports one of the most extensive known populations of Desmoulin's whorl snail <i>Vertigo moulinsiana</i> in the UK and is one of two sites representing the species in the south-western part of its range in the important chalk stream habitat. Integrity of the population is being maintained by taking measures, including habitat creation, to safeguard populations. The habitat occupied at this site differs from the Fenland sites in East Anglia in that it is predominantly reed sweet-grass <i>Glyceria maxima</i> swamp or tall sedges at the river</p>	No Likely Significant Effect	<p data-bbox="1597 520 2051 711">The works will be localised around the pump locations and given the distance to the SAC will not result in impacts from air pollution of run-off. Furthermore, while the SAC is a GWDTE it is not hydrologically connected to the works location and as such will not be impacted by any increases to water abstraction.</p> <p data-bbox="1597 743 2051 823">During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				margins, in ditches and in depressions in wet meadows.		

A.38 Crossness Desalination (Blended) - 50MI/d Enhancement

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-DES_RE2_ALL_crossnessdesa l50/100	Crossness Desalination (Blended) - 50MI/d Enhancement	Development of a 50MI/d or 100MI/d desalination plant located south of Crossness, using brackish estuarine feedwater from the River Thames. Transfer of treated water to Coppermills WTW for blending.	Thames Estuary & Marshes SPA is located approx. 19.5km east	<p>Article 4.1 Qualification</p> <p>Over winter the area regularly supports:</p> <p><i>Circus cyaneus</i> (Europe - breeding) 1% of the GB population 5 year peak count, 1993/94 to 1997/98</p> <p><i>Recurvirostra avosetta</i> 28% of the GB population 5 year peak count, 1992/93 to 1997/98</p> <p>Article 4.2 Qualification</p> <p>Over winter the area regularly supports:</p> <p><i>Calidris alpina alpina</i> (Northern Siberian / Europe / Western Africa) 2.1% of the population in Great Britain 5 year peak mean 1993/94-1997/98</p>	No LSE	<p>Potential for effects of brine discharge. However, following review of the option no LSE predicted on the Habitats site from return of diluted brine effluent as the brine will be diluted through mixing with the final effluent from 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 Habitats site and as such no impact on their qualifying features would result.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p><i>Calidris canutus</i> (North-eastern Canada/Greenland/Iceland/North-western Europe) 1.8% of the population in Great Britain 5 year peak mean 1991/92-1995/96</p> <p><i>Limosa limosa limosa</i> (Iceland – breeding) 2.4% of the population 5 year peak mean for 1993/94 to 1997/98</p> <p><i>Pluvialis squatarola</i> (Eastern Atlantic – wintering) 17% of the population 5 year peak mean for 1993/94 to 1997/98</p> <p><i>Tringa totanus</i> (Eastern Atlantic – wintering) 2.2% of the population 5 year peak for 1993/94 to 1997/97</p> <p>On passage the area regularly supports</p> <p><i>Charadrius hiatiula</i> (Europe / Northern Africa – wintering) 2.6% of the population 5 year peak mean for 1993/94 to 1997/98</p> <p>INTERNATIONALLY IMPORTANT ASSEMBLAGE OF BIRDS</p> <p>75019 waterfowl (5 year peak mean 21/03/2000)</p> <p>Including: <i>Recurvirostra avosetta</i>, <i>Pluvialis squatarola</i>, <i>Calidris</i></p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<i>canutus</i> , <i>Calidris alpina alpina</i> , <i>Limosa limosa islandica</i> , <i>Tringa totanus</i>		
		Thames Estuary & Marshes Ramsar Site is located approx. 19.5km east		<p>Ramsar criterion 2</p> <p>The site supports more than 20 British Red Data Book invertebrates and populations of the GB Red Book endangered least lettuce (<i>Lactuca saligna</i>) as well as the vulnerable slender hare's-ear (<i>Bupleurum tenuissimum</i>), divided sedge (<i>Carex divisa</i>), sea barley (<i>Hordeum marinum</i>), Norrer's saltmarsh-grass (<i>Puccinellia fasciculata</i>) and dwarf eelgrass (<i>Zoostera noltei</i>).</p> <p>Ramsar criterion 5</p> <p>Assemblages of international importance:</p> <p>Species with peak counts in winter:</p> <p>45,118 waterfowl (5 year peak mean 1998/99-2002/2003)</p> <p>Ramsar criterion 6</p>	No LSE	<p>Potential for effects of brine discharge. However, following review of the option no LSE predicted on the Habitats site from return of diluted brine effluent as the brine will be diluted through mixing with the final effluent from 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 Habitats site and as such no impact on their qualifying features would result.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Black-tailed godwit , <i>Limosa limosa islandica</i>, Iceland/W Europe 1,640 individuals, representing an average of 4.5% of the population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Dunlin , <i>Calidris alpina alpina</i>, W Siberia/W Europe 15,171 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3)</p> <p>Red knot , <i>Calidris canutus islandica</i>, W & Southern Africa (wintering) 7,279 individuals, representing an average of 1.6% of the population (5 year peak mean 1998/9-2002/3)</p>		

A.39 Managed Aquifer Recharge - Addington

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_ALL_addington asr	Managed Aquifer Recharge - Addington	Two new ASR boreholes near Addington PS, and 1 borehole refurbishment, 300m length of sewer for conditioning discharges, booster recharge pumps due to artesian head pressures in aquifer. DO benefit 3 MI/d average, 5 MI/d peak Coppermills WTW for blending.	The closest site is Mole Gap to Reigate Escarpment which is 15.3km from the works.	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>5110 Stable xerothermophilous formations with <i>Buxus sempervirens</i> on rock slopes (<i>Berberidion p.p.</i>)</p> <p>Mole Gap in south-east England supports the only area of stable box scrub in the UK, on steep chalk slopes where the River Mole has cut into the North Downs Escarpment, creating the Mole Gap. Here natural erosion maintains the open conditions required for the survival of this habitat type. The site therefore supports a stable formation and has good conservation of habitat structure and function.</p> <p>6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites)</p> <p>This site hosts the priority habitat type "orchid rich sites". This large but fragmented site on the North Downs escarpment supports a</p>	No LSE	<p>Given the distance from the works to the Habitats site and the absence of hydrological connection and pathways, no impacts are predicted.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>wide range of calcareous grassland types on steep slopes, including CG2 <i>Festuca ovina</i> – <i>Avenula pratensis</i>, CG3 <i>Bromus erectus</i>, CG4 <i>Brachypodium pinnatum</i>, CG5 <i>Brachypodium pinnatum</i> – <i>Bromus erectus</i> and CG6 <i>Avenula pubescens</i> grasslands. It exhibits a wide range of structural conditions ranging from short turf through to scrub margins, and is particularly important for rare vascular plants, including orchids. It is also significant in exhibiting transitions to scarce scrub, woodland and dry heath types, notably 5110 Stable xerothermophilous formations with <i>Buxus sempervirens</i> on rock slopes, 91J0 yew <i>Taxus baccata</i> woods, and chalk heath (4030 European dry heaths).</p> <p>91J0 <i>Taxus baccata</i> woods of the British Isles * Priority feature</p> <p>At Mole Gap to Reigate Escarpment yew <i>Taxus baccata</i> woodland has been formed both by invasion of chalk grassland and from development within beech <i>Fagus sylvatica</i> woodland following destruction of the beech overstorey. Yew occurs</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>here in extensive stands, with, in places, an understorey of box <i>Buxus sempervirens</i> at one of its few native locations.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>4030 European dry heaths</p> <p>9130 <i>Asperulo-Fagetum</i> beech forests</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection</p> <p>1166 Great crested newt <i>Triturus cristatus</i></p> <p>1323 Bechstein's bat <i>Myotis bechsteinii</i></p>		

A.40 Groundwater Development - Honor Oak

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_ALL_honor oak gw	Groundwater Development - Honor Oak	Two new abstraction boreholes, Connections to	No sites within 10km of the option	N/A	No LSE	Given the distance from the works to any Habitats site and the absence of hydrological connection and pathways, no impacts are predicted.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
		existing WTW, DO benefit 1 MI/d average, 2.82 MI/d peak				During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

A.41 Managed Aquifer Recharge - Streatham (SLARS2)

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_ALL_streatham ar	Managed Aquifer Recharge - Streatham (SLARS2)	One new AR borehole at Streatham PS, and one borehole refurbishment, new 17MU/d WTW. DO benefit is 4MI/d average, 4.5MI/d peak.	Wimbledon Common SAC: located 5.8km to the west	<p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p> <p>Annex II species that are a primary reason for selection of this site:</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p> <p>Wimbledon Common has a large number of old trees and much fallen decaying timber. It is at the heart of the south London centre of distribution for stag beetle <i>Lucanus cervus</i>, and a relatively large number of records were received from this site during a</p>	No LSE	<p>This option involves the potential release of raw water into the Streatham confined chalk aquifer for recharge and future potential abstraction. Recharge will occur during winter from water from the Thames. Also requiring a new 40m water recharge and sewer connection pipelines to the existing mains located nearby.</p> <p>No likely significant effect predicted. Existing abstraction will not increase as it is just a replacement borehole and pump.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				recent nationwide survey for the species (Percy et al. 2000). The site supports a number of other scarce invertebrate species associated with decaying timber.		
			Richmond Park SAC: located 8.2km to the west	Annex II species that are a primary reason for selection of this site: 1083 Stag beetle <i>Lucanus cervus</i>	No LSE	This option involves the potential release of raw water into the Streatham confined chalk aquifer for recharge and future potential abstraction. Recharge will occur during winter from water from the Thames. Also requiring a new 40m water recharge and sewer connection pipelines to the existing mains located nearby. No likely significant effect predicted. Existing abstraction will not increase as it is just a replacement borehole and pump. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

A.42 Managed Aquifer Recharge - Thames Valley, South London

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_ALL_thames valley asr	Managed Aquifer Recharge - Thames Valley, South London	Two new ASR boreholes at Ashford WTW, 1km length of sewer for conditioning discharges, booster injection pumps due to artesian head	South West London Waterbodies SPA: closest individual part of the designated site is	ARTICLE 4.2 QUALIFICATION (79/409/EEC) it is used regularly by 1% or more of the biogeographical	LSE	New boreholes (2) for abstraction of raw water from the Lower Greensand Aquifer and into Queen Mary Reservoir and new sewer line. Recharge water will be taken from the existing WTW at Ashford. King George VI Reservoir and Staines

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
		pressures in aquifer. DO benefit 3MU/d average, 5MU/d peak.	located 3km to the east.	<p>populations of the following regularly occurring migratory species (other than those listed on Annex 1), in any season:</p> <p>Gadwall <i>Anas strepera</i> 710 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.4 % NW Europe</p> <p>Shoveler <i>Anas clypeata</i> 853 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.1 % NW/Central Europe</p>		<p>Reservoirs as well as the Staines Moor SSSI are GWDTE areas. Potential adverse effects on the designated sites from altered groundwater levels in the aquifer. This may lead to a change in water availability upon which the designated features rely on for habitat and foraging sources.</p> <p>During construction, LSE of the option (alone) has been ruled out at screening stage.</p> <p>During operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>
			<p>South West London Waterbodies</p> <p>Ramsar: closest individual part of the designated site is located 3km to the east.</p>	<p>Ramsar criterion 6: species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler, <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p>	LSE	<p>New boreholes (2) for abstraction of raw water from the Lower Greensand Aquifer and into Queen Mary Reservoir and new sewer line. Recharge water will be taken from the existing WTW at Ashford. King George VI Reservoir and Staines Reservoirs as well as the Staines Moor SSSI are GWDTE areas. Potential adverse effects on the designated sites from altered groundwater levels in the aquifer. This may lead to a change in water availability upon which the designated features rely on for habitat and foraging sources.</p> <p>During construction, LSE of the option (alone) has been ruled out at screening stage.</p> <p>During operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Species with peak counts in winter: Gadwall, <i>Anas strepera</i> , NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)		

A.43 Managed Aquifer Recharge - Kidbrooke (SLARS1) Construction

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_CN O_kidbrooke slars	Managed Aquifer Recharge - Kidbrooke (SLARS1) Construction	The scheme comprises the upgrade of the existing borehole at the Rochester Way site, another at the Bromley Reservoir site and the construction of a new AR borehole on private land in Eltham Green. Six observation boreholes will be constructed for groundwater level monitoring, four at the Eltham Green site and two off-site the Eltham Green location. Benefit is 8.1MI/d peak and 7MI/d average. The scheme also includes: construction of a new 10MU/d WTW located on the existing Kidbrooke borehole	There are no N2K sites within 10km of the option.	N/A	No significant effects	There are no Habitats sites within 10km of the proposed option. This option involves the potential release of raw water into the Kidbrooke aquifer for recharge and future potential abstraction. The boreholes are located in a non-ground water zone between the Bromley Tertiaries, West Kent Tertiaries Greenwich Tertiaries and Chalk. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
		site to serve the Rochester Way, Bromley Reservoir and a new AR borehole, a 5.7km (300mm) raw water transfer main between Bromley Reservoir and new AR borehole, a 6.4km (400mm) bi-directional raw water transfer main between Rochester Way AR borehole and a new AR borehole via Kidbrooke WTW (3.5km between Rochester Way and Kidbrooke WTW, 2.6km between new borehole and Kidbrooke WTW), a 1.8km (450mm) treated water main between Kidbrooke WTW and Bermondsey (Well Hall PS).				

A.44 Managed Aquifer Recharge - Merton (SLARS3) Construction

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_CN O_merton ar	Managed Aquifer Recharge - Merton (SLARS3) Construction	The scheme comprises the upgrade of the existing well and adit system at the Merton Abbey WTW for recharge/abstraction purposes and the construction of a new AR borehole at the nearby	Richmond Park SAC: located 5.7km west	Annex II species that are a primary reason for selection of this site: 1083 Stag beetle <i>Lucanus cervus</i>	No LSE	The designated features of this site are not reliant on GW systems and therefore no significant effects predicted. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
		Byegrove Road site. DO benefit is 5MI/d average and 6MI/d peak. The scheme also includes the construction of a new 4.5MI/d WTW located at the existing Merton Abbey WTW site to serve the Byegrove Road AR borehole, and the installation of a 1.1km raw water main from the Byegrove Road AR borehole to the new Merton Abbey WTW.	Wimbledon Common SAC: Located 2.8km west	<p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p> <p>Annex II species that are a primary reason for selection of this site:</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p> <p>Wimbledon Common has a large number of old trees and much fallen decaying timber. It is at the heart of the south London centre of distribution for stag beetle <i>Lucanus cervus</i>, and a relatively large number of records were received from this site during a recent nationwide survey for the species (Percy et al. 2000). The site supports a number of other scarce invertebrate species associated with decaying timber.</p>	No LSE	<p>The option 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.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.45 Replace pump infrastructure at Barrow Hill - TWRM

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-ROC_NET_ALL_barrowhillpump	Replace pump infrastructure at Barrow Hill – TWRM	Pump 6 at Barrow Hill is to be replaced.	Lee Valley SPA is located approx. 8.2km north east of the works	<p>Article 4.1 Qualification</p> <p>it is used regularly by 1% or more of the Great Britain population of a species listed on Annex I, in any season:</p> <p>Bittern <i>Botaurus stellaris</i> 6 individuals - wintering 6% (5 year peak mean 1992/93 - 1996/97)</p> <p>Article 4.2 Qualification</p> <p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex I), in any season:</p> <p>Shoveler <i>Anas clypeata</i> 406 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.0% NW/Central Europe</p> <p>Gadwall <i>Anas strepera</i> 456 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.5% NW Europe"</p>	No LSE	<p>The SPA is sufficiently distanced to negate impacts from air pollution. The works are located within an existing pumping station and as such will not impact any habitats that could be used by qualifying bird species. Furthermore, no hydrological connection exists between the pipeline route and the SPA which could result in impacts from run-off or groundwater alterations.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			Lee Valley Ramsar site is located	Ramsar criterion 6	No LSE	The Ramsar site is sufficiently distanced to negate impacts from air pollution. The works are located

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			approx. 8.2km north east of the works.	<p>species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall , <i>Anas strepera strepera</i>, NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)</p>		<p>within an existing pumping station and as such will not impact any habitats that could be used by qualifying bird species. Furthermore, no hydrological connection exists between the pipeline route and the Ramsar site which could result in impacts from run-off or groundwater alterations.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.46 East London WTW

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-ROC_WT1_CN		184M/d treatment works for reservoir water in London.	Lee Valley SPA is located approx.	Article 4.1 Qualification	LSE	Given the close proximity to the Habitats Site the construction of the project will have the potential

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
O_eastlondon wtw100/150/200/300	East London WTW	Purpose is to accommodate additional future demand. Water for treatment could be supplied from various option types including wastewater reuse and water transfers. There are also 150M/d, 200M/d and 300M/d versions of the option.	100m north of the works	<p>it is used regularly by 1% or more of the Great Britain population of a species listed on Annex I, in any season:</p> <p>Bittern <i>Botaurus stellaris</i> 6 individuals - wintering 6% (5 year peak mean 1992/93 - 1996/97)</p> <p>Article 4.2 Qualification</p> <p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex I), in any season:</p> <p>Shoveler <i>Anas clypeata</i> 406 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.0% NW/Central Europe</p> <p>Gadwall <i>Anas strepera</i> 456 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.5% NW Europe</p>	LSE	<p>to result in noise and potentially visual disturbance to qualifying features of the SPA if present within proximity during the works. Furthermore, given the close proximity any dust or air borne particulars released during the works could have the potential to impact the qualifying features of the SPA either directly through air pollution or indirectly by damaging habitats which they are supported by. Unmitigated there is also potential for the construction works to result in run-off which could be released to the reservoir and impact the qualifying features.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			Lee Valley Ramsar site is located approx. 100m north	<p>Ramsar criterion 6</p> <p>species/populations occurring at levels of international importance.</p>		<p>Given the close proximity to the Habitats site the construction of the project will have the potential to result in noise and potentially visual disturbance to qualifying features of the Ramsar site if present within proximity during the works. Furthermore, given the close proximity any dust or air borne particulars released during the works could have the potential to impact the qualifying</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall , <i>Anas strepera strepera</i>, NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)"</p>		<p>features of the Ramsar site either directly through air pollution or indirectly by damaging habitats which they are supported by. Unmitigated there is also potential for the construction works to result in run-off which could be released to the reservoir and impact the qualifying features.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			<p>Epping Forest SAC is located approx. 3.2km east of the works</p>	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i>)</p> <p>Epping Forest represents Atlantic acidophilous beech forests in the north-eastern part of the habitat's UK range. Although the epiphytes</p>	No LSE	<p>The Habitats site is sufficiently distanced to negate impacts from air pollution or noise and vibration impacts to the stag beetle. The River Lea runs adjacent to the works location, The hang watercourse is a tributary of the River Lea and connects with Epping Forest, however these areas are a significant distance upstream and as such the works are not hydrologically connected the SAC and therefore are not at risk of run-off or pollution events.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>at this site have declined, largely as a result of air pollution, it remains important for a range of rare species, including the moss <i>Zygodon forsteri</i>. 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.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p> <p>Annex II species that are a primary reason for selection of this site</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p> <p>Epping Forest is a large woodland area in which records of stag beetle <i>Lucanus cervus</i> 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</p>		<p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Nationally Scarce invertebrate species.		

A.47 Chingford South

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-TFR_LON_ALL_ch'ford s intake	Intake Capacity Increase - Chingford South	Increase capacity of Chingford South intake	Epping Forest SAC is located 700m east	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i>)</p> <p>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 <i>Zygodon forsteri</i>. The long history of pollarding, and resultant large number of veteran trees, ensures</p>	LSE	<p>Increased abstraction from the reservoirs could result in detrimental impacts to the SAC given that some of the qualifying features are ground water dependant habitats and species which rely on them.</p> <p>During construction, LSE of the option (alone) has been ruled out at screening stage.</p> <p>During operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

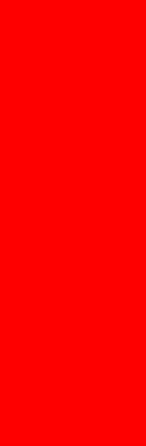
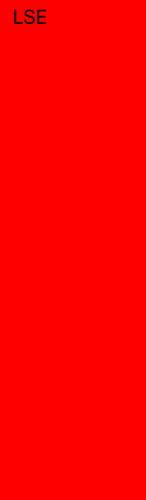
Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>that the site is also rich in fungi and dead-wood invertebrates.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p> <p>Annex II species that are a primary reason for selection of this site</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p> <p>Epping Forest is a large woodland area in which records of stag beetle <i>Lucanus cervus</i> 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.</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Lee Valley SPA is located approx. 4.6km south and 6km north of the works	<p>Article 4.1 Qualification</p> <p>it is used regularly by 1% or more of the Great Britain population of a species listed on Annex I, in any season:</p> <p>Bittern <i>Botaurus stellaris</i> 6 individuals - wintering 6% (5 year peak mean 1992/93 - 1996/97)</p> <p>Article 4.2 Qualification</p> <p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex I), in any season:</p> <p>Shoveler <i>Anas clypeata</i> 406 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.0% NW/Central Europe</p> <p>Gadwall <i>Anas strepera</i> 456 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.5% NW Europe"</p>	LSE	<p>While the works are distanced a minimum of 4.6km from the SPA which may negate impacts from noise and air pollution they are located directly adjacent to the King George's Reservoir and William Girling Reservoir's which are a designated SSSI (Chingford Reservoirs SSSI). An increase in abstraction from these reservoirs as a result of the works could cause a reduction in the water levels of the reservoirs. While Chingford Reservoirs is not an underpinning SSSI's of the SPA it is noted to support an important population of shoveler's which are noted as a qualifying species within the SPA. A reduction in water levels could impact the suitability of the reservoir to support this species and therefore have knock on effects to the suitability of the SPA areas. Furthermore, the reservoirs are found in between both areas of SPA habitat and water from these areas feed into the SPA. As such a reduction in the water levels within the reservoirs could directly impact the availability of within the SPA and impact upon habitats which support the qualifying features.</p> <p>During construction, LSE of the option (alone) has been ruled out at screening stage.</p> <p>During operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Lee Valley Ramsar site is located approx. 4.6km south and 6km north of the works.	<p>Ramsar criterion 6</p> <p>species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall , <i>Anas strepera strepera</i>, NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)"</p>	LSE	<p>While the works are distanced a minimum of 4.6km from the Ramsar site which may negate impacts from noise and air pollution they are located directly adjacent to the King George's Reservoir and William Girling Reservoir's which are a designated SSSI (Chingford Reservoirs SSSI). An increase in abstraction from these reservoirs as a result of the works could cause a reduction in the water levels of the reservoirs. While Chingford Reservoirs is not an underpinning SSSI's of the Ramsar site it is noted to support an important population of shoveler's which are noted as a qualifying species within the Ramsar site. A reduction in water levels could impact the suitability of the reservoir to support this species and therefore have knock on effects to the suitability of the SPA areas. Furthermore, the reservoirs are found in between both areas of Ramsar site habitat and water from these areas feed into the Ramsar site. As such a reduction in the water levels within the reservoirs could directly impact the availability of within the Ramsar Site and impact upon habitats which support the qualifying features.</p> <p>During construction, LSE of the option (alone) has been ruled out at screening stage.</p> <p>During operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

A.48 Intake Capacity Increase - Datchet

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
<p>TWU_LON_HI - TFR_LON_AL L_datchet int-qm</p>	<p>Intake Capacity Increase - Datchet</p>	<p>Datchet intake capacity increase by 300MI/d with transfer to Queen Mary and Wraysbury Reservoirs</p>	<p>South West London Waterbodies Ramsar 1.5km south east</p>	<p>Ramsar Criterion 2 The site supports the nationally scarce plant species whorled water-milfoil <i>Myriophyllum verticillatum</i> and the rare or vulnerable invertebrate <i>Micronecta minutissima</i> (a water-boatman) 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: Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 287 individuals, representing an average of 1.9%of the GB population (5 year peak mean 1998/9-2002/3) Species with peak counts in winter: <i>Gadwall</i> , <i>Anas strepera strepera</i>, NW Europe 445 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)"</p>	LSE	<p>Significant increase in the abstraction from the River Thames could impact the water availability at the Habitats site which would in turn affect the quality of the habitats supporting the qualifying species. Further assessment into the effect of increased abstraction on flow rates at the Habitats site is required. As the option is located upstream from the Habitats site, construction of the new pipeline could also lead to water pollution and potential sedimentation events which may affect the quality of habitats at the Habitats site and their ability to support the qualifying species.</p> <p>Additional water levels within the Wraysbury Reservoir may have uncertain impacts upon designated features of the Ramsar site.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>
			<p>South West London Waterbodies SPA 1.5km south east</p>	<p>ARTICLE 4.2 QUALIFICATION (79/409/EEC) it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring</p>	LSE	<p>Significant increase in the abstraction from the River Thames could impact the water availability at the Habitats site which would in turn affect the quality of the habitats supporting the qualifying species. Further assessment into the effect of</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>migratory species (other than those listed on Annex 1), in any season:</p> <p>Gadwall <i>Anas strepera</i> 710 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.4 % NW Europe</p> <p>Shoveler <i>Anas clypeata</i> 853 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.1 % NW/Central Europe"</p>		<p>increased abstraction on flow rates at the N2k site is required. As the option is located upstream from the Habitats site, construction of the new pipeline could also lead to water pollution and potential sedimentation events which may affect the quality of habitats at the habitats site and their ability to support the qualifying species.</p> <p>Additional water levels within the Wraysbury Reservoir may have uncertain impacts upon designated features of the SPA.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>
			<p>Windsor Forest & Great Park SAC 2.4km south west</p>	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>9190 Old acidophilous oak woods with <i>Quercus robur</i> on sandy plains</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robori-petraeae</i> or <i>Illici-Fagenion</i>)</p> <p>Annex II species that are a primary reason for selection of this site</p> <p>1079 Violet click beetle <i>Limoniscus violaceus</i></p>		 <p>LSE</p>

A.49 Intake Capacity Increase - Queen Mary

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
<p>TWU_LON_HI - TFR_LON_AL L_littleton int-qm</p>	<p>Intake Capacity Increase - Queen Mary</p>	<p>Increase capacity of Littleton intake PS site by 300M/d capacity</p>	<p>South West London Waterbodies Ramsar: Located 2.9km to the north and 3.4km to the south-west.</p>	<p>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: Northern shoveler, <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3) Species with peak counts in winter: Gadwall, <i>Anas strepera</i>, NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)</p>	<p>No LSE</p>	<p>Increased abstraction from the River Thames at the Laleham RWI (Raw Water Intake) by increasing the size of the pumping station (option description not very detailed). An increase in abstraction is not thought to have a significant effect on the Habitats site due to the small scale of the works.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.50 Replace New River Head Pump - TWRM

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
<p>TWU_LON_HI - TFR_LON_AL L_newriverhead pump 4</p>	<p>Replace New River Head Pump – TWRM</p>	<p>Pump 4 at NRH is to be replacement</p>	<p>Lee Valley SPA: located 6.2km to the north-east</p>	<p>Article 4.1 Qualification: it is used regularly by 1% or more of the Great Britain population of a species listed on Annex I, in any season: Bittern <i>Botaurus stellaris</i> 6 individuals - wintering 6% (5 year peak mean 1992/93 - 1996/97) Article 4.2 Qualification: it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex I), in any season: Shoveler <i>Anas clypeata</i> 406 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 1.0% NW/Central Europe Gadwall <i>Anas strepera</i> 456 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 1.5% NW Europe</p>	<p>No LSE</p>	<p>The option is to replace the current pump at New River Head pumping station. The nature of the option, and the distance between it and the Habitats site means that no significant effects predicted.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			<p>Lee Valley Ramsar: located 6.2km to the north-east</p>	<p>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:</p>	<p>No LSE</p>	<p>The option is to replace the current pump at New River Head pumping station. The nature of the option, and the distance between it and the designated site means that no significant effects predicted.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall , <i>Anas strepera</i> , NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)</p>		<p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			<p>Epping Forest SAC: Located 9.7km to the north-east</p>	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robori-petraeae</i> or <i>Illici-Fagenion</i>)</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p> <p>Annex II species that are a primary reason for selection of this site:</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p>	<p>No LSE</p>	<p>The option is to replace the current pump at New River Head pumping station. The nature of the option, and the distance between it and the designated site means that no significant effects predicted.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.51 Raw Water System Upgrade - Tunnel from Walthamstow 5 to Coppermills - Construction

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-TFR_LON_CNO _second spine tunnel	Raw Water System Upgrade - Tunnel from Walthamstow 5 to Coppermills - Construction	Second Spine Tunnel from break tank to reservoir five upstream of Coppermills WTW.	Lee Valley SPA is located within the works area	<p>Article 4.1 Qualification</p> <p>it is used regularly by 1% or more of the Great Britain population of a species listed on Annex I, in any season:</p> <p>Bittern <i>Botaurus stellaris</i> 6 individuals - wintering 6% (5 year peak mean 1992/93 - 1996/97)</p> <p>Article 4.2 Qualification</p> <p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex I), in any season:</p> <p>Shoveler <i>Anas clypeata</i> 406 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.0% NW/Central Europe</p> <p>Gadwall <i>Anas strepera</i> 456 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.5% NW Europe</p>	LSE	<p>This option will involve the construction of a new tunnel to convey raw transfers. The pipeline connects within the Reservoir Number 5 which is located within the SPA boundary, any abstractions or depositions from / to this reservoir could result in a change to the water table potentially impacting the extent of available habitat which supports the qualifying species. The tunnel will also cross the River Lee which feeds the reservoirs which make up the SPA, crossing of this river have the potential to release pollutants and sediment into the watercourse which could be deposited within the SPA boundary and result in detrimental impacts to the vegetation which supports the qualifying duck species or the fish which supports the qualifying bittern. Pollution of the SPA could also result in direct impacts to the qualifying species themselves if present at the time of the works, all three qualifying species are present within the SPA over-winter. Construction of the tunnel could also result in disturbance impacts to the qualifying species which could see them be displaced from the SPA boundary if present during the construction works.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>
			Lee Valley Ramsar Site is	Ramsar criterion 6 species/populations occurring at levels of international importance.	LSE	This option will involve the construction of a new tunnel to convey raw transfers. The pipeline connects within the Reservoir Number 5 which is located within the Ramsar Site boundary, any

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			located within the works area.	<p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall , <i>Anas strepera</i> , NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)"</p>		<p>abstractions or depositions from / to this reservoir could result in a change to the water table potentially impacting the extent of available habitat which supports the qualifying species. The tunnel will also cross the River Lee which feeds the reservoirs which make up the Ramsar Site, crossings of this river have the potential to release pollutants and sediment into the watercourse which could be deposited within the Ramsar Site boundary and result in detrimental impacts to the vegetation which supports the qualifying duck species. Pollution of the Ramsar Site could also result in direct impacts to the qualifying species themselves if present at the time of the works, all qualifying species are present within the Ramsar site over-winter and during spring / autumn. Construction of the tunnel could also result in disturbance impacts to the qualifying species which could see them be displaced from the Ramsar Site boundary if present during the construction works.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>
			Epping Forest is located approx. 3km east	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i>)</p>	LSE	<p>Some qualifying features of the SAC are ground water dependant habitats and as such could be impacted if the works result in any changes to the water levels within the adjacent reservoirs.</p> <p>During construction, LSE of the option (alone) has been ruled out at screening stage.</p> <p>During operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p> <p>Annex II species that are a primary reason for selection of this site</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p>		

A.52 Surbiton intake capacity increase with transfer to Walton inlet channel

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-TFR_LON_ALL_surbiton int-walton	Surbiton intake capacity increase with transfer to Walton inlet channel	Increase capacity of Surbiton intake	South West London Waterbodies SPA: located immediately adjacent to site	<p>ARTICLE 4.2 QUALIFICATION (79/409/EEC)</p> <p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex 1), in any season:</p> <p>Gadwall <i>Anas strepera</i> 710 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.4 % NW Europe</p> <p>Shoveler <i>Anas clypeata</i> 853 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.1 % NW/Central Europe</p>	LSE	This option is located adjacent to the designated site near the Walton inlet channel. During construction of the intake and pipeline to Walton inlet, construction activities are thought to have a significant effect on the designated features of the site due to the locality of the works. Construction activities such as lighting at night, dust created from construction, vibration from the new pipeline and noise from construction traffic have the potential to disturb those designated features of the site due to the close proximity to the site. Vehicle emissions from construction vehicles moving across the site may lead to higher levels of oxides within the nearby SPA leading to increased nutrient levels leading to disturbances on the designated features.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						<p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			<p>South West London Waterbodies Ramsar: located immediately adjacent to the site</p>	<p>Ramsar criterion 6: species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler, <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall, <i>Anas strepera</i>, NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)"</p>	LSE	<p>This option is located adjacent to the designated site near the Walton inlet channel. During construction of the intake and pipeline to Walton inlet, construction activities are thought to have a significant effect on the designated features of the site due to the locality of the works. Construction activities such as lighting at night, dust created from construction, vibration from the new pipeline and noise from construction traffic have the potential to disturb those designated features of the site due to the close proximity to the site. Vehicle emissions from construction vehicles moving across the site may lead to higher levels of oxides within the nearby Ramsar leading to increased nutrient levels leading to disturbances on the designated features.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			<p>Wimbledon Common SAC: located 5.6km north-east</p>	<p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p>	No LSE	<p>No significant effects predicted. The option is of a sufficient distance away as from the designated site that construction activities will not have any impact on the features. There is no pathway between the option and the designated site and the features will not be effect by</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>4030 European dry heaths</p> <p>Annex II species that are a primary reason for selection of this site:</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p> <p>Wimbledon Common has a large number of old trees and much fallen decaying timber. It is at the heart of the south London centre of distribution for stag beetle <i>Lucanus cervus</i>, and a relatively large number of records were received from this site during a recent nationwide survey for the species (Percy et al. 2000). The site supports a number of other scarce invertebrate species associated with decaying timber.</p>		<p>abstraction from the River Thames system at Surbiton.</p> <p>Breeding female stag beetles are not thought to disperse greater than 1km so no impacts to these features are predicted.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			<p>Richmond Park SAC: located 3.7km to the north-east</p>	<p>Annex II species that are a primary reason for selection of this site:</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p>	No LSE	<p>No significant effects predicted. The option is of a sufficient distance away as from the designated site that construction activities will not have any impact on the features. There is no pathway between the option and the designated site and the features will not be effect by abstraction from the River Thames system at Surbiton.</p> <p>Breeding female stag beetles are not thought to disperse greater than 1km so no impacts to these features are predicted.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Thames Basin Heaths SPA: Located 9.8km to the south-west	ARTICLE 4.1 QUALIFICATION (79/409/EEC): During the breeding season the area regularly supports: Caprimulgus europaeus 7.8% of the GB breeding population. Count mean (RSPB 1998-99) <i>Lullula arborea</i> 9.9% of the GB breeding population. Count as at 1997 (Wotton & Gillings 2000) <i>Sylvia undata</i> 27.8% of the GB breeding population. Count as at 1999 (RSPB)"		No significant effects predicted due to the distance away from the site and no impact pathways. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

A.53 Raw Water System Upgrade - TLT Removal of Constraints - Construction

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-TFR_LON_ALL_tlt upgrade - roc	Raw Water System Upgrade - TLT Removal of Constraints - Construction	TLT reinforcement for a section of the tunnel, a new shaft 6m diameter at a depth of 30m and a new air valve	Lee Valley SPA: within option location	Article 4.1 Qualification: it is used regularly by 1% or more of the Great Britain population of a species listed on Annex I, in any season: Bittern <i>Botaurus stellaris</i> 6 individuals - wintering 6% (5 year peak mean 1992/93 - 1996/97) Article 4.2 Qualification: it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring	LSE	Construction activities may have adverse effects due to the option being located within the Habitats Site. Any construction activity at the site will disturb those features of the Habitats site that are reliant on the surrounding habitats for foraging, resting and breeding (if any). Construction dust (drilling, vehicle movements etc.), noise, air and chemical pollution all have the potential to impact on the features. Further abstraction for the reservoir may also impact on surrounding habitats and ecologically

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>migratory species (other than those listed on Annex I), in any season:</p> <p>Shoveler <i>Anas clypeata</i> 406 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 1.0% NW/Central Europe</p> <p>Gadwall <i>Anas strepera</i> 456 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 1.5% NW Europe.</p>		<p>functional habitats leading to drawdown and habitat loss.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>
			Lee Valley Ramsar: within option location	<p>Ramsar criterion 6:</p> <p>species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall , <i>Anas strepera</i> , NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)"</p>	LSE	<p>Construction activities may have adverse effects due to the option being located within the designated site. Any construction activity at the site will disturb those features of the Habitats site that are reliant on the surrounding habitats for foraging, resting and breeding (if any). Construction dust (drilling, vehicle movements etc.), noise, air and chemical pollution all have the potential to impact on the features.</p> <p>Further abstraction for the reservoir may also impact on surrounding habitats and ecologically functional habitats leading to drawdown and habitat loss.</p> <p>During construction and operation, LSE of the Option (alone) could not be ruled out at the screening stage.</p>
			Epping Forest SAC: Located 3.9km to the east	Annex I habitats that are a primary reason for selection of this site:	LSE	Construction activity at the site are not thought to have significant effects due to the distance from the site and no significant vehicle

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i>)</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p> <p>Annex II species that are a primary reason for selection of this site:</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p>		<p>movements limiting the amount of pollutants released into the atmosphere. The construction of the upgrade will not affect stag beetles due to the distance from the site and the fact that breeding females rarely travel greater than 1km from breeding grounds. There is also no supporting habitat close by to the option.</p> <p>Further abstraction for the reservoir may impact on ground water dependant system within the designated site potentially leading to the loss of designated features.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

A.54 New Reservoir - Marsh Gibbon 30Mm3 - Construction

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_STR_HI-RSR_RE1_CNO_res_marsh_gibbon	New Reservoir - Marsh Gibbon 30Mm3 - Construction	New non-impounding banded reservoir situated within Oxfordshire, 5km southwest of Marsh Gibbon with various volumes 30/50/70Mm ³	Oxford Meadows SAC is located approx. 5.5km north of the works.	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>6510 Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>)</p> <p>Together with North Meadow and Clattinger Farm, also in southern England, Oxford Meadows</p>	No Likely Significant Effect	<p>Given the distance separating the works from the Habitats site no impacts are predicted as a result of noise or air pollution. The N2K is located upstream of the option and as such will not be impacted by any run-off or pollution events.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>represents lowland hay meadows in the Thames Valley centre of distribution. The site includes vegetation communities that are perhaps unique in the world in reflecting the influence of long-term grazing and hay-cutting on lowland hay meadows. The site has benefited from the survival of traditional management, which has been undertaken for several centuries, and so exhibits good conservation of structure and function.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>Not Applicable</p> <p>Annex II species that are a primary reason for selection of this site</p> <p>1614 Creeping marshwort <i>Apium repens</i></p> <p>Oxford Meadows is selected because Port Meadow is the larger of only two known sites in the UK for creeping marshwort <i>Apium repens</i>.</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Not Applicable		
			<p>Little Wittenham SAC: located approximately 9.8km downstream</p>	<p>Annex I habitats that are a primary reason for selection of this site Not Applicable</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site Not Applicable</p> <p>Annex II species that are a primary reason for selection of this site 1166 Great crested newt <i>Triturus cristatus</i> One of the best-studied great crested newt sites in the UK, Little Wittenham comprises two main ponds set in a predominantly woodland context (broad-leaved and conifer woodland is present). There are also areas of grassland, with sheep grazing and arable bordering the woodland to the south and west. The River Thames is just to the north of the site, and a hill fort to the south. Large numbers of great crested newts <i>Triturus cristatus</i> have been recorded in the two main ponds, and research has revealed that they range several hundred metres into the woodland blocks.</p>	<p>No Likely Significant Effect</p>	<p>Changes in water quality of flows in the River Thames are unlikely to affect the qualifying species of the SAC.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Annex II species present as a qualifying feature, but not a primary reason for site selection Not Applicable		

A.55 Groundwater Development - Dorney Existing Source DO Increase

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWA_HI-GRW_ALL_ALL_dorney do	Groundwater Development - Dorney Existing Source DO Increase	Drilling of two new boreholes and provision of two new submersible pumps (one per BH) to increase the overall site capacity up to the source DO.	Windsor Forest & Great Park SAC (Distance 3.2km south)5.5km north of the works.	<p>Annex I habitats that are a primary reason for selection of this site: 9190 Old acidophilous oak woods with <i>Quercus robur</i> on sandy plains.</p> <p>Windsor represents old acidophilous oak woods in the south-eastern part of its UK range. It has the largest number of veteran oaks <i>Quercus spp.</i> in Britain (and probably in Europe), a consequence of its management as wood-pasture. It is of importance for its range and diversity of saproxylic invertebrates, including many rare species (e.g. the beetle <i>Lacon querceus</i>), some known in the UK only from this site, and has recently been recognised as having rich fungal assemblages. Windsor Forest and Great Park has been</p>	No LSE	<p>The proposed option is not hydrologically connected to this SAC. The proposed works to install two new pumps is unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the option and the SAC will also negate any impacts that may arise from dust pollution during the construction phase.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989).</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 9120 Atlantic acidophilous beech forests with <i>Ilex</i> and sometimes also <i>Taxus</i> in the shrublayer (<i>Quercion robori-petraeae</i> or <i>Illici-Fagenion</i>).</p> <p>Annex II species that are a primary reason for selection of this site: 1079 Violet click beetle <i>Limoniscus violaceus</i>.</p> <p>Violet click beetle <i>Limoniscus violaceus</i> was first recorded at Windsor Forest in 1937. The site is thought to support the largest of the known populations of this species in the UK. There is a large population of ancient trees on the site, which, combined with the historical continuity of woodland cover, has resulted in Windsor Forest being listed as the most important site in the UK for fauna associated with decaying timber on ancient trees (Fowles, Alexander & Key 1999). The site was also identified as of potential</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989).		
			Burnham Beeches SAC (Distance 6.4km north east)	<p>Annex I habitats that are a primary reason for selection of this site: 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (<i>Quercion robori-petraeae</i> or <i>Illici-Fagenion</i>).</p> <p>Burnham Beeches is an example of Atlantic acidophilous beech forests in central southern England. It is an extensive area of former beech wood-pasture with many old pollards and associated beech <i>Fagus sylvatica</i> and oak <i>Quercus spp.</i> high forest. Surveys have shown that it is one of the richest sites for saproxylic invertebrates in the UK, including 14 Red Data Book species. It also retains nationally important epiphytic communities, including the moss <i>Zygodon forsteri</i>."</p>	No LSE	<p>The proposed option is not hydrologically connected to this SAC. The proposed works to install two new pumps is unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the option and the SAC will also negate any impacts that may arise from dust pollution during the construction phase.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			Chilterns Beechwoods SAC (Distance 8.2km north west)	<p>Annex I habitats that are a primary reason for selection of this site: 9130 Asperulo-Fagetum beech forests.</p> <p>The Chilterns Beechwoods represent a very extensive tract of</p>	No Likely Significant Effect	<p>The proposed option is not hydrologically connected to any of the Chilterns Beechwoods SAC locations. The proposed works to install two new pumps is unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the option and the SAC will</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Asperulo-Fagetum beech forests in the centre of the habitat's UK range. The woodland is an important part of a grassland-scrub-woodland mosaic. A distinctive feature in the woodland flora is the occurrence of the rare coralroot <i>Cardamine bulbifera</i>.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites).</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection: 1083 Stag beetle <i>Lucanus cervus</i>."</p>		<p>also negate any impacts that may arise from dust pollution during the construction phase.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			South West London Waterbodies SPA (Distance 9.2km south east)	<p>The South West London Waterbodies SPA comprises a series of embanked water supply reservoirs and former gravel pits that support a range of man-made and semi-natural open-water habitats.</p> <p>The site qualifies under article 4.2 of the Directive (79/409/EEC) as it is used regularly by 1% or more of the biogeographical populations of the</p>	LSE	<p>This option proposes works to install two new pumps that are directly linked to the River Thames.</p> <p>The proposed option is hydrologically connected to the River Thames which is directly linked to the South West London Waterbodies SPA. During the works to install the new pumps, there is potential for increased sedimentation and surface water pollution that could travel along the River Thames and negatively impact the SAC habitats and the</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				following regularly occurring migratory species (other than those listed on Annex 1), in any season: gadwall <i>Anas strepera</i> and shoveler <i>Anas clypeata</i> "		<p>species for which it is designated: gadwall and shoveler.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			South West London Waterbodies Ramsar (Distance 9.2km south east)	<p>The South West London Waterbodies site comprises a series of reservoirs and former gravel pits that support internationally important numbers of wintering <i>Anas strepera</i> and <i>Anas clypeata</i>.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler <i>Anas clypeata</i>.</p> <p>Species with peak counts in winter:</p> <p>Gadwall <i>Anas strepera strepera</i>.</p>	LSE	<p>This option proposes works to install two new pumps that are directly linked to the River Thames.</p> <p>The proposed option is hydrologically connected to the River Thames which is directly linked to the South West London Waterbodies Ramsar. During the works to install the new pumps, there is potential for increased sedimentation and surface water pollution that could travel along the River Thames and negatively impact the Ramsar habitats and the species for which it is designated: gadwall and shoveler."</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

A.56 Groundwater Development - Taplow Existing Source DO Increase

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWA_HI-GRW_ALL_ALL_taplowincreasedo	Groundwater Development - Taplow Existing Source DO Increase	Aims to increase SDO up to licensed quantities. This is expected to bring peak SDO from 44M/d to 50M/d. The scope is as follows: increase Taplow to peak licence (50M/d) by drilling a new chalk abstraction borehole at the Dorney WTW site but added to the Taplow abstraction licence. Adding two pumps, duty/stand-by fitted with variable speed drives (VSDs). 300m rising main and 300m run to waste.	Burnham Beeches SAC (Distance 4.4km north east)	<p>Annex I habitats that are a primary reason for selection of this site: 9120 Atlantic acidophilous beech forests with <i>Ilex</i> and sometimes also <i>Taxus</i> in the shrublayer (<i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i>).</p> <p>Burnham Beeches is an example of Atlantic acidophilous beech forests in central southern England. It is an extensive area of former beech wood-pasture with many old pollards and associated beech <i>Fagus sylvatica</i> and oak <i>Quercus spp.</i> high forest. Surveys have shown that it is one of the richest sites for saproxylic invertebrates in the UK, including 14 Red Data Book species. It also retains nationally important epiphytic communities, including the moss <i>Zygodon forsteri</i>.</p>	No LSE	<p>The site of the proposed works are not hydrologically connected to this SAC and therefore unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the works and the SAC will also negate any impacts that may arise from dust pollution during the construction phase.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			Chilterns Beechwoods SAC (Distance 6.8km north west)	<p>Annex I habitats that are a primary reason for selection of this site: 9130 Asperulo-Fagetum beech forests.</p> <p>The Chilterns Beechwoods represent a very extensive tract of Asperulo-Fagetum beech forests in</p>	No LSE	The proposed works are not hydrologically connected to any of the Chilterns Beechwoods SAC location. The works are unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the unknown works and the SAC will also negate any impacts

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>the centre of the habitat's UK range. The woodland is an important part of a grassland-scrub-woodland mosaic. A distinctive feature in the woodland flora is the occurrence of the rare coralroot <i>Cardamine bulbifera</i>.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites).</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection: 1083 Stag beetle <i>Lucanus cervus</i>.</p>		<p>that may arise from dust pollution during the construction phase.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			Windsor Forest & Great Park SAC (Distance 5.3km south)	<p>Annex I habitats that are a primary reason for selection of this site: 9190 Old acidophilous oak woods with <i>Quercus robur</i> on sandy plains.</p> <p>Windsor represents old acidophilous oak woods in the south-eastern part of its UK range. It has the largest number of veteran oaks <i>Quercus spp.</i> in Britain (and probably in Europe), a consequence of its management as wood-pasture. It is of importance</p>	No LSE	<p>The proposed works are not hydrologically connected to the Windsor Forest & Great Park SAC. The works are unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the unknown works and the SAC will also negate any impacts that may arise from dust pollution during the construction phase.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>for its range and diversity of saproxylic invertebrates, including many rare species (e.g. the beetle <i>Lacon querceus</i>), some known in the UK only from this site, and has recently been recognised as having rich fungal assemblages. Windsor Forest and Great Park has been identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989).</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 9120 Atlantic acidophilous beech forests with <i>Ilex</i> and sometimes also <i>Taxus</i> in the shrublayer (<i>Quercion robori-petraeae</i> or <i>Illici-Fagenion</i>).</p> <p>Annex II species that are a primary reason for selection of this site: 1079 Violet click beetle <i>Limoniscus violaceus</i>.</p> <p>Violet click beetle <i>Limoniscus violaceus</i> was first recorded at Windsor Forest in 1937. The site is thought to support the largest of the known populations of this species in the UK. There is a large population of ancient trees on the site, which, combined with the</p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				historical continuity of woodland cover, has resulted in Windsor Forest being listed as the most important site in the UK for fauna associated with decaying timber on ancient trees (Fowles, Alexander & Key 1999). The site was also identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989)."		
			South West London Waterbodies SPA (Distance 9.9km south east)	<p>The South West London Waterbodies SPA comprises a series of embanked water supply reservoirs and former gravel pits that support a range of man-made and semi-natural open-water habitats.</p> <p>The site qualifies under article 4.2 of the Directive (79/409/EEC) as it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex 1), in any season: gadwall <i>Anas strepera</i> and shoveler <i>Anas clypeata</i>"</p>	LSE	<p>A worst case scenario has been adopted and it has been assumed that the proposed works will be hydrologically connected to the River Thames. As such there is potential for works to have an impact on the SPA through increased sedimentation and surface water run-off, thus potentially impacting the species for which it is designated: gadwall and shoveler.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			South West London Waterbodies	The South West London Waterbodies site comprises a series of reservoirs and former gravel pits that support	LSE	<p>A worst case scenario has been adopted and it has been assumed that the proposed works will be hydrologically connected to the River Thames. As such. there is potential for works to have an</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Ramsar (Distance 9.9km south east)	<p>internationally important numbers of wintering <i>Anas strepera</i> and <i>Anas clypeata</i>.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler <i>Anas clypeata</i>.</p> <p>Species with peak counts in winter:</p> <p>Gadwall <i>Anas strepera strepera</i>.</p>		<p>impact on the Ramsar through increased sedimentation and surface water run-off, thus potentially impacting the species for which it is designated: gadwall and shoveler.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

A.57 New Medmenham Surface Water WTW

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWA_HI-ROC_WT1_CN O_medmenha mwtw	New Medmenham Surface Water WTW	24MU/d treatment works for river water near Medmenham (SWA). Purpose is to accommodate additional future demand. Includes a treated water pumping station, treated water transfer pipeline and new storage reservoir at Widdenton.	Chilterns Beechwoods SAC 2.2km east	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>9130 Asperulo-Fagetum beech forests</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p>	No LSE	<p>No effect pathways identified between the Habitats Site and the option.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites)</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p>		

A.58 Henley to SWA Transfer – 2.4MI/d and 5MI/d

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
<p>TWU_SWA_HI-TFR_HEN_ALL_henley-swa2.4</p> <p>TWU_SWA_HI-TFR_HEN_ALL_henley-swa5</p>	<p>Henley to SWA Transfer - 2.4MI/d and 5MI/d</p>	<p>The option is for one new main from Sheeplands WTW (Henley) to Hambleden WTW (SWA). This will require a new 9.94km main from Sheeplands WTW and a new pumping station at Sheeplands.</p>	<p>Chilterns Beechwoods SAC: 6.1km to the east</p>	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>9130 Asperulo-Fagetum beech forests</p> <p>The Chilterns Beechwoods represent a very extensive tract of Asperulo-Fagetum beech forests in the centre of the habitat's UK range. The woodland is an important part of a grassland-scrub-woodland mosaic. A distinctive feature in the woodland flora is the occurrence of the rare coralroot <i>Cardamine bulbifera</i>.</p>	No LSE	<p>This option involves the construction of a new pipeline that will cross the River Thames upstream from the Habitats site. The Habitats Site is not groundwater dependant and therefore no significant effects are likely.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites)</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection:</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p>		

A.59 New Medmenham Surface Water Intake - 53 MI/d

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWA_HI-TFR.UTC_ALL_medmenham intake 53/80	New Medmenham Surface Water Intake - 53 MI/d	The Medmenham intake element includes the construction of an intake structure on the River Thames located approximately 1.75km west of the village of Medmenham, close to the	Chilterns Beechwoods SAC 2.5km north east	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>9130 Asperulo-Fagetum beech forests</p>	No LSE	Given the distance separating the works from the Habitats site no impacts are predicted as a result of noise or air pollution. The works are not hydrologically connected to the Habitats site and as such are not at risk of run-off or pollution events.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
		village of Mill End. In addition to the intake structure, a pumping station will be constructed. The intake structure, pumping station and raw water transfer main would supply water from the River Thames to a new water treatment works at Medmenham. The intake and all associated infrastructure will be constructed with an abstraction capacity of either 53MU/d or 80MU/d.		Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) Annex II species present as a qualifying feature, but not a primary reason for site selection 1083 Stag beetle <i>Lucanus cervus</i>		During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

A.60 New WTW - Radcot

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-ROC_WT1_ALL_radcotwtw	New WTW – Radcot	24 MLD Treatment works for reservoir water in Radcot (SWOX). Purpose is to accommodate additional future demand.	North Meadow and Clattinger Farm SAC is located approx. 6.1km northwest of the southern extent of the pipeline in Blunsdon St Andrew	Annex I habitats that are a primary reason for selection of this site 6510 Lowland hay meadows (<i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i>) North Meadow and Clattinger Farm in the Thames Valley in southern England is one of two sites representing lowland hay meadows near the centre of its UK range. As in the case of the Oxford Meadows,	No LSE	The Habitats site is sufficiently distanced to negate impacts from air pollution. Furthermore no hydrological connection exists between the pipeline route and the Habitats site which could result in impacts from run-off, changed to groundwater etc. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>this site represents an exceptional survival of the traditional pattern of management and so exhibits a high degree of conservation of structure and function. This site also contains a very high proportion (>90%) of the surviving UK population of fritillary <i>Fritillaria meleagris</i>, a species highly characteristic of damp lowland meadows in Europe and now rare throughout its range.</p>		
			<p>Oxford Meadows SAC: located approx. 28.95km downriver on the River Thames to the north-east.</p>	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>6510 Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>)</p> <p>Together with North Meadow and Clattinger Farm, also in southern England, Oxford Meadows represents lowland hay meadows in the Thames Valley centre of distribution. The site includes vegetation communities that are perhaps unique in the world in reflecting the influence of long-term grazing and hay-cutting on lowland hay meadows. The site has benefited from the survival of traditional management, which has been undertaken for several centuries, and so exhibits good</p>	LSE	<p>Uncertain impacts of pipeline construction on Oxford Meadows SAC downstream.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>conservation of structure and function.</p> <p>Annex II species that are a primary reason for selection of this site</p> <p>1614 Creeping marshwort <i>Apium repens</i></p> <p>Oxford Meadows is selected because Port Meadow is the larger of only two known sites in the UK for creeping marshwort <i>Apium repens</i>.</p>		

A.61 New Shaft on the TWRM at Kempton

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_WLJ_HI-ROC_NET_CN O_twrn shaft kempton	New shaft on the TWRM at Kempton - Construction	This option includes a new shaft on the TWRM to accommodate 800ML/d of treated water flow from the expanded Kempton WTW	South West London Waterbodies Ramsar: Located app. 320m to the east.	<p>Ramsar criterion 6: species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler, <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of</p>	LSE	<p>Construction activities such as lighting at night, dust created from construction, vibration from the new shaft and noise from construction traffic have the potential to disturb those designated features of the site due to the close proximity to the site. Vehicle emissions from construction vehicles moving across the site may lead to higher levels of oxides within the nearby Ramsar leading to increased nutrient levels leading to disturbances on the designated features.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall, <i>Anas strepera</i> , NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)</p>		<p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			<p>South West London Waterbodies SPA: Located app. 320m to the east</p>	<p>ARTICLE 4.2 QUALIFICATION (79/409/EEC)</p> <p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex 1), in any season:</p> <p>Gadwall <i>Anas strepera</i> 710 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.4 % NW Europe</p> <p>Shoveler <i>Anas clypeata</i> 853 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.1 % NW/Central Europe</p>		<p>Construction activities such as lighting at night, dust created from construction, vibration from the new shaft and noise from construction traffic have the potential to disturb those designated features of the site due to the close proximity to the site. Vehicle emissions from construction vehicles moving across the site may lead to higher levels of oxides within the nearby SPA leading to increased nutrient levels leading to disturbances on the designated features.</p>

A.62 Additional conveyance from Queen Marry Reservoir to Kempton WTW

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_WLJ_HI-TFR_WLJ_CNO_qm res-kempton wtw	Additional conveyance from Queen Mary Reservoir to Kempton WTW - Construction	New conveyance of raw water from Queen Mary Reservoir to Kempton WTW.	South West London Waterbodies Ramsar: 500m to the east of the Kempton WTW	<p>Ramsar criterion 6: species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9-2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall, <i>Anas strepera strepera</i>, NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3)</p>	LSE	<p>This option involves the transportation of raw water from QMR to Kempton Park WTW. Construction activities near the Kempton Park WTW may lead to dust, noise and air pollution in the local area which may have an effect on the designated features of the site.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			South West London SPA: 500m to the east of the Kempton WTW	<p>ARTICLE 4.2 QUALIFICATION (79/409/EEC):</p> <p>it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex 1), in any season:</p>	LSE	<p>This option involves the transportation of raw water from QMR to Kempton Park WTW. Construction activities near the Kempton Park WTW may lead to dust, noise and air pollution in the local area which may have an effect on the designated features of the site.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Gadwall <i>Anas strepera</i> 710 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.4 % NW Europe</p> <p>Shoveler <i>Anas clypeata</i> 853 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.1 % NW/Central Europe"</p>		<p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			<p>Richmond Park SAC: 7.7km to the east</p>	<p>Annex II species that are a primary reason for selection of this site:</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p>	No LSE	<p>This option involves the transportation of raw water from QMR to Kempton Park WTW. No likely effects predicted on the Habitats site from construction activities due to the distance between the option and no direct hydrological links.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			<p>Windsor Forest & Great Park SAC: 9.9km west</p>	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>9190 Old acidophilous oak woods with <i>Quercus robur</i> on sandy plains</p> <p>Windsor represents old acidophilous oak woods in the south-eastern part of its UK range. It has the largest number of veteran oaks <i>Quercus</i> spp. in Britain (and probably in Europe), a consequence of its management as wood-pasture. It is of importance</p>	No LSE	<p>This option involves the transportation of raw water from QMR to Kempton Park WTW. No likely effects predicted on the Habitats site from construction activities due to the distance between the option and no direct hydrological links.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>for its range and diversity of saproxylic invertebrates, including many rare species (e.g. the beetle <i>Lacon querceus</i>), some known in the UK only from this site, and has recently been recognised as having rich fungal assemblages. Windsor Forest and Great Park has been identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989).</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (<i>Quercion robori-petraeae</i> or <i>Illici-Fagenion</i>)</p> <p>Annex II species that are a primary reason for selection of this site:</p> <p>1079 Violet click beetle <i>Limoniscus violaceus</i></p>		
			<p>Thursley, Ash, Pirbright & Chobham SAC: 9.3km to the south-west</p>	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p>	<p>No LSE</p>	<p>This option involves the transportation of raw water from QMR to Kempton Park WTW. No likely effects predicted on the Habitats site from construction activities due to the distance between the option and no direct hydrological links.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>This site represents lowland northern Atlantic wet heaths in south-east England. The wet heath at Thursley is NVC type M16 <i>Erica tetralix</i> – Sphagnum compactum and contains several rare plants, including great sundew <i>Drosera anglica</i>, bog hair-grass <i>Deschampsia setacea</i>, bog orchid <i>Hammarbya paludosa</i> and brown beak-sedge <i>Rhynchospora fusca</i>. There are transitions to valley bog and dry heath. Thursley Common is an important site for invertebrates, including the nationally rare white-faced darter <i>Leucorhina dubia</i>.</p> <p>4030 European dry heaths</p> <p>This south-east England site contains a series of large fragments of once-continuous heathland. It is selected as a key representative of NVC type H2 <i>Calluna vulgaris</i> – Ulex minor dry heathland. This heath type has a marked south-eastern and southern distribution. There are transitions to wet heath and valley mire, scrub, woodland and acid grassland, including types rich in annual plants. The European dry heaths support an important assemblage of animal species, including numerous rare and local invertebrate species, European</p>		<p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>nightjar <i>Caprimulgus europaeus</i>, Dartford warbler <i>Sylvia undata</i>, sand lizard <i>Lacerta agilis</i> and smooth snake <i>Coronella austriaca</i>.</p> <p>7150 Depressions on peat substrates of the Rhynchosporion</p> <p>This site contains examples of Depressions on peat substrates of the Rhynchosporion in south-east England, where it occurs as part of a mosaic associated with valley bog and wet heath. The vegetation is found in natural bog pools of patterned valley mire and in disturbed peat of trackways and former peat-cuttings.</p>		
			Thames Basin Heaths SPA: 9.4km to the south	<p>ARTICLE 4.1 QUALIFICATION (79/409/EEC):</p> <p>During the breeding season the area regularly supports:</p> <p><i>Caprimulgus europaeus</i> 7.8% of the GB breeding population. Count mean (RSPB 1998-99)</p> <p><i>Lullula arborea</i> 9.9% of the GB breeding population. Count as at 1997 (Wotton & Gillings 2000)</p>		<p>This option involves the transportation of raw water from QMR to Kempton Park WTW. No likely effects predicted on the Habitats site from construction activities due to the distance between the option and no direct hydrological links.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<i>Sylvia undata</i> 27.8% of the GB breeding population. Count as at 1999 (RSPB)"		

A.63 New Reservoir - Chinnor 30Mm3 - Construction

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI- RSR_RE1_CNO _res_chinnor_2	New Reservoir - Chinnor 30Mm3 - Construction	New non-impounding bunded reservoir situated within Oxfordshire, 5km southwest of Chinnor with a volume of 30Mm ³	Chilterns Beechwoods SAC (2.3km to the SE of the proposed option)	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>9130 <i>Asperulo-Fagetum</i> beech forests</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites)</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p>	No LSE	<p>The proposed reservoir appears to connect to the River Thames in two locations. A connection to the SW using over 19km of potentially new pipeline and to the River Thames at Thame, NW of the proposed reservoir with over 6km of pipeline.</p> <p>There are no effect pathways predicted that could cause effects on the qualifying features of the SAC site. The proposed pipeline is sited at a significant distance - approximately 2.3km from the qualifying features within the SAC and the designated site does not appear to be hydrologically connected to the proposed works.</p> <p>SSSIs within 2km of the proposed pipeline's construction do not correlate significantly with the qualifying species and habitats of the SAC and are also some distance from the proposed works. For example, the closest SSSI, Knightsbridge Lane is just over 0.5km to the SE of the proposed pipeline. and its principal listed features are not considered to correlate significantly with those of the SAC.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.
			Little Wittenham SAC (Distance 3.1km west)	<p>Annex II species that are a primary reason for selection of this site: 1166 Great crested newt <i>Triturus cristatus</i>.</p> <p>One of the best-studied great crested newt sites in the UK, Little Wittenham comprises two main ponds set in a predominantly woodland context (broad-leaved and conifer woodland is present). There are also areas of grassland, with sheep grazing and arable bordering the woodland to the south and west. The River Thames is just to the north of the site, and a hill fort to the south. Large numbers of great crested newts <i>Triturus cristatus</i> have been recorded in the two main ponds, and research has revealed that they range several hundred metres into the woodland blocks.</p>	LSE	<p>The proposed option is hydrologically connected to the River Thames which is directly linked to the SAC. During the construction of the reservoir there is the possibility of sediment discharge and pollution into the River Thames that could negatively impact SAC habitat and the species for which it is designated: the great crested newt.</p> <p>During construction, LSE of the Option (alone) could not be ruled out at the screening stage.</p> <p>During operation, LSE of the option (alone) has been ruled out at the screening stage.</p>
			Aston Rowant SAC (Distance 3.1km east)	Annex I habitats that are a primary reason for selection of this site: 5130 <i>Juniperus communis</i> formations on heaths or calcareous grasslands.	No LSE	The proposed option is not hydrologically connected to Aston Rowant SAC. The proposed reservoir does not cross any substantial watercourses that are interconnected to the SAC. Furthermore, the distance also negates impacts

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Aston Rowant represents <i>Juniperus communis</i> formations near the northern edge of the habitat's range on the chalk of southern England where it is rare and declining. The juniper population has been estimated to be between 1,000 and 2,000 individuals of various age-classes. It is one of the best remaining examples in the UK of lowland juniper scrub on chalk.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 9130 <i>Asperulo-Fagetum</i> beech forests</p>		<p>resulting from dust pollution during the construction phase.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>

A.64 STT to SESRO Link

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_STT_HI-TFR_STT_ALL_s tt-sesro	STT to SESRO Link	Potential increase in DO by integrating the Severn to Thames Transfer (STT) pipeline and the Abingdon Reservoir Strategic Resource Options (SROs).	Little Wittenham SAC (8.4km east of proposed option)	<p>Annex II species that are a primary reason for selection of this site</p> <p>1166 Great crested newt <i>Triturus cristatus</i></p> <p>One of the best-studied great crested newt sites in the UK, Little Wittenham comprises two main ponds set in a predominantly</p>	No LSE	Option is located 8.4km upstream from SAC. Construction of the option will not have a significant effect upon the designated feature due to the distance from the site, limited hydrological connectivity and major infrastructure barriers to the features movement.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				woodland context (broad-leaved and conifer woodland is present). There are also areas of grassland, with sheep grazing and arable bordering the woodland to the south and west. The River Thames is just to the north of the site, and a hill fort to the south. Large numbers of great crested newts <i>Triturus cristatus</i> have been recorded in the two main ponds, and research has revealed that they range several hundred metres into the woodland blocks.		During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.
			Cothill Fen SAC (4.4km north of proposed option)	Annex I habitats that are a primary reason for selection of this site 7230 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 <i>Schoenus nigricans</i> – <i>Juncus subnodulosus</i> vegetation found here occurs under a wide range of hydrological conditions, with frequent bottle sedge <i>Carex rostrata</i> , grass-of-Parnassus <i>Parnassia palustris</i> , common butterwort <i>Pinguicula vulgaris</i> and marsh helleborine <i>Epipactis palustris</i> . The alkaline fen	No LSE	No viable effects pathway between SAC and site. SAC is located 4.4.km from site, at this distance any adverse construction impacts from dust, air and lighting effects are unlikely to affect SAC. No effects on Habitats site and qualifying species predicted. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>vegetation forms transitions to other vegetation types that are similar to M24 <i>Molinia caerulea</i> – <i>Cirsium dissectum</i> fen-meadow and S25 <i>Phragmites australis</i> – <i>Eupatorium cannabinum</i> tall-herb fen and wet alder <i>Alnus</i> spp. wood.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) * Priority feature</p>		

A.65 Didcot Power Station Licence Trading

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-OTH_ALL_ALL_didcot purchase	Didcot Power Station Licence Trading	The option extends the current agreement which is in place from AMP7 between Thames Water and RWE NPower.	N/A	N/A	No Likely Significant Effect	Existing agreement between Thames Water and RWE NPower. No additional effects.

A.66 Transfer from SES WTW to Merton TWRM shaft

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-TFR_SES_ALL_chemamerton	Transfer from SES WTW to Merton TWRM shaft	Proposed new trunk mains to transfer water from Cheam WTW (SES) to Merton Ring Main Shaft including a new PS at Cheam WTW.	Wimbledon Common SAC 3.2km north west	<p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p> <p>Annex II species that are a primary reason for selection of this site</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p> <p>Wimbledon Common has a large number of old trees and much fallen decaying timber. It is at the heart of the south London centre of distribution for stag beetle <i>Lucanus cervus</i>, and a relatively large number of records were received from this site during a recent nationwide survey for the species (Percy et al. 2000). The site supports a number of other scarce invertebrate species associated with decaying timber.</p>	No Likely Significant Effect	<p>Habitats site is considered at enough of a distance (3.2km) not to be at risk from direct effects from the proposed option. Although the Habitats site is located downstream from the proposed option, the site is unlikely to experience any significant increase in pollution as a result of the construction activities due to the distance across a largely built up area and the lack of hydrological connection.</p> <p>During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.</p>
			Richmond Park SAC 5.8km north west	<p>Annex II species that are a primary reason for selection of this site</p> <p>1083 Stag beetle <i>Lucanus cervus</i></p>		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Richmond Park has a large number of ancient trees with decaying timber. It is at the heart of the south London centre of distribution for stag beetle <i>Lucanus cervus</i> , and is a site of national importance for the conservation of the fauna of invertebrates associated with the decaying timber of ancient trees.	No Likely Significant Effect	any significant increase in pollution as a result of the construction activities due to the distance across a largely built up area and the lack of hydrological connection. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.
			South West London Waterbodies SPA and Ramsar 12km west	<p>General Overview of The Site (S12) Information Sheet on Ramsar Wetlands (RIS)</p> <p>The South West London Waterbodies site comprises a series of reservoirs and former gravel pits that support internationally important numbers of wintering <i>Anas strepera</i> and <i>Anas clypeata</i></p> <p>Justification for the Application of Each Ramsar Criterion (S14)</p> <p>Ramsar criterion 6</p> <p>species/population occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p>		Habitats site is considered at enough of a distance (12km) to not be at risk from direct effects from the proposed option. The Habitats site is unlikely to experience any significant increase in pollution as a result of the construction activities due to the distance across a largely built up area and the lack of hydrological connection. During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>Northern shoveler , <i>Anas clypeata</i>, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9- 2002/3)</p> <p>Species with peak counts in winter:</p> <p>Gadwall , <i>Anas strepera strepera</i>, NW Europe 487 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9- 2002/3)</p> <p>General Ecological Features (S20)</p> <p>Open water, plus associated wetland habitats including grassland and woodland supporting a number of wetland plant and animal species including internationally important numbers of wintering wildfowl.</p>		
			<p>Mole Gap to Reigate Escarpment (SAC) 11km south west</p>	<p>Annex I habitats that are a primary reason for selection of this site</p> <p>5110 Stable xerothermophilous formations with <i>Buxus sempervirens</i> on rock slopes (Berberidion p.p.)</p> <p>6210 Semi-natural dry grasslands and scrubland facies on calcareous</p>	No Likely Significant Effect	<p>Habitats site is considered at enough of a distance (11km) not to be at risk from direct effects from the proposed option. The Habitats site is unlikely to experience any significant increase in pollution as a result of the construction activities due to the distance across a largely built up area and the lack of hydrological connection.</p>

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				<p>substrates (<i>Festuco-Brometalia</i>) (* important orchid sites)</p> <p>91J0 <i>Taxus baccata</i> woods of the British Isles * Priority feature</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>4030 European dry heaths</p> <p>9130 <i>Asperulo-Fagetum</i> beech forests</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection</p> <p>1166 Great crested newt <i>Triturus cristatus</i></p> <p>1323 Bechstein's bat <i>Myotis bechsteinii</i></p>		During construction and operation, LSE of the Option (alone) has been ruled out at the screening stage.

A.67 Groundwater Development - Removal of Constraints to Dapdune DO

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_GUI_HI-GRW_ALL_ALL-dapdune roc	Groundwater Development - Removal of	Removal of the current constraints on the DO at the Dapdune source. Increase in pump capacity at Dapdune	Thames Basin Heaths SPA is 2.5km north	<p>Article 4.1 Qualification</p> <p>During the breeding season the SPA regularly supports 1% or more of</p>	No Likely Significant Effect	The SPA is located to the north of the pump upgrades. The site is not hydrologically connected to the River Wey which will see an increase in abstraction as a result of the works and as such

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
	Constraints to Dapdune DO	boreholes with an additional 4 rapid gravity filters at Ladymead WTW to treat.		<p>the Great Britain (GB) populations of the following species listed in Annex I:</p> <ul style="list-style-type: none"> • A302 Dartford Warbler (<i>Sylvia undata</i>) – 27.8% of the GB population • A224 Nightjar (<i>Caprimulgus europaeus</i>) – 7.8% of the GB population • A246 Woodlark (<i>Lullula arborea</i>) – 9.9% of the GB population <p>Non-qualifying species of interest</p> <p>Hen harrier <i>Circus cyaneus</i>, merlin <i>Falco columbarius</i>, short-eared owl <i>Asio flammeus</i> and kingfisher <i>Alcedo atthis</i> (all Annex I species) occur in nonbreeding numbers of less than European importance (less than 1% of the GB population).</p>		will not be impacted by the increase in abstraction. While the SPA is situated on a GWDTE it is not fed by the River Wey or its tributaries. The option will see small scale upgrades to two pump locations, works will be localised to these locations which are on hardstanding areas and as such are not suitable for any of the qualifying features.

B. Designated Site Information

B.1 Cothill Fen SAC (UK0012889)

B.1.1 Description

Cothill Fen is an exceptionally important site with an outstanding range of nationally rare habitats which support a large number of rare invertebrates and plants.

The habitats consist of calcareous fen, calcareous grassland, woodland and scrub of varying degrees of wetness. The habitat supports over 330 species of vascular plant and over 120 nationally scarce or rare invertebrates, including the nationally rare southern damselfly (*Coenagrion mercuriale*)³⁰.

B.1.2 Qualifying features

The site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I³¹:

- 7230. Alkaline fens; Calcium-rich springwater-fed fens
- 91E0. Alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*) (*Alno-Padion*, *Alnion incanae*, *Salicion albae*). Alder woodland on floodplains are Annex I priority habitats.

B.1.3 Conservation objectives

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change. 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. Alkaline fens consist of a complex assemblage of wetland vegetation characteristic of sites where there is tufa and/or peat formation with a high water table and a calcareous base-rich water supply. The M13 (*Schoenus nigricans*) - (*Juncus subnodulosus*) vegetation type found here occurs under a wide range of hydrological conditions.

Alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*), comprise dynamic woods that are part of a successional series of habitats. Their structure and function are best maintained within a larger unit that includes the open communities, mainly fen and swamp, of earlier successional stages. They also occur as a stable component within transitions to surrounding dry-ground forest, sometimes including other Annex I woodland types. These transitions from wet to drier woodland and from open to more closed communities provide an important facet of ecological variation³².

B.1.4 Pressures and threats

The Site Improvement Plan³³ has identified the following issues for the site and the features they may affect:

- **Water pollution:** Water samples from streams, ponds and ditches at Parsonage Moor and //Cothill National Nature Reserve (NNR) show high nitrate levels. Further water quality monitoring, together with monitoring of

³⁰ Improvement Programme for England's Natura 2000 sites (IPENS) (2014). Site Improvement Plan Cothill Fen SAC

³¹ English Nature (2005). EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora. Citation for Special Area of Conservation (SAC)

³² Natural England (2016). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Cothill Fen Special Area of Conservation (SAC) Site code: UK0012889

³³ Improvement Programme for England's Natura 2000 sites (IPENS) (2014). Site Improvement Plan Cothill Fen SAC

vegetation and invertebrate populations, on Parsonage Moor, the NNR and Lashford Lane Fen needs to be carried out to identify sources, pathways and potential means of reducing nitrate levels, and to understand the effects of diffuse nitrate pollution on fen vegetation and invertebrate communities.

- **Hydrological changes:** There is concern that fen areas of Cothill Fen SAC may be becoming drier, and that this may be affecting populations of rare fen plants and invertebrates. This needs to be investigated by carrying out hydrological studies of the fen, and detailed studies of vegetation & invertebrates.
- **Air pollution:** Modelled nitrogen deposition exceeds site relevant critical load for the rich calcareous fen feature. Excess reed growth in unit 2 (Parsonage Moor & Cothill Fen NNR) which supports southern damselfly, could potentially be related to atmospheric nitrogen deposition.

B.2 Hartslock Wood SAC (UK0030164)

B.2.1 Description

Hartslock Wood SAC was classified on 1 April 2005 and comprises areas of mosaic of chalk grassland, chalk scrub and broadleaved woodland, and one of the few examples of ancient yew (*Taxus baccata*) wood in the Chilterns. The chalk grassland consists mainly of close-grazed, species-rich turf and supports one of only three UK populations of monkey orchid (*Orchis simia*). The site comprises an area of approximately 34.24 ha and shares a boundary with component SSSI Hartslock SSSI.³⁴

B.2.2 Qualifying features

Qualifying habitats: The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

- Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco Brometalia*) [6210] (important orchid sites). (Dry grasslands and scrublands on chalk or limestone, including important orchid sites)*
- (*Taxus baccata*) [91J0] woods of the British Isles. (Yew-dominated woodland)*

This site is designated for Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) ('important orchid sites'*). These grasslands are generally found on thin, well-drained, lime-rich soils associated with underlying chalk and limestone geology. A large number of rare plants are associated with this habitat and its associated invertebrate fauna can also be noteworthy. This SAC is also distinctive in hosting the priority habitat type "orchid rich sites" and important populations of at least one nationally uncommon orchid species or one or several orchid species considered to be rare, very rare or exceptional in the UK.

This site is also designated for (*Taxus baccata*) woods of the British Isles ('yew-dominated woodland'*). This occurs on shallow, dry soils usually on chalk or limestone slopes, but in a few areas stands on more mesotrophic soils are found. The habitat corresponds to NVC type W13 (*Taxus baccata*) woodland (Rodwell, 1991). Within this community yew tends to be overwhelmingly dominant and is usually associated with a very sparse shrub and tree layer.

B.2.3 Conservation objectives

Maintaining the total extent of the features, maintaining its distribution and configuration, maintaining its vegetation composition, structure, class and layers are essential for this site success.³⁵

³⁴ English Nature (2005). EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora Citation for Special Area of Conservation (SAC)

³⁵ Natural England (2016) European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Hartslock Wood Special Area of Conservation (SAC) Site code: UK0030164

B.2.4 Pressures and threats

The Site Improvement Plan³⁶ has identified the following issues for the site and the features they may affect:

Air pollution and the impact of nitrogen deposition has been identified as a threat to Dry grasslands and scrublands on chalk or limestone (important orchid sites) and Yew dominated woodland. It is proposed the impacts of atmospheric nitrogen deposition will be investigated by Natural England.

B.3 Kennet & Lambourn Floodplain SAC (UK0030044)

B.3.1 Description

The Kennet and Lambourn Floodplain SAC is situated in the river valleys of the Lambourn and Kennet in the Berkshire and Marlborough Downs (NE482) and Thames Basin Heaths National Character Areas (NE530). The underlying geology is chalk. The site is particularly important as it has a significant concentration of areas supporting a threatened species of snail - the desmoulin's whorl snail (*Vertigo moulinsiana*) [1016]. This species inhabits permanently wet habitats, particularly riverside fen, sedge beds and swamps. Parts of the SAC are former water-meadows managed by extensive cattle grazing but most areas are fringing, riverside or ditch-side vegetation which receives little management intervention. Part of the site is managed as a Local Nature Reserve with open public access.

B.3.2 Qualifying features

Desmoulin's whorl snail is widely distributed along the valleys of both the River Kennet between just downstream of Marlborough and to the east of Newbury, and on the River Lambourn between Welford and Newbury. The areas selected for inclusion in the SAC were, at the time of designation, the areas known to support particularly high populations of this snail.

The supporting habitats are mostly dominated by lesser pond-sedge (*Carex acutiformis*), greater pond-sedge (*Carex riparia*) or reed sweet-grass (*Glyceria maxima*) and are usually unshaded or partly shaded. The snail inhabits a particular 'zone' in the transition between truly aquatic habitat and terrestrial habitat where ground conditions are permanently wet and humid, but not subject to significant flooding or rapid flow of surface water. The snail feeds on minute algae on the surface of leaves and over-winter in the leaf litter above the ground layer of peat. The areas of supporting habitat are all fed by calcareous or base-rich groundwater which appears to be an important factor in providing suitable environmental conditions

B.3.3 Conservation objectives

Desmoulin's whorl snail populations are sensitive to changes in land management, particularly management neglect which results in increased shading due to an increase in scrub or tree cover, drainage of fens and lowering of the water table, increased grazing intensity or mowing of riverside vegetation for fishery management. The species may also be strongly susceptible to the effects of climate change. In particular, prolonged periods of exceptional flooding and high river flow rates may deplete colonies, and subsequent recovery may take many years if colonies are isolated. Conservation objectives encompasses³⁷:

- Management measures (either within and/or outside the site boundary)
- Extent of supporting habitat for this snail
- Supporting processes to absorb or adapt to wider environmental changes (given this SAC high sensitivity to climate change and this snail high dependency of humidity)

³⁶ Improvement Programme for England's Natura 2000 sites (IPENS) (2015). Site Improvement Plan Hartslock Wood

³⁷ <http://publications.naturalengland.org.uk/publication/6261183967395840>

- Supporting processes to maintain the soil properties (including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, within typical values for the supporting habitat)
- Supporting processes to maintain (or restore where appropriate) water quality and quantity to a standard which provides the necessary conditions to support Desmoulin's whorl snail habitat.

B.3.4 Pressures and threats

This Site Improvement Plan³⁸ identifies three pressures (siltation, spread of invasive species and water pollution) and seven threats (hydrological changes, inland flood defence works, inappropriate cutting/mowing, change in inland management, inappropriate water levels, hydrological changes and water pollution).

B.4 Kennet Valley Alderwoods SAC (UK0030175)

B.4.1 Description

Kennet Valley Alderwoods SAC is composed of two blocks of wet woodland situated on the floodplain of the River Kennet, a tributary of the River Thames, which rises in the Berkshire and Marlborough Downs. These woodlands are the largest remaining fragments of damp, ash-alder woodland in the Kennet floodplain. They are situated on alluvial soils, overlain by a shallow layer of moderately calcareous peat through most of the woodland. The water table is relatively high, giving a range of soil moisture conditions from waterlogged to relatively dry.

The underlying geology of the catchment is chalk, which gives rise to strongly calcareous groundwater conditions. The alder woods are situated on a largely undeveloped section of the floodplain surrounded by grazed pastures. The woods include natural river valley features such as former river channels and seasonal ponds. These woods have a relatively natural structure with hydrological features typical of unmodified floodplains (although man-made features such as ditches and sluices are also evident). The woods are said to have a long history and may have originally been utilised as a source of charcoal.

In comparison with other examples of this habitat type in the national context, the Kennet Valley Alderwoods SAC is regarded as a particularly species-rich and relatively undisturbed example. It supports an unusually rich diversity of plants associated with this woodland type, and displays a complete transition from open water and swamp through to relatively dry woodland.

The site comprises Alluvial forests with alder (*Alnus glutinosa*) and ash (*Fraxinus excelsior*). These, the two largest fragments of alder-ash woodland on the Kennet floodplain, lie on alluvium overlain by a shallow layer of moderately calcareous peat. The wettest areas are dominated by alder (*Alnus glutinosa*) over tall herbs, sedges and reeds, but dryer patches include a base-rich woodland flora with much dog's mercury (*Mercurialis perennis*) and also herb-Paris (*Paris quadrifolia*). The occurrence of the latter is unusual, as it is more typically associated with ancient woodland, whereas the evidence suggests that these stands have largely developed over the past century.

B.4.2 Qualifying features

Annex I habitats that are a primary reason for selection of this site:

- 91E0 Alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*) (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) * Priority feature

³⁸ <https://publications.naturalengland.org.uk/publication/6261183967395840>

B.4.3 Conservation objectives

There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. Vegetation community composition, structure, age class distribution and others need to be maintained at a desirable level to indicate the promotion of natural processes with as lower human intervention as possible. The overall vulnerability of this particular SAC to climate change has been assessed by Natural England as being moderate, taking into account the sensitivity, fragmentation, topography and management of its habitats. This means that some adaptation action for specific issues may be required, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be required.³⁹

B.4.4 Pressures and threats

The Site Improvement Plan lists two priority issues as pressure of threat for this site: One related to Inappropriate water levels and the other related to game management: other.⁴⁰

B.5 Oxford Meadows SAC (UK0012845)

B.5.1 Description

The Oxford Meadows was classified as a Special Area of Conservation on 1 April 2005 and is composed by an extensive complex of meadows and pastures which support species-rich grassland vegetation which would once have been widespread on floodplains in lowland England but which is now very rare. The SAC covers an area of 265.89 ha, in Oxfordshire on the broad floodplain of the River Thames and within the Upper Thames Clay Vales National Character Area (NCA profile 108⁴¹) with some areas overlapping with Pixey and Yarnton Meads SSSI, Port Meadow with Wolvercote Common and Green SSSI, Cassington Meadows SSSI, Wolvercote Meadows SSSI⁴².

B.5.2 Qualifying features

The site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following listed habitat and species⁴³:

- Annex I: Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) [6510]
- Annex II: Creeping marshwort (*Apium repens*) [1614]

B.5.3 Conservation objectives

The vegetation at the SAC includes extensive stands of a grassland type which is strongly associated with floodplain meadows. The site includes vegetation communities that are perhaps unique in the world in reflecting the influence of centuries of traditional management by long-term grazing and hay-cutting on lowland hay meadows which contributes to the special character and composition of the grasslands. It exhibits good conservation of structure and function. It also contains a nationally rare grassland type, classified as type MG4

³⁹ <http://publications.naturalengland.org.uk/publication/4608485786386432>

⁴⁰ <http://publications.naturalengland.org.uk/publication/5578853737037824>

⁴¹ <http://publications.naturalengland.org.uk/file/6557755053703168>

⁴² Natural England (2019). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Oxford Meadows Special Area of Conservation (SAC) Site code: UK0012845

⁴³ English Nature (2005). EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora. Citation for Special Area of Conservation (SAC)

(*Alopecurus pratensis* - *Sanguisorba officinalis*) grassland in the National Vegetation Classification, with less than 1500 hectares estimated to remain in England. This is vulnerable to degradation, through excessive nutrient input, changes in the cutting or grazing regime, and changes in hydrology thus in need to be protected.

(*Apium repens*) is a very rare plant of seasonally flooded habitats which are unshaded, have very low levels of competition with surrounding vegetation and is tolerant of heavy grazing (grow very close to the ground and flower below the grazing level of cattle and horses). It is specially protected through inclusion in Schedule 8 of the Wildlife and Countryside Act 1981, which makes it an offence to pick or uproot any part of the plant for the purpose of offering for sale.

B.5.4 Pressures and threats

The Site Improvement Plan⁴⁴ has identified the following issues for the site and the features they may affect:

- Hydrological changes have been identified as a pressure and threat to Creeping marshwort. It is proposed to improve the knowledge and understanding of the hydrological conditions on the site by the following delivering bodies: Environment Agency, Natural England, Network Rail, Oxford City Council, Oxfordshire Rare Flora Group.
- Invasive species has been identified as a threat to Creeping marshwort. It is proposed to eliminate/control the *Crassula* populations on the site by the following delivering bodies: Natural England, Oxford City Council, Oxfordshire Rare Flora Group, Wolvercote Commons Committee.

B.6 Richmond Park SAC (UK0030246)

B.6.1 Description

Richmond Park has been managed as a royal deer park since the seventeenth century, producing a range of habitats of value to wildlife. In particular, Richmond Park is of importance for its diverse deadwood beetle fauna associated with the ancient trees found throughout the parkland. Many of these beetles are indicative of ancient forest areas where there has been a long continuous presence of over-mature timber. The site is at the heart of the south London centre of distribution for stag beetle (*Lucanus cervus*).

B.6.2 Qualifying features

The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following species listed in Annex II:

- Stag beetle (*Lucanus cervus*) [1083]

B.6.3 Conservation objectives

Maintaining the decaying wood habitat, habitat structure, the natural processes ensuring the continuity of timber decay, maintaining and restoring the presence of the stag beetle population across the SAC, maintain the management measures which are necessary to maintain or restore the structure, functions and supporting processes associated with the stag beetle feature⁴⁵.

⁴⁴ Improvement Programme for England's Natura 2000 sites (IPENS) (2014). Site Improvement Plan Oxford Meadows

⁴⁵ <http://publications.naturalengland.org.uk/publication/5279688851193856>

B.6.4 Pressures and threats

No current issues 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 habitat⁴⁶.

B.7 South West London Waterbodies Ramsar Site (UK11065)

B.7.1 Description

South West London Waterbodies was classified as a Ramsar Site on 9 October 2000. The site comprises of a number of reservoirs and former gravel pits in the Thames Valley adjacent to Heathrow Airport between Windsor and Hampton Court which support internationally important numbers of gadwall (*Anas strepera*) and shoveler (*Anas clypeata*) (Criterion 6)⁴⁷. Potential future decommissioning of reservoirs once they are no longer needed for water supply may eventually require discussions with the current owners. Threats from potential urban development pressures are felt to be covered by existing regulations. Disturbance from recreational activities in parts of the site in winter months will be monitored. Ramsar Site no. 1038. Most recent RIS information: 2000.⁴⁸

B.7.2 Qualifying features

The site qualifies under the following Ramsar Site criterion 6⁴⁹:

- Gadwall (*Anas strepera*) 710 individuals - wintering 2.4 % NW Europe
- Shoveler (*Anas clypeata*) 853 individuals - wintering 2.1 % NW/Central Europe

B.7.3 Conservation objectives

N/A

B.7.4 Issues and threats from site improvement plan

N/A

B.8 South West London Waterbodies SPA (UK9012171)

B.8.1 Description

The South West London Waterbodies was classified as a Special Protection Area on 22 September 2000 and comprises a series of embanked water supply reservoirs and former gravel /pits that support a range of man-made and semi-natural open-water habitats. The SPA covers an area of 828.14 ha, with its boundary coinciding with Kempton Park Reservoirs SSSI, Knight & Bessborough Reservoirs SSSI, Thorpe Park, Gravel Pit SSSI, Wraysbury Reservoir SSSI, and parts of Staines Moor SSSI and Wraysbury & Hythe End Gravel Pits SSSI.⁵⁰

⁴⁶ <http://publications.naturalengland.org.uk/publication/6625232836100096>

⁴⁷ <https://rsis.Ramsar Site.org/RISapp/files/RISrep/GB1038RIS.pdf>

⁴⁸ JNCC (2000). South West London Waterbodies Ramsar Site Information Sheet: 7UK152

⁴⁹ JNCC (2000). South West London Waterbodies Ramsar Site Information Sheet: 7UK152 <https://rsis.Ramsar Site.org/RISapp/files/RISrep/GB1038RIS.pdf>

⁵⁰ English Nature (2000). EC Directive 79/409 on the Conservation of Wild Birds: Special Protection Area (SPA). South West London Waterbodies SPA

B.8.2 Qualifying features

The site qualifies under article 4.2 of the Directive (79/409/EEC) as it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex 1), in any season:

- Gadwall (*Anas strepera*) [A051] 710 individuals - wintering 2.4 % NW Europe
- Shoveler (*Anas clypeata*) [A056] 853 individuals - wintering 2.1 % NW/Central Europe

B.8.3 Conservation objectives

The following Conservation objectives have been identified for this site⁵¹:

The site is designated for internationally important numbers of gadwall (*Anas strepera*) and regularly supports this species in the winter season. Gadwall favour shallow eutrophic water bodies with a low level of human disturbance. Water quality and chemistry are important aspects in habitat suitability as factors such as high levels of turbidity or siltation may render sites or parts of sites unsuitable if macrophyte beds are affected.

The site is also designated for internationally important numbers of shoveler (*Anas clypeata*) Birds tend to start arriving at the end of September and will generally disperse to breeding areas in March to early April. They favour waterbodies with shallow margins/areas and where at least parts have an open, tree-less landscape character. Shoveler may spend less time feeding as winter progresses than gadwall. Unlike gadwall they utilise different lake and reservoir types at different times of day for different types of behaviour and may show changes in site preference as winter progresses. Numbers of birds using the complex appear to have remained relatively stable since the classification of the SPA but there is evidence of changing patterns of utilisation of waterbodies.

B.8.4 Pressures and threats

The Site Improvement Plan⁵² has identified the following issues for the site and the features they may affect:

- Public Access/Disturbance has been identified as a pressure and threat to gadwall and shoveler populations. It is proposed a written agreement is made with landowners and recreational users to reduce disturbance which will be carried out by the following delivering bodies: Local Authorities, Natural England, RSPB, Thames Water Utilities Ltd, Parish Council(s), Affinity Water, Silver Wing Sailing Club, R K Leisure (Angling club), Local residents' association(s), Local bird watching groups(s)
- Changes in species distributions has been identified as a pressure and a threat to gadwall and Shoveler populations. It is proposed existing data will be reviewed and fit for-purpose recording practices will be secured across the SPA and its surroundings. This will be carried out by the following delivering bodies: Local Authorities, Natural England, RSPB, University(ies), British Trust for Ornithology (BTO), Joint Nature Conservation Committee (JNCC), Local bird watching group(s)
- The invasive species, (*Crassula helmsii*), has been identified as a pressure and threat to gadwall and shoveler populations. It is proposed the invasive species is managed and recreational users and landowners are instructed on how to monitor for the plant. This will be carried out by the following delivering bodies: Environment Agency, Natural England, Thames Water Utilities Ltd, GB Non-native Species Secretariat (NNS), R K Leisure (Angling club).
- Natural changes to site conditions have been identified as a pressure and threat to gadwall and shoveler populations. It is proposed that strategic habitat management will be carried out including the management

⁵¹ Natural England (2018). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features South West London Waterbodies Special Protection Area (SPA) Site code: UK9012171

⁵² Improvement Programme for England's Natura 2000 sites (IPENS) (2014). Site Improvement Plan South West London Waterbodies

of bankside vegetation. This will be carried out by the following delivering bodies: Natural England, Thames Water Utilities Ltd, Landowner(s), Local conservation group, Affinity Water

- Fish stocking (Fisheries) has been identified as a pressure to gadwall and shoveler populations. This will be managed by securing appropriate fish stocking levels and will be implemented by the following delivering bodies: Natural England, Thames Water Utilities Ltd, R K Leisure (Angling club), Local angling club(s).
- Inappropriate weed control has been identified as a threat to gadwall and shoveler populations. This will be managed by clarifying appropriate weed control with owners and tenants through consents and carry out enforcement action where necessary. This will be implemented by the following delivering bodies: Natural England, RSPB, Thames Water Utilities Ltd, Royal Yachting Association (RYA), Silver Wing Sailing Club.
- The Invasive species Egyptian goose (*Alopochen aegyptiaca*) has been identified as a threat to gadwall and shoveler populations. It is proposed further research is done into this invasive species and identify control measures if necessary. This will be carried out by the following: Natural England, RSPB, Thames Water Utilities Ltd, GB Non-native Species Secretariat (NNSS), Local bird watching group(s), Heathrow Airport.

B.9 Thames Basin Heaths SPA (UK9012141)

B.9.1 Description

The Thames Basin Heaths was classified as a Special Protection Area in March 2005 and forms part of an extensive complex of lowland heathlands in southern England that support important breeding bird populations.

The SPA covers an area of 8274.72 ha, fragmented across Surrey, Berkshire, Hampshire and within the Thames Basin Heaths National Character Area (NCA). Some areas overlap with Ash to Brookwood Heaths SSSI, Bourley and Long Valley SSSI, Bramshill SSSI, Broadmoor to Bagshot Woods and Heaths SSSI, Castle Bottom to Yateley and Hawley Commons SSSI, Chobham Common SSSI, Colony Bog and Bagshot Heaths SSSI, Eelmoor Marsh SSSI, Hazeley Heath SSSI, Horsell Common SSSI, Ockham and Wisley Commons SSSI, Sandhurst to Owlsmoor Bogs and Heaths SSSI, Whitmoor Common SSSI and Thursley, Ash, Pirbright & Chobham SAC⁵³.

B.9.2 Qualifying features

The site qualifies under article 4.1 of the Directive (79/409/EEC) as during the breeding season the area regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:

- Nightjar (*Caprimulgus europaeus*) [A224]- 7.8% of the GB breeding population
- Woodlark (*Lullula arborea*) [A246]- 9.9% of the GB breeding population
- Dartford warbler (*Sylvia undata*) [A302]- 27.8% of the GB breeding population

B.9.3 Conservation objectives

The SPA is designated for the above-mentioned qualifying feature that are supported by principal habitats of lowland heathland and rotationally managed coniferous plantation woodland. Heathland is particularly important for the ground nesting birds (Nightjar and Woodlark) and also the Dartford Warbler which often nests close to the ground amongst dense heather and gorse.

The protected birds are most likely to be present in the months shown in Figure 7.1, nevertheless in the remaining times of the year, their presence is less significant but not to be considered absent. If project timescale is within the breeding season, early consultation with Natural England is beneficial.

⁵³ Natural England (2016) version 2. European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Thames Basin Heaths Special Protection Area (SPA) Site code: UK9012141

Figure 7.1: Site-specific seasonality of SPA features

Feature	Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dartford Warbler	Breeding												
Nightjar	Breeding												
Woodlark	Breeding												

Source: extract from Natural England (2016) version 2. European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Thames Basin Heaths Special Protection Area (SPA) Site code: UK9012141

B.9.4 Pressures and threats

The Site Improvement Plan⁵⁴ has identified the following issues for the site and the features they may affect:

- Public access/disturbance has been identified as a pressure and threat to Nightjar, Woodlark and Dartford warbler populations. It is proposed to agree and implement an over-arching access management strategy among multiple delivering bodies: Berks, Bucks and Oxon Wildlife, Trust, Crown Estate (Rural), Forest Enterprise, Forestry Commission, Hampshire and Isle of Wight Wildlife Trust, Local Authorities, National Trust, Natural England, RSPB, Surrey County Council, Surrey Heath Borough Council, Surrey Wildlife Trust, Defence Infrastructure Organisation (DIO), Amphibian and Reptile Conservation Trust (ARCT), Horsell Common Preservation Society, Local partnership.
- Undergrazing has been identified as a pressure to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath, European dry heaths and depressions on peat substrates. It is proposed to agree and implement an over-arching access management strategy by the following delivering bodies: National Trust, Natural England, RSPB, DIO.
- Forestry and woodland management have been identified as a pressure to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath and European dry heaths. It is proposed to review and agree forestry plans/policies to ensure compatibility with objectives by the following delivering bodies: Forest Enterprise, Natural England, DIO, Crown Estate.
- Hydrological changes have been identified as a threat to wet heathland with cross-leaved heath and depressions on peat substrates. It is proposed to undertake hydrological investigations by the following delivering bodies: Natural England, Surrey Wildlife Trust, DIO.
- Inappropriate scrub control has been identified as a pressure to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath and European dry heaths. It is proposed to agree a habitat management strategy among multiple delivering bodies: Berks, Bucks and Oxon Wildlife Trust, Bracknell Forest Borough Council, Crown Estate (Rural), Forestry Commission, Hampshire and Isle of Wight Wildlife Trust, Natural England, RSPB, Surrey County Council, Surrey Heath Borough Council, Surrey Wildlife Trust, Windsor and Maidenhead Royal Borough Council, ARCT.
- Invasive species has been identified as a pressure and threat to wet heathland with cross-leaved heath and European dry heaths. It is proposed to agree and implement invasive control strategy by the following delivering bodies: Hampshire and Isle of Wight Wildlife Trust, Natural England, Surrey Wildlife Trust, DIO.
- Wildfire/arson has been identified as a pressure to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath, European dry heaths and depressions on peat substrates. It is proposed to agree and implement a fire risk reduction strategy among multiple delivering bodies: Berks, Bucks and Oxon Wildlife Trust, Forestry Commission, Hampshire and Isle of Wight Wildlife Trust, Hampshire County Council, Local Authorities, Natural England, Surrey County Council, Surrey Wildlife Trust, DIO, Royal Berkshire Fire and Rescue Service, Hampshire Fire and Rescue Service, Surrey Fire and Rescue Service, Wildfire, Horsell Common Preservation Society, South East England Wildfire Group.

⁵⁴ Improvement Programme for England's Natura 2000 sites (IPENS). (2014) Site Improvement Plan Thames Basin

- Air pollution: impact of atmospheric nitrogen deposition has been identified as a pressure and threat to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath, European dry heaths and depressions on peat substrates. It is proposed to agree and implement nitrogen management/mitigation strategy among multiple delivering bodies: Berks, Bucks and Oxon Wildlife Trust, Hampshire and Isle of Wight Wildlife Trust, Hampshire County Council, Natural England, Surrey Heath Borough Council, Surrey Wildlife Trust, DIO.
- Feature location/extent/condition unknown has been identified as a threat to Nightjar, Woodlark and Dartford warbler. It is proposed to develop and implement improved bird monitoring strategy by the following delivering bodies: Hampshire and Isle of Wight Wildlife Trust, Natural England, RSPB, Surrey Wildlife Trust, DIO, Surrey Bird Club.
- Military has been identified as a threat to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath, European dry heaths and depressions on peat substrates. It is proposed to agree and implement integrated management plans for military sites by the following delivering bodies: Hampshire and Isle of Wight Wildlife Trust, Natural England, Surrey Wildlife Trust, DIO, ARCT.
- Habitat fragmentation has been identified as a pressure to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath, European dry heaths and depressions on peat substrates. It is proposed to commission study to identify habitat management priorities to reduce fragmentation among multiple delivering bodies: Berks, Bucks and Oxon Wildlife Trust, Bracknell Forest Borough Council, Crown Estate (Rural), Forestry Commission, Hampshire and Isle of Wight Wildlife Trust, Natural England, /RSPB, Surrey Heath Borough Council, Surrey Wildlife Trust, ARCT.

B.10 Thames Estuary and Marshes SPA (UK9012021)

B.10.1 Description

The Thames Estuary and Marshes Special Protection Area is a wetland of European importance comprising a mosaic of intertidal habitats, saltmarsh, coastal grazing marshes, saline lagoons and chalk pits. The site provides wintering and breeding habitats for important assemblages of wetland bird species, particularly wildfowl and waders as well as supporting migratory birds on passage. The site forms part of the wider Thames Estuary together with other classified SPAs in both Essex and Kent.

B.10.2 Qualifying features

Designated for supporting migratory populations of birds, the site qualifies under Article 4.1 of the Directive (79/409/EEC) as over winter the area regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:

- Avocet (*Recurvirostra avosetta*) [A132] – 28.3% of the GB wintering population.
- Hen harrier (*Circus cyaneus*) [A082]– 1% of the GB wintering population.

The site also qualifies under Article 4.2 of the Directive (79/409/EEC) as the area regularly supports 1% or more of the GB populations of the following species not listed in Annex I. These species are regularly supported over winter:

- Dunlin (*Calidris alpina alpina*) [A672]– 2.1% of the North Siberia / Europe / West Africa population;
- Knot (*Calidris canutus islandica*) [A143]– 1.4% of the NE Canada / Greenland / Iceland / North West Europe population;
- Black-tailed godwit (*Limosa limosa islandica*) [A616]– 2.4% of the Iceland breeding population;
- Grey plover (*Pluvialis squatarola*) [A141]– 1.7% of the Eastern Atlantic wintering population; and
- Redshank (*Tringa totanus totanus*) [A162]– 2.2% of the Eastern Atlantic wintering population.

These species are regularly supported on passage:

- Ringed plover (*Charadrius hiaticula*) [A137]– 2.6% of the Europe / Northern African wintering population.

The area also supports an internationally important assemblage of birds over winter:

75,019 waterfowl individuals.

B.10.3 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
- The distribution of the qualifying features within the site

B.10.4 Pressures and threats

The Site Improvement Plan⁵⁵ that cover this SPA also cover Benfleet and Southend Marshes SPA; Medway Estuary & Marshes SPA and The Swale SPA. The issues for the site and the features that might be affected are summarised here and detailed in section B.9.4:

- Coastal squeeze (pressure)
- Public access/ disturbance (pressure and threat)
- Invasive species (threat)
- Changes in species distribution (pressure and threat)
- Fisheries: Commercial marine and estuarine (pressure and threat)
- Vehicles: illicit (pressure)
- Air pollution: risk of atmospheric nitrogen deposition (threat)

B.11 Thursley, Ash, Pirbright and Chobham SAC (UK0012793)

B.11.1 Description

The Thursley, Ash, Pirbright and Chobham was classified as a Special Area of Conservation in April 2005 and is an extensive complex of heaths with extensive areas of wet and dry heath, acid mire and bog pools.

The SAC covers an area of 5138 ha, fragmented across Surrey, within the Surrey Hills Area of Outstanding Natural Beauty (AONB) and is part of the Weald National Character Area. Some areas overlap with Ash to Brookwood Heaths SSSI, Colony Bog and Bagshot Heaths SSSI, Chobham Common SSSI, Thursley, Hankley and Frensham Commons SSSI, Thames Basin Heaths SPA and Thursley, Hankley and Frensham Commons (Wealden Heaths Phase 1) SPA and includes Thursley and Ockley Bog Ramsar Site⁵⁶.

⁵⁵ Natural England (2014). Site Improvement Plan: Greater Thames Complex

⁵⁶ Natural England (2016). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Thursley, Ash, Pirbright and Chobham Special Area of Conservation (SAC) Site code: UK0012793

B.11.2 Qualifying features

The site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I⁵⁷:

- Depressions on peat substrates of the (*Rhynchosporion*) [7150]
- European dry heaths [4030]
- Northern Atlantic wet heaths with (*Erica tetralix*) [4010] (wet heathland with cross-leaved heath)

This site supports the sole area of lowland northern Atlantic wet heath in south-east England. The heathland supports an important assemblage of animal species, including numerous rare and local invertebrate species, including the nationally rare white-faced darter (*Leucorhinia dubia*), as well as sand lizard (*Lacerta agilis*) and smooth snake (*Coronella austriaca*).

B.11.3 Conservation objectives

Many detailed conservation objectives have been identified for each qualifying feature of this site⁵⁸. Here are reported those applicable to all habitats:

- Maintain the total extent, distribution, configuration and abundance of the species so they can be a viable component.
- Ensure the vegetation communities are preferable to and characterised by the National Vegetation Classification type(s).
- Ensure invasive, non-native and introduced non-native species are either rare or absent, but if present are causing minimal damage .
- Maintain or restore where appropriate, the management measures within and/or outside the site boundary which are necessary to maintain or restore the structure, functions and supporting processes (e.g. spatial configuration of land or habitat, connectivity - critical habitat 'corridors' and habitat patches).
- Maintain or restore (where habitats are suffering) natural hydrological processes, water chemistry and soil properties to provide the conditions necessary to sustain each feature.
- Maintain or restore (where the resilience is degraded) the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change.
- Restore the concentrations and deposition of air pollutants to below the site-relevant Critical Load or Level values given for each qualifying feature of the site on the Air Pollution Information System (www.apis.ac.uk).

B.11.4 Pressures and threats

The Site Improvement Plan⁵⁹ that cover this SAC also cover Thames Basin Heaths SPA and Thursley, Hankley & Frensham Commons SPA. Therefore, the issues for the site and the features that might be affected are summarised here and detailed in section B.9.4:

- Public access/disturbance - pressure and threat
- Undergrazing - pressure
- Forestry and woodland management - pressure
- Hydrological changes - threat

⁵⁷ English Nature (2005). EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora. Citation for Special Area of Conservation (SAC)

⁵⁸ Natural England (2016). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Thursley, Ash, Pirbright and Chobham Special Area of Conservation (SAC) Site code: UK0012793

⁵⁹ Improvement Programme for England's Natura 2000 sites (IPENS). (2014) Site Improvement Plan Thames Basin

- Inappropriate scrub control - pressure
- Invasive species - pressure and threat
- Wildfire/arson - pressure
- Air pollution: impact of atmospheric nitrogen deposition - pressure and threat
- Feature location/extent/condition unknown - threat
- Military - threat
- Habitat fragmentation - pressure

B.12 Wimbledon Common SAC (UK0030301)

B.12.1 Description

Wimbledon Common supports an extensive area of open, wet heath on acidic soil and also contains a variety of other acidic heath and grassland communities. The high plateau in the east and north of the site has a capping of glacial gravels overlying Claygate Beds and London Clay, which are exposed on the western slope of the Common. The acidic soils and poor drainage give rise to a mosaic of wet heath and unimproved acidic grassland. Semi-natural broadleaved woodland covers the deeper, clay soils of the western slope.

A significant cover of heather (*Calluna vulgaris*) distinguishes areas of dry and wet heath. The wet heath supports typical species such as the heath rush (*Juncus squarrosus*). The brown sedge (*Carex disticha*) is present, as is mat-grass (*Nardus stricta*) on drier parts. Localised areas of dry heath support bell heather (*Erica cinerea*) and dwarf gorse (*Ulex minor*). The semi-natural woods of the clay soils comprise a dense canopy of maturing pedunculate oak.

Wimbledon Common has a large number of old trees and much fallen decaying timber. The site supports a number of other scarce invertebrate species associated with decaying timber, including stag beetle (*Lucanus cervus*).

B.12.2 Qualifying features

Qualifying habitats - The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

- European dry heaths [4030]
- Northern Atlantic wet heaths with (*Erica tetralix*) [4010]. (Wet heathland with cross-leaved heath)

Qualifying species - The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following species listed in Annex II:

- Stag beetle (*Lucanus cervus*) [1083]

B.12.3 Conservation objectives

Maintaining the decaying wood habitat, maintain or restore a well-structured broadleaved woodland habitat, with sheltered, sunlit glades and rides containing stumps and other suitable decaying wood habitat structure, maintaining the natural processes ensuring the continuity of timber decay, maintaining and restoring the presence of the stag beetle population across the SAC, maintain the management measures which are necessary to maintain or restore the structure, functions and supporting processes associated with the stag beetle feature⁶⁰.

⁶⁰ <http://publications.naturalengland.org.uk/publication/5706571287887872>

B.12.4 Pressures and threats

Public disturbance and air pollution (nitrogen deposition) are listed as pressures to this site. Habitat fragmentation and invasive species are listed as threat to this SAC⁶¹.

⁶¹ <http://publications.naturalengland.org.uk/publication/5638512552443904>

C. HRA Stage 2 Appropriate Assessments

C.1 Beckton Desalination

(ID: TWU_LON_HI-DES_ALL_CNO_beckton desal 50/100/150)

C.1.1 Option Description

This option proposes taking brackish water from the River Thames to the Beckton desalination plant. The volume of raw water abstracted from the Thames would be 187ML/d, in order that 150ML/d of desalinated water can be produced. The deployable output will be 142ML/d for 150ML/d capacity. The 50 and 100 options involve raw water abstraction for production of 50ML/d and 100ML/d desalinated water.

C.1.2 HRA Stage 1 Screening Assessment – Summary

The HRA Stage 1 Screening assessment identified three Habitats Sites within the Zone of Influence (Zol) of this option: Epping Forest Special Area of Conservation (SAC) (UK0012720), Thames Estuary & Marshes Ramsar Site (UK11069), and Thames Estuary and Marshes Special Protection Area (SPA) (UK9012021). LSE could not be ruled out for Thames Estuary & Marshes Ramsar Site and Thames Estuary and Marshes SPA. Therefore, this Option has proceeded to the next HRA stage – AA.

A summary of the HRA Stage 1 screening assessment is given in

Table C.1 C.1.1, including the relative distances of the Habitats Sites from the options. The full HRA Screening assessment is presented in Annex A. Information on the Habitats Sites in this assessment are provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table C.1.1: Beckton Desalination HRA Stage 1 Screening Assessment Summary

LSE	No LSE
Thames Estuary & Marshes Ramsar (UK11069) (24.7km downstream)	Epping Forest SAC (UK0012720) (7.1km northwest)
Thames Estuary and Marshes SPA (UK9012021) (24.7km downstream)	

C.1.3 Stage 2: Appropriate Assessment

C.1.3.1 Scope

The following Habitats Sites were assessed at Stage 2 AA:

- Thames Estuary & Marshes Ramsar (UK11069) (24.7km downstream of the option).
- Thames Estuary and Marshes SPA (UK9012021) (24.7km downstream of the option).

C.1.3.2 Potential adverse effects on Habitats Sites

The potential effects of the construction and operation phases of the option are described below, taking into account the type, size and scale of the option, following the methodology described in Chapter 2. An assessment of each potential effect is made in view of the site's conservation objectives. Where adverse effects cannot be ruled out, mitigation will be required in order to ascertain that the option will not adversely affect the integrity of the Habitats Site. Where stated, mitigation is in addition to the best practice assumptions and mitigation measures already outlined in Section 2.4.5.

C.1.3.3 Thames Estuary & Marshes Ramsar Site (UK11069) (24.7km downstream)

Thames Estuary & Marshes was classified as a Ramsar Site in May 2000. The site comprises a complex of brackish, floodplain grazing marsh ditches, saline lagoons and intertidal saltmarsh and mudflat. These habitats support international important numbers of wintering waterfowl and the saltmarsh and grazing marsh are of international importance, for their diverse assemblages of wetland plants and invertebrates⁶².

The Thames Estuary & Marshes Ramsar Site comprises sand/shingle shores (0.8%), tidal flats (49.6%), saltmarshes (1.3%), permanent freshwater lakes (0.7%), permanent saline/brackish lakes (4.2%), seasonal/intermittent saline/brackish lakes (3.2%), seasonally flooded agricultural land (38.6%) and other habitats (1.6%).

Qualifying Features

The site qualifies for Ramsar Criteria 2, 5, and 6:

- Ramsar Criterion 2 is met because the site supports populations of British Red Book:
 - Invertebrates (over 20 species).
 - Least lettuce (*Lactuca saligna*) – endangered.
 - Slender hare's ear (*Bupleurum tenuissimum*) – vulnerable.
 - Divided sedge (*Carex divisa*) – vulnerable.
 - Sea barley (*Hordeum marinum*) – vulnerable.
 - Borrer's saltmarsh-grass (*Puccinellia fasciculata*) – vulnerable.
 - Dwarf eelgrass (*Zostera noltei*) – vulnerable.
- Ramsar Criterion 5 is met because the site supports assemblages of international importance:
 - Waterfowl (45,118 individuals) with peak counts in winter.
- Ramsar Criterion 6 is met because the site supports species occurring at levels of international importance:
 - Species with peak counts in spring / autumn:
 - Black-tailed godwit (*Limosa limosa islandica*) – 4.5% of the Iceland / West Europe population.
 - Species with peak counts in winter:
 - Dunlin (*Calidris alpina alpina*) – 1.1% of the West Siberian / West Europe population.
 - Red knot (*Calidris canutus islandica*) – 1.6% of the Western and Southern Africa population.

Conservation Objectives

As the provisions on the Habitats Regulations relating to HRAs extend to Ramsar sites, Natural England generally considers the conservation advice packages for the overlapping SPA designation to be, in most cases, sufficient to support the management of the Ramsar interests. Therefore, the conservation objectives for the Thames Estuary and Marshes SPA is considered applicable to this Ramsar.

Construction Effects

This option proposes the abstraction of water from the River Thames and the transportation of this water to the Beckton Desalination plant. The proposed works are located 30km away from this Ramsar Site, therefore, dust, light, air and noise pollution, machinery activities and/or anthropogenic disturbances related to the construction of this option are unlikely to affect the qualifying features.

⁶² Ramsar (2005). Thames Estuary and Marshes. Available at: <https://rsis.ramsar.org/RISapp/files/RISrep/GB1025RIS.pdf>. Last accessed 14/06/2023.

However, the Thames Estuary & Marshes Ramsar Site is directly hydrologically connected to the Option via the River Thames, through both the intake and the discharge. As a result of this hydrological connection, pollution events may occur resulting in increased turbidity, siltation, sedimentation and changes in water quality. If a pollution event occurred, degradation of feeding and roosting habitats and resultant changes to food availability may be observed. The habitats of qualifying plant and invertebrate species may also be degraded. In severe pollution incidents, this could potentially cause mortality of qualifying species and/or bioaccumulation of toxic contaminants. However, based on the distance between the construction works and the Habitats Site and due to the dynamic nature of the Thames Estuary, which will ensure dilution of any toxic contaminants, is unlikely to result in significant changes to water quality, habitat degradation and mortality of qualifying species.

It is concluded that provided mitigation measures outlined within Section C.1.3.5 are adhered to, no adverse effects on the integrity of the site are anticipated,

Operation effects

During operation of this option, raw water will be abstracted from the River Thames, transferred to the Beckton Desalination plant and then brine wastewater will be discharged into the River Thames. As this Habitat Site is located downstream of the Option and a direct hydrological connection is identified (via River Thames), a pathway for potential pollution effects upon this Habitats Site and its qualifying features cannot be dismissed during the operation phase.

Changes in flow and velocity caused by the new / increased (up to) 150 ML/d abstraction may result in a change in the pattern of flow entering the Habitats Site. The WFD L2 assessment does however recognise that the EA ALS states water is available for abstraction at Q30 flow, and it is assumed that flow will remain large relative to the size of the abstraction as the Thames Watercourse itself is so large. But further investigation is required to understand if the loss of flow velocity and volume would lead to a reduction in dilution of water quality parameters, sedimentation patterns and/or hydromorphology downstream to the Habitats Site. Furthermore, water discharged into Thames is waste water from the desalination process and therefore likely to be lower quality (highly saline). This could lead to changes in water quality in the flow entering the Habitats Site, particularly regarding salinity. It is noteworthy that the receiving water is brackish in the tidal Thames and in this way the identified impacts of new discharge potentially would not lead to an adverse effect on biology

Such hydrological changes in the River Thames entering the Thames Estuary & Marshes Ramsar site could lead to non-toxic contamination, through changes in water flows and velocity, turbidity, and sedimentation/siltation, which could cause physical damage to habitats through degradation and fragmentation of water-dependent habitats as well as edge effects. Water flow and level changes may also alter water availability. All of the above impacts could cause biological disturbances, including habitat avoidance, changes to habitat and prey availability, and changes in natural succession processes for vegetation (qualifying plants and vegetation on which qualifying invertebrates and birds depend).

Further studies are recommended to inform mitigation measures that are proposed at plan level. Flow modelling will inform the flow needed to protect the estuary habitats downstream and so that conservation objectives are not compromised. Any additional mitigation measures required at the project stage should be considered once further hydrological modelling and ecological studies are undertaken.

C.1.3.4 Thames Estuary and Marshes SPA (UK9012021) (24.7km downstream)

The Thames Estuary and Marshes was classified as a SPA in March 2000, and comprises a mosaic of intertidal habitats, saltmarsh, coastal grazing marshes, saline lagoons and chalk pits, providing wintering and breeding habitats for important wetland bird assemblages⁶³.

The Thames Estuary and Marshes SPA site comprises tidal rivers, estuaries, mudflats, sandflats, lagoons (57.3%), saltmarshes, salt pastures, salt steppes (1.5%), shingle, sea cliffs, islets (0.9%), inland water bodies (5.6%), bogs, marshes, water fringed vegetation, fens (3.7%), dry grassland, steppes (1.9%), and humid, mesophile grassland (29.1%)⁶⁴.

Qualifying Features

Designated for supporting migratory populations of birds, the site qualifies under Article 4.1 of the Directive (79/409/EEC) as over winter the area regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:

- Avocet (*Recurvirostra avosetta*) [A 132] – 28.3% of the GB wintering population.
- Hen harrier (*Circus cyaneus*) [A 082] – 1% of the GB wintering population.

The site also qualifies under Article 4.2 of the Directive (79/409/EEC) as the area regularly supports 1% or more of the GB populations of the following species not listed in Annex I. These species are regularly supported over winter:

- Dunlin (*Calidris alpina alpina*) [A 672]– 2.1% of the North Siberia / Europe / West Africa population;
- Knot (*Calidris canutus islandica*) [A 143]– 1.4% of the NE Canada / Greenland / Iceland / North West Europe population;
- Black-tailed godwit (*Limosa limosa islandica*) [A 616] – 2.4% of the Iceland breeding population;
- Grey plover (*Pluvialis squatarola*) [A 141] – 1.7% of the Eastern Atlantic wintering population; and
- Redshank (*Tringa totanus totanus*) [A 162]– 2.2% of the Eastern Atlantic wintering population.

These species are regularly supported on passage:

- Ringed plover (*Charadrius hiaticula*) [A 137]– 2.6% of the Europe / Northern African wintering population.

The area also supports an internationally important assemblage of birds over winter:

- 75,019 waterfowl individuals.

Conservation Objectives

The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified i.e. (the "Qualifying features" listed above).

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.

⁶³ Natural England (2014) Thames Estuary and Marshes SPA Citation. Available at: <https://publications.naturalengland.org.uk/publication/4698344811134976>. Last accessed 12/06/2023.

⁶⁴ Natural England (2012) Thames Estuary and Marshes SPA Standard Data Form. Available at: <https://publications.naturalengland.org.uk/publication/3227002>. Last accessed 12/06/2023.

- the supporting processes on which the habitats of the qualifying features rely.
- the populations of each of the qualifying features.
- the distribution of qualifying features within the site.

On top of the Conservation Objectives, the Supplementary Advice on Conservation Objectives (SACOs) provides a framework to inform the management and measures needed to conserve or restore a Habitats Site and the prevention of deterioration and significant disturbance of its qualifying features. The SACOs for the Thames Estuary & Marshes SPA⁶⁵ have been referred to in assessing this option.

Construction effects

The construction effects on the Thames Estuary & Marshes SPA and specifically the qualifying birds will be similar to the ones listed above for the Thames Estuary and Marshes Ramsar Site, as both sites follow the same boundary.

Operation effects

The operation effects on the Thames Estuary & Marshes SPA and specifically the qualifying birds will be similar to the ones listed above for the Thames Estuary and Marshes Ramsar Site, as both sites follow the same boundary.

C.1.3.5 Proposed Mitigation

Mitigation measures during construction will follow best practice guidelines to minimise potential adverse effects whenever close to waterbodies e.g., use of sediment screens, coverage of construction stockpiles during adverse weather conditions and sand/silt removal facilities. Standard best practice procedures will be followed during construction to limit construction-related disturbance and contamination including (but not limited to) the following:

- CIRIA C741 Environmental good practice on site guide
- Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites).
- Industry best practice mitigation measures for dust suppression.
- Biodiversity risk assessment for the introduction and spread of invasive non-native species (INNS) and mitigation from the findings of the assessment to be included in the Construction Environment Management Plan (CEMP).
- Specific mitigation to reduce increased sedimentation and silt deposition downstream of the proposed works should include silt screening around the area of works to limit the movement and redeposition of material.
- The addition of fish screens at the intake and discharge structures in order to avoid eventual fish entrapment as guided by best practice guidelines⁶⁶
- Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage.

The following mitigation measures are required during operation:

⁶⁵ Natural England (2023). The Thames Estuary & Marshes SPA SACO is available at: [Thames Estuary and Marshes SPA - UK9012021A \(naturalengland.org.uk\)](https://www.naturalengland.org.uk). Last accessed 1/08/2023.

⁶⁶ Best practice can be guided by (but is not limited to) 'Due regard will be had to implementing the measures set out in the 'Screening for Intake and Outfalls: a best practice guide' (Environment Agency, Science Report - ISBN: 1 84432 361 7,2005)'

- Installation of a salinity and residual chemical diffuser on the outtake. This will increase mixing and enhance rapid initial dilution of the concentrate, minimising increases in local salinity and its influence on the seabed.
- Further brine dilution with cooling water (this will also be mitigated by permits governing the temperature of discharged water).
- Where chlorine dosing is required to reduce/remove biofouling, this should be applied in the direction of the plant to avoid chlorine discharge into the marine environment.

The significance of hydrological changes within the Habitats Site, in particular changes in flows and salinity levels will depend on the abstraction volume and the concentration and volume of brine discharge at the proposed outfall point. Modelling has been undertaken as part of the London Water Recycling SRO to look at cumulative effects on salinity within the estuarine Thames Tideway from Beckton Reuse, Beckton Desalination and Deephams Reuse options from abstraction, reduced effluent flows from reuse and brine discharge. This potentially associates with changes in the normal estuarine patterns linked to ecological preferences through tidal level and inundation patterns, tidal salinity patterns and sedimentation patterns. The modelling showed that the combination of options change flows in the middle part of the estuary, at the same time as the TGWTP, and the desalination schemes change the salinity of the Beckton STW discharge. Modelling identified the environmental risks for this as low for salinity changes and negligible for tidal level and sedimentation. The low risk to twice daily cycles of such salinity variability would be seawards of Beckton at low tide when salinities are in the range of 5 parts per thousand (ppt); and seawards of Tower Bridge at high tide when salinities at Beckton are in the range of 20 ppt, with differences of around 0.3 ppt (seawater is around 35 ppt, river water 0 ppt). Based on this modelling it is considered that changes to salinity and temperature will not have adverse effects on the site integrity of the Thames Estuary and Marshes Ramsar and SPA.

As a precaution, a set target for salinity is required to be set. This is a complex factor due to the dynamic nature of the marine environment, however, as per Common Standards Monitoring Guidance for Estuaries JNCC 2004, readings should not deviate from the salinity range predicted for the Habitats Site by the baseline data.

As well as monitoring the salinity and flows within the Habitats Sites during operation, monitoring of qualifying features will also be undertaken, which will inform the requirement for adaptations of, or additional measures, that may be needed to enhance mitigation.

C.1.4 Stage 2 Outcomes and Further Studies

Following this HRA AA, it is considered that with adherence to the proposed mitigation, the proposed works associated with the option are not expected to have adverse effects on the overall integrity of the Thames Estuary & Marshes Ramsar Site and Thames Estuary and Marshes SPA and their qualifying features, when evaluated alone during the construction and operation phase of this option.

The modelling undertaken has demonstrated a low risk for salinity changes and negligible for tidal level and sedimentation. The low risk to twice daily cycles of such salinity variability would be seawards of Beckton at low tide when salinities are in the range of 5 parts per thousand (ppt); and seawards of Tower Bridge at high tide when salinities at Beckton are in the range of 20 ppt, with differences of around 0.3 ppt (seawater is around 35 ppt, river water 0 ppt). Based on this modelling it is considered that changes to salinity and temperature will not have adverse effects on the site integrity of the Thames Estuary and Marshes Ramsar and SPA.

It is recommended that during operation monitoring of salinity and flows within the Habitats is undertaken, monitoring of qualifying features will also be undertaken, which will inform the requirement for adaptations of, or additional measures, that may be needed to enhance mitigation.

A summary of the AA for this option is given in Table C.1.2.

Table C.1.2: Beckton Desalination Option – HRA Stage 2 Appropriate Assessment Summary

Habitats Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Effects After Mitigation
Thames Estuary & Marshes Ramsar (UK11069) (24.7km downstream)	<p>Ramsar Criterion 2:</p> <ul style="list-style-type: none"> ● Invertebrates (over 20 species) ● Least lettuce ● Slender hare’s ear ● Divided sedge ● Sea barley ● Borrer’s saltmarsh-grass ● Dwarf eelgrass <p>Ramsar Criterion 5:</p> <ul style="list-style-type: none"> ● Waterfowl (45,118 individuals) <p>Ramsar Criterion 6:</p> <ul style="list-style-type: none"> ● Black-tailed godwit ● Dunlin ● Red knot 	<p>This site is in direct hydrological connection with the Option via the River Thames. Potential reduction in flow in the River Thames as result of this option is a possibility and as the River Thames is already considered to be impacted by abstraction, it is likely this option can reinforce this issue. Discharge into the River Thames of brine wastewater may also change the salinity of the water and affect habitats.</p> <p>During construction, this option is likely to result in:</p> <ul style="list-style-type: none"> ● Physical damage - habitat damage due to toxic and non-toxic contamination related to potential pollution events may be observed, such as an increase in turbidity, increase in siltation, sedimentation and changes in water quality. This could result in changes in the distribution and extent of qualifying plants and invertebrates. ● Population fluctuation of qualifying species - due to habitat degradation and prey availability related to toxic and non-toxic contamination (potential pollution events associated with the hydrological connection/water quality degradation). 	<p>Mitigation measures will follow best practice guidelines to minimise potential adverse effects. These include (but are not limited to) the following:</p> <ul style="list-style-type: none"> ● CIRIA C741 Environmental good practice on site guide ● Environment Agency’s PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). ● Industry best practice mitigation measures for dust suppression. ● Biodiversity risk assessment for the introduction and spread of invasive non-native species (INNS) and mitigation from the findings of the assessment to be included in the Construction Environment Management Plan (CEMP). ● Specific mitigation to reduce increased sedimentation and silt deposition downstream of the proposed works should include silt screening around the area of works to limit the movement and redeposition of material. ● The addition of fish screens at the intake and discharge structures in order to avoid eventual fish entrapment as guided by best practice guidelines 	<p>During construction, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> ● 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 each of the qualifying features ● the distribution of qualifying features within the site <p>The modelling undertaken has demonstrated a low risk for salinity changes and negligible for tidal level and sedimentation. The low risk to twice daily cycles of such salinity variability would be seawards of Beckton at low tide when salinities are in the range of 5 parts per thousand (ppt); and seawards of Tower Bridge at high tide when salinities at Beckton are in the range of 20 ppt, with differences of around 0.3 ppt (seawater is around 35 ppt, river water 0 ppt). Based on this modelling it is considered that changes to salinity and temperature will not have adverse effects on the</p>

Habitats Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Effects After Mitigation
		<p>The effects of construction are considered to be short duration and localised, however, may lead to temporary and permanent effects on this site and its qualifying species.</p> <p>During operation, this option is likely to result in:</p> <ul style="list-style-type: none"> ● Physical damage - Habitat degradation due to flow reduction, non-toxic contamination and changes in water quality. ● Water table/availability – changes to surface water levels and flows. The new transfer and intake from River Thames may result in changes in water level and flows as the River Thames feeds directly into this site. ● Water quality – salinity changes as a result of brine water discharge from the desalination plant. ● Non-toxic contamination – changes in turbidity leading to changes in sediment loading and silt deposition, which may lead to smothering of supporting habitats and qualifying plants. ● Biological disturbances – changes in habitat availability; habitat avoidance (rapid population fluctuations) and potential for SPA populations to be displaced from current foraging areas. 	<ul style="list-style-type: none"> ● Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage. <p>The following mitigation measures are required during operation:</p> <ul style="list-style-type: none"> ● Installation of a salinity and residual chemical diffuser on the outtake. This will increase mixing and enhance rapid initial dilution of the concentrate, minimising increases in local salinity and its influence on the seabed. ● Further brine dilution with cooling water (this will also be mitigated by permits governing the temperature of discharged water). ● Where chlorine dosing is required to reduce/remove biofouling, this should be applied in the direction of the plant to avoid chlorine discharge into the marine environment. <p>As well as monitoring the salinity and flows within the Habitats Sites during operation, monitoring of qualifying features will also be undertaken, which will inform the requirement for adaptations of, or additional measures, that may be needed to enhance mitigation.</p>	<p>site integrity of the Thames Estuary and Marshes Ramsar and SPA.</p> <p>It is recommended that during operation monitoring of salinity and flows within the Habitats is undertaken, monitoring of qualifying features will also be undertaken, which will inform the requirement for adaptations of, or additional measures, that may be needed to enhance mitigation.</p>

Habitats Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Effects After Mitigation
Thames Estuary and Marshes SPA (UK9012021) (approx. 29km)	<p>Qualifying birds over winter (Article 4.1 / Annex I):</p> <ul style="list-style-type: none"> ● Avocet (A132) ● Hen harrier (A082) <p>Qualifying birds over winter (Article 4.2):</p> <ul style="list-style-type: none"> ● Black-tailed godwit ● Dunlin (A149) ● Knot (A143) ● Black-tailed godwit (A156) ● Grey plover (A141) ● Redshank (A162) <p>Qualifying birds on passage (Article 4.2):</p> <ul style="list-style-type: none"> ● Ringed plover (A137) ● Waterbird assemblage (75,019 individuals) 	<p>The identified effects have the potential to reduce the extent and distribution of functional habitat which supports the qualifying species' populations. Disturbance to qualifying species may impact upon adult survival.</p> <p>This site is in direct hydrological connection with the Option via the River Thames. Potential reduction in flow in the River Thames as result of this option is a possibility and as the River Thames is already considered to be impacted by abstraction, it is likely this option can reinforce this issue. Discharge into the River Thames of brine wastewater may also change the salinity of the water and affect habitats.</p> <p>During construction, this option is likely to result in:</p> <ul style="list-style-type: none"> ● Physical damage - habitat damage due to toxic and non-toxic contamination related to potential pollution events may be observed, such as an increase in turbidity, increase in siltation, sedimentation and changes in water quality. This could result in changes in the distribution and extent of qualifying plants and invertebrates. ● Population fluctuation of qualifying species - due to habitat 	<p>Mitigation measures will follow best practice guidelines to minimise potential adverse effects. These include (but are not limited to) the following:</p> <ul style="list-style-type: none"> ● CIRIA C741 Environmental good practice on site guide ● Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). ● Industry best practice mitigation measures for dust suppression. ● Biodiversity risk assessment for the introduction and spread of invasive non-native species (INNS) and mitigation from the findings of the assessment to be included in the Construction Environment Management Plan (CEMP). ● Specific mitigation to reduce increased sedimentation and silt deposition downstream of the proposed works should include silt screening around the area of works 	<p>During construction, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> ● 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 each of the qualifying features ● the distribution of qualifying features within the site <p>The modelling undertaken has demonstrated a low risk for salinity changes and negligible for tidal level and sedimentation. The low risk to twice daily cycles of such salinity variability would be seawards of Beckton at low tide when salinities are in the range of 5 parts per thousand (ppt); and seawards of Tower Bridge at high tide when salinities at Beckton are in the range of 20 ppt, with differences</p>

Habitats Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Effects After Mitigation
	<p>degradation and prey availability related to toxic and non-toxic contamination (potential pollution events associated with the hydrological connection/water quality degradation).</p> <p>The effects of construction are considered to be short duration and localised, however, may lead to temporary and permanent effects on this site and its qualifying species.</p> <p>During operation, this option is likely to result in:</p> <ul style="list-style-type: none"> ● Physical damage - Habitat degradation due to flow reduction, non-toxic contamination and changes in water quality. ● Water table/availability – changes to surface water levels and flows. The new transfer and intake from River Thames may result in changes in water level and flows as the River Thames feeds directly into this site. ● Water quality – salinity changes as a result of brine water discharge from the desalination plant. ● Non-toxic contamination – changes in turbidity leading to changes in sediment loading and silt deposition, which may lead to smothering of supporting habitats and qualifying plants. 	<p>degradation and prey availability related to toxic and non-toxic contamination (potential pollution events associated with the hydrological connection/water quality degradation).</p> <p>The effects of construction are considered to be short duration and localised, however, may lead to temporary and permanent effects on this site and its qualifying species.</p> <p>During operation, this option is likely to result in:</p> <ul style="list-style-type: none"> ● Physical damage - Habitat degradation due to flow reduction, non-toxic contamination and changes in water quality. ● Water table/availability – changes to surface water levels and flows. The new transfer and intake from River Thames may result in changes in water level and flows as the River Thames feeds directly into this site. ● Water quality – salinity changes as a result of brine water discharge from the desalination plant. ● Non-toxic contamination – changes in turbidity leading to changes in sediment loading and silt deposition, which may lead to smothering of supporting habitats and qualifying plants. 	<p>to limit the movement and redeposition of material.</p> <ul style="list-style-type: none"> ● The addition of fish screens at the intake and discharge structures in order to avoid eventual fish entrapment as guided by best practice guidelines ● Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage. <p>The following mitigation measures are required during operation:</p> <ul style="list-style-type: none"> ● Installation of a salinity and residual chemical diffuser on the outtake. This will increase mixing and enhance rapid initial dilution of the concentrate, minimising increases in local salinity and its influence on the seabed. ● Further brine dilution with cooling water (this will also be mitigated by permits governing the temperature of discharged water). ● Where chlorine dosing is required to reduce/remove biofouling, this should be applied in the direction of the plant to avoid chlorine discharge into the marine environment. <p>As well as monitoring the salinity and flows within the Habitats Sites during operation, monitoring of qualifying features will also be undertaken, which will inform the requirement for</p>	<p>of around 0.3 ppt (seawater is around 35 ppt, river water 0 ppt). Based on this modelling it is considered that changes to salinity and temperature will not have adverse effects on the site integrity of the Thames Estuary and Marshes Ramsar and SPA.</p> <p>It is recommended that during operation monitoring of salinity and flows within the Habitats is undertaken, monitoring of qualifying features will also be undertaken, which will inform the requirement for adaptations of, or additional measures, that may be needed to enhance mitigation.</p>

Habitats Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Effects After Mitigation
		<ul style="list-style-type: none"> Biological disturbances – changes in habitat availability; habitat avoidance (rapid population fluctuations) and potential for SPA populations to be displaced from current foraging areas. <p>The identified effects have the potential to reduce the extent and distribution of functional habitat which supports the qualifying species' populations. Disturbance to qualifying species may impact upon adult survival.</p>	<p>adaptations of, or additional measures, that may be needed to enhance mitigation.</p>	

C.2 Beckton to Coppermills tunnel (treated) - Construction

(ID: TWU_LON_HI-TFR_LON_ALL_beckton-coppermills)

C.2.1 Option Description

This option proposes conveying treated water via a tunnel from the new Beckton Desalination Plant to Coppermills Water Treatment Works (WTW). The total length of the route is approximately 11.47km.

C.2.2 HRA Stage 1 Screening Assessment – Summary

The HRA Stage 1 Screening assessment (Annex A and summarised in Section 2.3) identified three Habitats Sites within the ZoI of this option: Lee Valley SPA (UK9012111), Lee Valley Ramsar Site (UK11034), and Epping Forest SAC (UK0012720). The screening assessment could not rule out LSE for Lee Valley SPA and Lee Valley Ramsar Site due to the proximity of the proposed works adjacent to the Lee Valley site, and the potential for construction-related disturbances to occur. This Option has therefore proceeded to the next HRA stage – AA.

A summary of the HRA Stage 1 screening assessment is given in Table C.2.1, including the relative distances of the Habitats Sites from the options. The full HRA Screening assessment is presented in Annex A. Information on the Habitats Sites in this assessment are provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table C.2.1: Beckton to Coppermills tunnel (treated) - Construction– Summary of HRA Stage 1 Screening Results

LSE	No LSE
Lee Valley SPA (UK9012111) (approx. 0.16km)	Epping Forest SAC (UK0012720) (2.9km east)
Lee Valley Ramsar (UK11034) (approx. 0.16km)	

C.2.3 HRA Stage 2: Appropriate Assessment

C.2.3.1 Scope

The following Habitats Sites were assessed at Stage 2 AA:

- Lee Valley SPA (UK9012111) (approx. 0.16km from the option)
- Lee Valley Ramsar site (UK11034) (approx. 0.16km from the option)

C.2.3.2 Potential effects on Habitats Sites

The potential effects of the construction and operation phases of the option are described below, considering the type, size and scale of the option, following the methodology described in Chapter 2. An assessment of each potential effect is made in view of the site's conservation objectives. Where adverse effects cannot be ruled out, mitigation will be required in order to ascertain that the option will not adversely affect the integrity of the Habitats Site. Where stated, mitigation is in addition to the best practice assumptions and mitigation measures already outlined in Section 2.4.4.2.

C.2.3.3 Lee Valley SPA (UK9012111) (approx. 0.16km)

The Lee Valley was classified as a SPA in September 2000 and comprises a series of embanked water supply reservoirs, sewage treatment lagoons and former gravel pits that display a range of man-made and semi-natural wetland and valley bottom habitats.

The Lee Valley SPA site comprises bogs, marshes, water fringed vegetation and fens (4%), inland water bodies (67%), humid mesophile grasslands (8%), improved grassland (10%), broad-leaved deciduous woodland (10%) and other land (including manmade urban sites) (1%).

Qualifying Features

Designated for supporting migratory populations of birds, the site qualifies under Article 4.1 of the Directive (79/409/EEC) as over winter the area regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:

- Great bittern (*Botaurus stellaris*) [A021] - 6% of the GB wintering population

The site also qualifies under Article 4.2 of the Directive (79/409/EEC) as over winter the area regularly supports 1% or more of the GB populations of the following species not listed in Annex I:

- Gadwall (*Anas strepera*) [A051]- 1.5% of the North West European wintering population
- Northern shoveler (*Anas clypeata*) [A056]- 1.0% of the North West/Central European wintering population

Conservation Objectives

The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified (i.e. the "Qualifying features" listed above).

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 each of the qualifying features
- the distribution of qualifying features within the site

On top of the Conservation Objectives, the Supplementary Advice on Conservation Objectives (SACOs) provides a framework to inform the management and measures needed to conserve or restore a Habitats Site and the prevention of deterioration and significant disturbance of its qualifying features. The SACOs for the Lee Valley SPA⁶⁷ have been referred to in assessing this option.

Construction effects

This option proposes the transfer of water from Beckton Desalination Plant to Coppermills WTW via a tunnel. The option is located directly south of this Habitats Site, and therefore there is the potential for noise disturbance, air pollution, and pollution run-off during construction to affect the qualifying features.

The site is designated for supporting populations of wintering waterbirds. Great bittern are present in reedbed habitats, gadwall favour gravel pits and reservoirs as feeding locations and shoveler prefer shallow water areas including marshes, flooded pastures, reservoirs and lakes with marginal reeds or emergent vegetation. All three species are also reliant on supporting habitat beyond the SPA boundary. The vicinity of the works could constitute supporting habitats for these qualifying

⁶⁷ Natural England (2018). The Lee Valley SPA SACO is available at: [UK9012111_Lee_Valley_SPA_SACO_final.5_Feb_2018.pdf](#). Last accessed 11/07/2023.

species (the pipeline footprint crosses two rivers and a pond which may have reeds and emergent vegetation in the spring and summer months). In that case, physical damage (represented by supporting habitat loss, edge effects and habitat damage) followed by biological disturbances listed above may be observed.

Birds are likely to avoid habitat within the vicinity of the works. The use of vehicles, machinery and movement of personnel within this Habitats Site may result in adverse effects on qualifying birds due to noise and light pollution. Traffic activity during construction may also exceed critical loads of emissions (such as nitrogen oxides (NO_x), sulphur dioxide (SO₂), and particulates) that can lead to nutrient enrichment and eutrophication having adverse effects on this Habitats Site and its protected species. Air pollutants can alter the chemical status of habitat substrates, plant growth and vegetation composition, leading to effects on feeding, or roosting habitat quality and availability. For great bittern, maximum critical loads for nitrogen, ammonia and nitrogen oxides are 25kgN/ha/yr, 3µgm⁻³ and 30µgm⁻³ respectively. For gadwall and northern shovellers within the SPA, ammonia and nitrogen oxide maximum critical loads are also 3µgm⁻³ and 30µgm⁻³.

Disturbance to qualifying species may alter their feeding or roosting behaviour, increasing energy expenditure due to increased flight and desertion of supporting habitat. Effects of displacement may be temporary or long-lasting and may result in redistribution within or from a site, which could jeopardise adult fitness and survival. The identified effects may also have the potential to reduce the extent and distribution of functional linked habitat used by qualifying species' populations outside the Habitats Site. In case of pollution events, a localised reduction on invertebrate, amphibian and fish stocks, as well as on macrophytes may be observed, indirectly affecting this site's qualifying birds due to a reduction in food availability. Standard measures are recommended to mitigate possible effects from disturbance (vehicles and people movement), noise and light pollution.

Ahead of works (if undertaken over the wintering period from September – March inclusive), surveys must be undertaken to gather information on habitat use by great bittern, gadwall and shoveler with the intention to inform the best locations for the new connections, diversions and pipe bridge, in order to avoid areas mostly used by birds and ensure minimal habitat fragmentation.

Surveys will inform the CEMP which will include all of the above proposed mitigation measures and any further measures identified at the project stage. Once the construction is complete, habitats should be reinstated.

Given the size of the Habitats Site and the fact that the works should only affect a small proportion of the site (approximately 10% of the Site is within 500m of the Option), no adverse effects on the integrity of the site are expected if all mitigation measures proposed are in place. A summary of the required mitigation is given in Section C.2.3.5.

Operation effects

No operation effects are anticipated for this option which could result in adverse effects on this Habitats Site or result in adverse effects on the integrity of the site.

C.2.3.4 Lee Valley Ramsar site (UK11034) (approx. 0.16km)

Lee Valley was classified as a Ramsar Site on 22 September 2000. The site comprises a series of embanked water supply reservoirs, sewage treatment lagoons and former gravel pits, which support internationally important numbers of wintering gadwall and shoveler and nationally

important numbers of several other bird species⁶⁸. The site also supports the nationally scarce plant species whorled water-milfoil (*Myriophyllum verticillatum*) and the rare or vulnerable water-boatman invertebrate (*Micronecta minutissima*).

The Lee Valley Ramsar Site comprises peatlands (4%), reservoirs, barrages and dams (30%), gravel, brick, and clay pits (30%), sewage farms (7%) and other habitats (29%).

Qualifying Features

The site qualifies under Ramsar Criterion 2:

- The site supports the nationally scarce plant species whorled water-milfoil (*Myriophyllum verticillatum*) and the rare or vulnerable water-boatman invertebrate (*Micronecta minutissima*)

The site qualifies under Ramsar Criterion 6:

- Over winter the site regularly supports internationally important populations of: gadwall *Anas strepera* and shoveler *Anas clypeata*

Conservation Objectives

As the provisions on the Habitats Regulations relating to HRAs extend to Ramsar sites, Natural England generally considers the conservation advice packages for the overlapping SPA designation to be, in most cases, sufficient to support the management of the Ramsar interests. Therefore, the conservation objectives for the Lee Valley SPA is considered applicable to this Ramsar.

Construction effects

The construction effects on the Lee Valley Ramsar Site and specifically gadwall and shoveler will be similar to the ones listed above for the Lee Valley SPA, as both sites follow the same boundary. Therefore, the assessment below will focus on whorled water-milfoil and *Micronecta minutissima*.

Whorled water-milfoil typically grows in clear or slightly turbid calcareous, slow-flowing waters⁶⁹. Dust effects during the construction phase have the potential to affect photosynthesis and decrease productivity and growth of this plant, as well as other vegetation that comprises the habitats supporting the qualifying invertebrate species. This, in turn, could result in changes to habitat availability and biological disturbances, including rapid population fluctuations of water-boatmen and whorled water-milfoil. Traffic activity during construction may also exceed critical loads of emissions (such as NO_x, SO₂, and particulates) that can lead to nutrient enrichment and eutrophication having adverse effects on this Habitat Site and its protected species. Air pollutants can alter the chemical status of habitat substrates, plant growth and vegetation composition, leading to effects on habitat quality and availability.

Whorled water-milfoil and the water-boatman species are both dependent on slow-flowing waters. The works are located in the same catchment area as this Ramsar site, however no changes in groundwater levels and flows are anticipated during the construction phase of this option. The works are situated in close proximity to the River Lee (adjacent) which is hydrologically connected to the Ramsar site. Therefore, a potential pathway for pollution effects via water degradation (air pollution followed by subsequent deposition in the water surface) should be considered. Water quality degradation from potential pollution events can lead to temporary changes in turbidity,

⁶⁸ <https://jncc.gov.uk/jncc-assets/RIS/UK11034.pdf>

⁶⁹ Lansdown, R.V. 2014. *Myriophyllum verticillatum*. *The IUCN Red List of Threatened Species 2014*: e.T164335A1042718. <https://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T164335A1042718.en>. Accessed on 09 June 2023.

sedimentation and/or silting associated with run-off during construction when crossing waterbodies interconnected to the Habitats Site, as well as toxic contamination from dust/air pollution depositing on surface water. Ultimately, pollution events can alter the ecological balance of this site's habitats which may affect bird, plant and invertebrate population survival. There is also the potential for invasive species spread: Himalayan balsam *Polygonum polystachym* and Japanese knotweed *Reynoutria japonica* both threaten native plant communities and their dependent fauna within the Ramsar⁷⁰.

The SACO for this Habitats Site includes conservation targets relating to air and water quality; vegetation characteristics; extent, distribution and connectivity of supporting habitats; human disturbance; food availability and population abundance. The above effects would impact upon the Habitats Site meeting its conservation objectives.

The adverse effects identified are related to construction practices and in practice, the CEMP will include appropriate mitigation measures to limit to occurrence of the identified effects. It is further assumed that any affected habitats would be reinstated post-construction.

Given the size of the Habitats Site and the fact that the works should only affect a small proportion of the site (approximately 10% of the Site is within 500m of the option), no adverse effects on the site integrity are expected if all mitigation measures proposed are in place. A summary of the required mitigation is given in Section C.2.3.5.

Operation effects

No operation effects are anticipated for this option which could affect this Habitats Site and/or its qualifying features.

C.2.3.5 Proposed Mitigation

Mitigation measures will follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g. use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.

Standard best practice procedures must also include:

- CIRIA C741 Environmental good practice on site guide
- Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites).
- Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise.
- Best practice such as 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night).
- Biosecurity measures to ensure appropriate removal and/or management control of INNS at source.

Works will be agreed with Natural England and, if possible, to be undertaken outside the wintering period (September – March inclusive) to avoid effects on this site's qualifying bird species.

Any works which are undertaken outside of this period may disturb or displace overwintering species from suitable functional land. These works will only be permitted if the population present

⁷⁰ Ramsar (2000). Ramsar Information Sheet. Available at: <https://rsis.ramsar.org/RISapp/files/RISrep/GB1037RIS.pdf>. Last accessed: 16/06/2023.

at risk of disturbance is less than 1% of the cited SPA population and works will be supervised by an Ecological Clerk of Works (ECoW).

Visual screening barriers must be erected around construction activities and plant movement routes, where works are taking place in or adjacent to habitats which may be considered functionally linked to the Habitats site, or there is visual line of sight between construction activities and these habitats.

Additional working methods which will reduce disturbance to overwintering birds during construction include:

- A slow construction start, allowing plant engines to idle for five minutes to allow acclimatisation to additional noise;
- Plant machinery to be painted/ camouflaged to be less conspicuous; it is unlikely that all plant will be effectively screened by barriers due to size. The use of netting or colours in dark greens, grey or black will blend into the background when moving;
- All plant and equipment will be in good working order to reduce potential engine and machinery noise associated with older equipment. Advances in technology will be utilised, including the use of electric and hybrid alternatives; and
- All flashing beacons will be removed to avoid visual disturbance unless safety critical. White noise reversing warnings will be used instead of typical 'beeps'.

Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage.

Monitoring surveys for qualifying bird species and supporting habitats are required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies.

Where habitat loss and/or damage occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, must be carried out once the works are concluded. If possible, enhancement to habitats within the Habitats Site unaffected by the works will be undertaken prior to works commencing.

Mitigation measures will be refined at the project stage.

C.2.4 Stage 2 Outcomes and Further Studies

Following this HRA AA, it is considered that with adherence to the proposed mitigation measures (including no construction works during the wintering period from September to March inclusive), adverse effects on the overall integrity of the Lee Valley SPA and Lee Valley Ramsar site are not anticipated.

However, if construction works are undertaken during the wintering period, adverse effects cannot be ruled out at this stage and further investigation on the loss of any functionally linked habitats, anthropogenic disturbance and exposure to air pollution is required. This includes a detailed review of the baseline ecological data, to determine whether qualifying birds are present/absent within the construction footprint. A desk-based noise assessment and air quality assessment are also recommended, due to the proximity of the option to the Habitats Sites.

A summary of the AA for this option is given in Table C.2.2.

Table C.2.2: Beckton to Coppermills tunnel (treated) - Construction– Summary of HRA Stage 1 Screening Results

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
Lee Valley SPA (UK9012111) (Approx. 0.16km)	Qualifying birds over winter (Article 4.1 / Annex I) Great bittern (A021) Qualifying birds over winter (Article 4.2) Gadwall (A051) Northern shoveler (A056)	<p>The Option is likely to adversely affect this Habitat Site as the proposed footprint is close to this site’s boundaries. Therefore, there is the potential for a pathway for effects due to construction, including eventual pollution events and biological disturbances to the qualifying bird species populations.</p> <p>During construction this option could result in:</p> <ul style="list-style-type: none"> ● Physical loss - loss of functionally linked supporting habitat/habitat damage due to the construction works. ● Physical damage - habitat degradation and edge effects resulting from construction works. ● Non-physical disturbance - air pollution (dust) and light disturbance; noise and anthropogenic disturbance. ● Toxic contamination - air pollution from vehicle emissions and other airborne pollutants may lead to habitat degradation; ● Invasive species spread, during construction works impacting upon birds’ population due to habitat degradation, for example. ● Biological disturbances - Rapid population fluctuations (habitat 	<p>Mitigation measures will follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g., use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.</p> <p>Standard best practice procedures must include:</p> <ul style="list-style-type: none"> ● CIRIA C741 Environmental good practice on site guide ● Environment Agency’s PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). ● Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise. ● Best practice such as ‘Guidance Notes for the Reduction of Obtrusive Light’ (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night). ● Biosecurity measures to ensure appropriate removal and/or 	<p>During construction, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> ● 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 each of the qualifying features ● the distribution of qualifying features within the site <p>No adverse effects on the integrity of the site are anticipated if construction works are undertaken outside of the wintering period (from September – March inclusive). However, if works are undertaken during the wintering period, there is potential for adverse effects due to anthropogenic disturbance of qualifying birds, exposure to air pollution and loss of functionally linked habitat for qualifying birds.</p> <p>Further studies to better understand how the qualifying species use habitats within the construction footprint are required. Therefore, birds</p>

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
		<p>avoidance =), changes to habitat and prey availability. These effects are likely to be associated with all described above.</p> <p>Potential construction pollution events are likely to be localised and of short duration and may result in temporary and permanent effects on this site and its qualifying features.</p> <p>No operation pathways are identified for this option which could affect this site and its qualifying features.</p>	<p>management control of INNS at source.</p> <ul style="list-style-type: none"> ● Works should be agreed with Natural England and, if possible, to be undertaken outside the wintering period (September – March inclusive) to avoid effects on this site’s qualifying bird species. ● Any works which are undertaken outside of this period may disturb or displace overwintering species from suitable functional land. These works will only be permitted if the population present at risk of disturbance is less than 1% of the cited SPA population and works will be supervised by an Ecological Clerk of Works (ECoW). ● Visual screening barriers must be erected around construction activities and plant movement routes, where works are taking place in or adjacent to habitats which may be considered functionally linked to the Habitats site, or there is visual line of sight between construction activities and these habitats. ● Additional working methods which will reduce disturbance to overwintering birds during construction include: <ul style="list-style-type: none"> – A slow construction start, allowing plant engines to idle 	<p>and habitat suitability surveys to inform the project-level HRA will be required.</p> <p>No operation effects are anticipated for this option which could affect this Habitats Site and/or its qualifying features.</p>

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
			<p>for five minutes to allow acclimatisation to additional noise;</p> <ul style="list-style-type: none"> - Plant machinery to be painted/ camouflaged to be less conspicuous; it is unlikely that all plant will be effectively screened by barriers due to size. The use of netting or colours in dark greens, grey or black will blend in to the background when moving; - All plant and equipment will be in good working order to reduce potential engine and machinery noise associated with older equipment. Advances in technology will be utilised, including the use of electric and hybrid alternatives; and - All flashing beacons will be removed to avoid visual disturbance unless safety critical. White noise reversing warnings will be used instead of typical 'beeps'. 	
			<p>Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage.</p>	
			<p>Monitoring surveys for qualifying bird species and supporting habitats are required during and post-construction</p>	

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
Lee Valley Ramsar (UK11034) (Approx. 0.16km)	Ramsar Criterion 2 Whorled water-milfoil <i>Miconecta minutissima</i> Ramsar Criterion 6 Gadwall Shoveler	<p>The Option is likely to adversely affect this Habitat Site as the proposed footprint is close to this site’s boundaries. Therefore, there is the potential for a pathway for effects due to construction, including eventual pollution events and biological disturbances to the qualifying species populations.</p> <p>During construction this option could result in:</p>	<p>to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies.</p> <p>Where habitat loss and/or damage occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, must be carried out once the works are concluded. If possible, enhancement to habitats within the Habitats Site unaffected by the works will be undertaken prior to works commencing.</p> <p>Mitigation measures will be refined at the project stage.</p> <p>Mitigation measures should follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g., use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.</p> <p>Standard best practice procedures must include:</p> <ul style="list-style-type: none"> • CIRIA C741 Environmental good practice on site guide 	<p>During construction, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> • 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

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
		<ul style="list-style-type: none"> Physical loss - loss of functionally linked supporting habitat/habitat damage due to the construction works. Physical damage - habitat degradation and edge effects resulting from construction works. Non-physical disturbance - air (dust) and light disturbance; noise and anthropogenic disturbance. Toxic contamination – air pollution from vehicle emissions and other airborne pollutants may lead to habitat degradation; Non-toxic contamination – air pollution (dust), temporary changes in turbidity, sedimentation and/or silting associated to run-off during construction. Invasive species spread, during construction works impacting upon birds’ population due to habitat degradation, for example. Biological disturbances - Rapid population fluctuations (habitat avoidance), changes to habitat and prey availability. These effects are likely to be associated with all described above. 	<ul style="list-style-type: none"> Environment Agency’s PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise. Best practice such as ‘Guidance Notes for the Reduction of Obtrusive Light’ (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night). Biosecurity measures to ensure appropriate removal and/or management control of INNS at source. Works should be agreed with Natural England and, if possible, to be undertaken outside the wintering period (September - March inclusive) to avoid effects on this site’s qualifying bird species. Any works which are undertaken outside of this period may disturb or displace overwintering species from suitable functional land. These works will only be permitted if the population present at risk of disturbance is less than 1% of the 	<ul style="list-style-type: none"> the populations of each of the qualifying features the distribution of qualifying features within the site <p>No adverse effects on the integrity of the site are anticipated if construction works are undertaken outside of the wintering period (from September – March inclusive). However, if works are undertaken during the wintering period, there is potential for adverse effects due to anthropogenic disturbance of qualifying birds, exposure to air pollution and loss of functionally linked habitat for qualifying birds.</p> <p>Further studies to better understand how the qualifying species use habitats within the construction footprint are required. Therefore, birds and habitat suitability surveys to inform the project-level HRA will be required.</p> <p>No operation effects are anticipated for this option which could affect this Habitats Site and/or its qualifying features.</p>
		<p>Potential construction pollution events are likely to be localised and of short duration and may result in temporary</p>		

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
		<p>and permanent effects on this site and its qualifying features.</p> <p>No operation pathways are identified for this option which could affect this site and its qualifying features.</p>	<p>cited SPA population and works will be supervised by an ECoW.</p> <ul style="list-style-type: none"> • Visual screening barriers should be erected around construction activities and plant movement routes, where works are taking place in or adjacent to habitats which may be considered functionally linked to the Habitats site, or there is visual line of sight between construction activities and these habitats. • Additional working methods which will reduce disturbance to overwintering birds during construction include: <ul style="list-style-type: none"> – A slow construction start, allowing plant engines to idle for five minutes to allow acclimatisation to additional noise; – Plant machinery to be painted/ camouflaged to be less conspicuous; it is unlikely that all plant will be effectively screened by barriers due to size. The use of netting or colours in dark greens, grey or black will blend in to the background when moving; – All plant and equipment will be in good working order to reduce potential engine and machinery noise associated with older equipment. 	

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
			<p>Advances in technology will be utilised, including the use of electric and hybrid alternatives; and</p> <ul style="list-style-type: none"> - All flashing beacons will be removed to avoid visual disturbance unless safety critical. White noise reversing warnings will be used instead of typical 'beeps'. <p>Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage.</p> <p>Monitoring surveys for qualifying bird species and supporting habitats are required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies.</p> <p>Where habitat loss and/or damage occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, must be carried out once the works are concluded. If possible, enhancement to habitats within the Habitats Site unaffected by the works</p>	

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
			will be undertaken prior to works commencing. Mitigation measures will be refined at the project stage.	

Source: Mott MacDonald, 2023

C.3 Oxford Canal to Duke's Cut (SWOX)

(ID: TWU_SWX_HI-IMP_SWX_CNO_oxc-dukes cutswox)

C.3.1 Option Description

This Option proposes upgrades to the canal network to transfer 15 Ml/d surplus from the Wolverhampton Levels to upstream of Dukes Cut.

The construction activities are not known at this stage of the assessment. However, it is assumed that it may involve deployment of machinery, personal and use of construction material.

C.3.2 Stage 1: HRA Screening Review

The Stage 1 screening carried out identified one Habitats Sites within the Zol of this option. LSE could not be ruled out for this site Table C.3.1.

Option TWU_SWX_HI-therefore needs progressing to Stage 2: HRA AA.

Table C.3.1: Oxford Canal to Duke's Cut (SWOX - Summary Of HRA Stage 1 Screening Results

Potential for Significant Effects	No LSE
Oxford Meadows SAC (UK0012845) (approx. 0.3km south)	Hartslock Wood SAC
Cannock Extension Canal SAC (UK0012672) (0km)	Little Whittenham SAC
	Chiltern Beechwoods SAC
	Fen Pools SAC

C.3.3 Stage 2: Appropriate Assessment

The Stage 2 AA provides an assessment to determine whether the construction and/or operation of this option will result in an adverse effect on the site integrity of the Habitats Site identified at the screening stage with potential for LSE. At this stage, mitigation measures to prevent adverse effects can be included. For the purpose of these assessments, the use of widely used best practice measures constitute mitigation and are therefore included within Table 1.2

The AA will result in one of three potential outcomes:

- Evidence is sufficient and demonstrates there will be no adverse effects
- Evidence is sufficient but indicates that there will be an adverse effect
- Insufficient evidence to determine the effects.

C.3.3.1 Scope

The following sites were assessed at Stage 2 AA:

- Oxford Meadows SAC
- Cannock Extension Canal SAC

C.3.3.2 Potential Effects on Habitat Sites

The potential effects of the construction and operation phases for the scheme are described below, considering the type, size, and scale of the element.

An assessment of each potential effect on the integrity of the Habitats Sites is made, in view of the sites' structure, function and conservation objectives. Where adverse effects on site integrity cannot be ruled out, mitigation measures are also proposed and detailed in the following section.

At this stage, based on current information and in the absence of ecological assessment, a worst-case scenario is assumed. The potential adverse effects and recommended mitigation measures are outlined in Table C.3.2.

Oxford Meadows SAC (UK0012845) (approx. 0.3km)

Together with North Meadow and Clattinger Farm, Oxford Meadows represents lowland hay meadows in the Thames Valley centre of distribution. The site includes vegetation communities that are perhaps unique in the world in reflecting the influence of long-term grazing and hay-cutting on lowland hay meadows. The site has benefited from the survival of traditional management, which has been undertaken for several centuries and so exhibits good conservation of structure and function. Oxford Meadows is selected because Port Meadow is the larger of only two known sites in the UK for creeping marshwort.

This site is selected for supporting the following Annex I habitats:

- Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) (6510), and

This site is selected for supporting the following Annex II species:

- Creeping marshwort (*Apium repens*) species (1614).

This SAC is vulnerable to degradation, through excessive nutrient input, changes in the cutting or grazing regime, and changes in hydrology and potential invasive species spread are the principal threats to this site (further details on threats and pressures can be found in Annex B).

Conservation Objectives

The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified i.e. (the "Qualifying features" listed above).

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 each of the qualifying features
- the distribution of qualifying features within the site

On top of the Conservation Objectives, the Supplementary Advice on Conservation Objectives (SACOs) provides a framework to inform the management and measures needed to conserve or restore a Habitats Site and the prevention of deterioration and significant disturbance of its

qualifying features. The SACOs for Oxford Meadows SAC⁷¹ have been referred to in assessing this option.

Construction effects

There is a potential indirect hydrological pathway between this option's footprint and the SAC via the Oxford Canal. Although the canal is not in direct hydrological connection with the option, it is located within 500m. There is potential for pollution events to occur, which may have adverse effects on the SAC downstream.

Construction works are proposed outside of the Habitats Sites boundary and sufficiently distant to exclude potential adverse effects from air pollution (nitrogen oxides and sulphur dioxide from construction vehicles). However, there is potential for dust produced during construction works to enter the canal (via run-off or deposition), adding to the suspended sediment load in the canal.

In addition, there is potential for adverse effects during construction due to changes in water quality from pollution incidents, increases in suspended sediment and subsequent loading downstream and the introduction and/or spread of INNS as a result of the proposed works. This is due to the hydrological connectivity with qualifying habitats present downstream of the proposed option.

The adverse effects described above can be mitigated using best practice mitigation measures and adherence to a CEMP. These measures are listed in Table 1.2. With the implementation of mitigation measures, no adverse effects are anticipated.

Operation effects

Given that the Option and the Habitats Site are not directly hydrologically connected, there is no potential impact pathway and no operational effects are anticipated.

7.1.1.1 Cannock Extension Canal SAC (UK0012672) (0km of the proposed works)

The Cannock Extension Canal in central England is an example of anthropogenic, lowland habitat supporting floating water-plantain (*Luronium natans*) [1831] at the eastern limit of the plant's natural distribution on England. The site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following species listed in Annex II:

Annex II: Floating water-plantain (*Luronium natans*) [1831]

Construction Effects

Construction activities may lead to temporary and permanent loss of qualifying habitat resulting from land clearance around the pipeline construction area. Functionally linked habitats important for qualifying plant species can also be affected during construction due to air pollution (dust) affecting photosynthesis and decreasing productivity.

Critical loads of emissions (such as NO_x, SO_x, and particulates) from increased traffic can lead to nutrient enrichment and eutrophication. The movement of soil during construction may worsen the already ongoing invasion of invasive species. Habitat loss and degradation, including habitat fragmentation during construction may also have adverse effects on some of the smallest heaths and the connectivity between these and the larger heaths creating a hostile landscape to species dispersal.

⁷¹ Natural England (2019). The Oxford Meadows SAC SACO is available at: [UK0012845_OxfordMeadowsSAC_COSA Formal Published 16 Jan 19.pdf](#). Last accessed 1/08/2023.

Standard measures are recommended to mitigate possible effects from soil disturbance and light pollution. The site is sensitive to invasive species pressure and measures to avoid its spread will be undertaken during construction.

Habitat surveys should be conducted ahead of construction to inform the pipeline route in areas where protected habitats may be affected. Surveys will inform the Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at the project stage. Once the construction is complete, all habitats affected are to be reinstated.

No adverse effects to the site integrity are expected if all mitigation measures proposed are in place. However, this option is included in the in-combination assessment as it may result in low effects.

Operation Effects

No operation effects are anticipated for this option which could affect this designated site and/or its qualifying features.

C.3.4 Proposed Mitigation

During construction, mitigation measures will follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g. use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.

Standard best practice procedures must also include:

- CIRIA C741 Environmental good practice on site guide
- Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites).
- Biosecurity measures to ensure appropriate removal and/or management control of INNS at source.
- Specific mitigation to reduce increased sedimentation and silt deposition downstream include:
 - Planning site layout so that machinery and dust causing activities are located away from the site, as far as is possible.
 - Planning silt screening around the area of works to limit the movement and redeposition of material.
 - Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport.

Monitoring of pollutants immediately downstream of the restoration and improvement areas, to adapt mitigation measures as needed, is required to ensure that significant levels of contaminants are not being transferred into the Oxford Canal.

Specific monitoring of qualifying features within the Habitats Sites to inform mitigation measures during the construction phase is also required, due to the proximity between the sites and the option, as well as the presence of functionally linked habitats (waterbodies such as streams and ponds).

Mitigation measures will be refined at the project stage.

C.3.5 Stage 2: Outcomes and Further Studies

Following this HRA AA, it is considered that with adherence to the proposed mitigation, the works associated with the option are not anticipated to have any adverse effects on the integrity of the Oxford Meadows SAC and Cannock Extension Canal SAC (UK0012672) during the construction phase.

During construction, continuous monitoring is required in order to identify, at the earliest stage, changes which may result in adverse effects on the Habitats Sites. Proposed mitigation will then be adapted or refined accordingly.

There are no potential impact pathways for adverse effects to the Habitats Site during operation.

In light of the assessment carried out, conclusions of the implications for the site, and mitigation measures outlined, it can be ascertained that the option will not adversely affect the integrity of Oxford Meadows SAC or Cannock Extension Canal SAC.

A summary of the AA for this option is given in Table C.3.2.

Table C. 3.2:Oxford Canal to Duke’s Cut (SWOX – Summary of the HRA Stage 2 Appropriate Assessment

Habitats Sites	Qualifying Features	Potential Adverse Effects	Mitigation Measures	Outcome of the Appropriate Assessment
<p>Oxford Meadows SAC (UK0012845) (approx 0.3km south)</p>	<p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> ● 6510 Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) <p>Annex II species that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> ● 1614 Creeping marshwort (<i>Apium repens</i>) 	<p>This option may have the following permanent or temporary effects on the SAC during the construction phase:</p> <ul style="list-style-type: none"> ● Physical damage – habitat degradation or damage as a result of construction activities such as trampling, compaction that may affect habitat and species and functionally linked land ● Toxic contamination – chemical pollution in the canal during construction works which could be transferred downstream and damage habitats and plants and reduce prey availability for qualifying animals (waterbirds and insects). ● Non-toxic contamination – additional sedimentation or siltation during construction works within or adjacent to the canal, leading to degradation of qualifying or supporting habitats downstream. ● Physical loss/damage – significant localised habitat loss and/or degradation from pollution, both toxic and non-toxic. ● Biological disturbances – potential introduction of Invasive Non-Native Species INNS, reductions in the habitat (qualifying or those which support qualifying species), anthropogenic disturbances, and 	<p>The following mitigation and best practice measures will be implemented to avoid or reduce adverse impacts:</p> <ul style="list-style-type: none"> ● CIRIA C741 Environmental good practice on site guide. ● Environment Agency’s PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). ● Biosecurity measures to ensure appropriate removal and/or management control of INNS at source. ● Specific mitigation to reduce increased sedimentation and silt deposition downstream include: <ul style="list-style-type: none"> – Planning site layout so that machinery and dust causing activities are located away from the site, as far as is possible. – Planning silt screening around the area of works to limit the movement and redeposition of material. – Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport. ● Monitoring of pollutants immediately downstream of the restoration and improvement areas, to adapt mitigation measures as needed, is required to ensure that significant levels of contaminants are not being transferred into the Oxford Canal. ● Specific monitoring of qualifying features within the Habitats Sites to inform mitigation measures during the construction phase is also required, due to the proximity between the sites and the option, as well as the presence of functionally linked habitats (waterbodies such as streams and ponds). 	<p>During construction, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> ● 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 each of the qualifying features ● the distribution of qualifying features within the site <p>Further studies to better understand the distribution of qualifying features and linked habitats are required to inform the option design and associated mitigation measures. Therefore, habitat suitability surveys are required.</p> <p>Given that the Option and the Habitats Site are not directly hydrologically connected, there is no potential impact pathway and no operational effects are anticipated.</p>

Habitats Sites	Qualifying Features	Potential Adverse Effects	Mitigation Measures	Outcome of the Appropriate Assessment
		<p>habitat avoidance, all of which may subsequently lead to displacement of qualifying features within or from the site, as a result of the above impact pathways.</p> <p>During operation, no impact pathway has been identified and therefore no adverse are anticipated during operation.</p>	<ul style="list-style-type: none"> The proposed monitoring measures will be confirmed or modified in the light of consultation responses. Adherence a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage. <p>Mitigation measures will be refined at the project stage.</p>	
<p>Cannock Extension Canal SAC (UK0012672) (0km of the proposed works)</p>	<p>The site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following species listed in Annex II:</p> <ul style="list-style-type: none"> floating water-plantain (<i>Luronium natans</i>) [1831] 	<p>The option is likely to affect this designated site as the proposed footprint is within the designated site boundary (0km). Therefore, there is a pathway for potential effects due to eventual pollution events</p> <p>During construction this option could result in:</p> <ul style="list-style-type: none"> Physical loss - loss of habitat/habitat damage due to the pipeline construction. Physical damage - habitat degradation and edge effects resulting from pipeline construction. Non-physical disturbance - air (dust) and light disturbance due to machinery movement and other anthropogenic activities. Toxic contamination - air pollution from vehicle emissions and other airborne pollutants may lead to habitat degradation; Similarly, effects related to water pollution in case of pollution events may affect 	<p>Mitigation measures will follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g., use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.</p> <p>Standard best practice procedures must include:</p> <ul style="list-style-type: none"> CIRIA C741 Environmental good practice on site guide Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). Best practice such as 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night). Biosecurity measures to ensure appropriate removal and/or management control of INNS at source. Monitoring of pollutants immediately downstream of the restoration and improvement areas, to adapt mitigation measures as needed, is required to ensure that significant levels of contaminants are not being transferred into the Habitats Site. Specific monitoring of qualifying features within the Habitats Sites to inform mitigation measures during the 	<p>During construction, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> 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 each of the qualifying features the distribution of qualifying features within the site <p>Further studies to better understand the changes in the qualifying species and linked habitats are required. The option may result in temporary low effects and therefore is included in the in-combination assessment.</p> <p>No operation effects are anticipated for this option which could affect this designated site and/or its qualifying features.</p>

Habitats Sites	Qualifying Features	Potential Adverse Effects	Mitigation Measures	Outcome of the Appropriate Assessment
		<p>this site given its hydrological connection to the option footprint.</p> <ul style="list-style-type: none"> ● Invasive species spread, during construction works impacting upon floating water-plantain population due to habitat degradation, competition and increase of shading for example. ● Biological disturbances - Rapid population fluctuations (direct mortality) and changes to habitat availability. These effects are likely to be associated with all described above. <p>Potential construction pollution events are likely to be localised and of short duration and may result in temporary and permanent effects on this site and its qualifying features.</p> <p>No operation pathways are identified for this option which could affect this site and its qualifying features.</p>	<p>construction phase is also required, due to the proximity between the sites and the option, as well as the presence of functionally linked habitats (waterbodies such as streams and ponds).</p> <ul style="list-style-type: none"> ● Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage. <p>Mitigation measures will be refined at the project stage.</p>	

C.4 Oxford Canal - Transfer from Duke's Cut to Farmoor

(ID: TWU_SWX_HI-TFR_SWX_ALL_dukescut-farmoor)

C.4.1 Option Description

This option proposes a 15 Ml/d conveyance option from the Oxford Canal to Farmoor Reservoir (see Table 2.1 for full option description).

C.4.2 HRA Stage 1 Screening Assessment - Summary

The HRA Stage 1 screening assessment (Annex A and summarised in Section 2.3) carried out in 2020 identified unknown effects on one Habitats Site within the Zol of this option: Oxford Meadows SAC (UK0012845). A screening review has been undertaken based on the most current design of WRMP options, and this screening review identified four Habitats Sites within the Zol of this option. LSE could not be ruled out for Oxford Meadows SAC as a result of hydrological connectivity between the option footprint and the Habitats Site via the River Thames, potentially leading to pollution effects during construction. Therefore, this option has proceeded to HRA Stage 2 – AA.

A summary of the HRA Stage 1 screening assessment is given in Table C.4.1, including the relative distances of the Habitats Sites from the options. The full HRA Screening assessment is presented in Annex A. Information on the Habitats Sites in this assessment are provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table C.4.1: Oxford Canal - Transfer from Duke's Cut to Farmoor - Summary Of HRA Stage 1 Screening Results

LSE	No LSE
Oxford Meadows SAC (UK0012845) (approx. 0.9km)	Cothill Fen SAC (UK0012889) (approx. 5.2km)
	Burnham Beeches SAC (UK0030034) (approx. 4.8km)
	Windsor Forest & Great Park SAC (UK0012586) (approx. 5.2km)

C.4.3 Stage 2 Appropriate Assessment

The Stage 2 AA provides an assessment to determine whether this option will result in an AESI on the Habitats Sites identified at the screening stage with LSE.

The AA will result in one of three potential outcomes:

- Evidence is sufficient and demonstrates there will be no adverse effects;
- Evidence is sufficient but indicates that there will be an adverse effect;
- Insufficient evidence to determine the effects.

C.4.3.1 Scope

The following Habitats Sites were assessed at Stage 2 AA:

- Oxford Meadows SAC (UK0012845) (approx. 0.9km from the option).

C.4.3.2 Potential Effects on Habitats Sites

The following sections describe the potential effects of the construction and operational phases for the Dukes Cut to Farmoor Option taking into account the type, size and scale of the option, following the methodology described in Chapter 2. An assessment of each potential effect is made in view of the site's conservation objectives. Where adverse effects cannot be ruled out, mitigation

will be required in order to ascertain that the option will not adversely affect the integrity of the Habitats Site. Where stated, mitigation is in addition to the best practice assumptions and mitigation measures already outlined in Section 2.4.4.2.

LSE was identified in relation to:

- Hydrological connectivity between the option footprint and Habitats Site via River Thames may lead to potential pollution effects during construction of this option.

C.4.3.3 Oxford Meadows SAC (UK0012845) (approx. 0.9km).

Together with North Meadow and Clattinger Farm, Oxford Meadows represents lowland hay meadows in the Thames Valley centre of distribution. The site includes vegetation communities that are perhaps unique in the world in reflecting the influence of long-term grazing and hay-cutting on lowland hay meadows. The site has benefited from the survival of traditional management, which has been undertaken for several centuries and so exhibits good conservation of structure and function. Oxford Meadows is selected because Port Meadow is the larger of only two known sites in the UK for creeping marshwort.

This site is selected for supporting the following Annex I habitats:

- lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) (6510), and

This site is selected for supporting the following Annex II species:

- creeping marshwort (*Apium repens*) species (1614).

This SAC is vulnerable to degradation, through excessive nutrient input, changes in the cutting or grazing regime, and changes in hydrology and potential invasive species spread are the principal threats to this site (further details on threats and pressures can be found in Annex B).

Conservation Objectives

The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified i.e. (the "Qualifying features" listed above).

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 each of the qualifying features
- the distribution of qualifying features within the site

On top of the Conservation Objectives, the Supplementary Advice on Conservation Objectives (SACOs) provides a framework to inform the management and measures needed to conserve or restore a Habitats Site and the prevention of deterioration and significant disturbance of its qualifying features. The SACOs for Oxford Meadows SAC⁷² have been referred to in assessing this option.

⁷² Natural England (2019). The Oxford Meadows SAC SACO is available at: [UK0012845_OxfordMeadowsSAC_COSA Formal Published 16 Jan 19.pdf](#). Last accessed 1/08/2023.

Construction effects

The works will involve an abstraction on the Oxford Canal; the Oxford Canal connects with the Wolvercote Stream which runs through the SAC area. The SAC supports extensive areas of grassland vegetation with a number of important plant species associated with floodplain meadows and seasonally flooded habitats.

Abstraction of water from the Oxford Canal is unlikely to have an adverse effect on the designated features within the SAC due to the system of locks to prevent water levels being affected downstream. However, the pipeline route will cross the River Evenlode which flows downstream connecting the River Isis and River Thames, both of which support the floodplain areas of the SAC. The crossing of the River Evenlode by construction vehicles has the potential to result in the release of sediment associated with concrete / hydrocarbon pollutants that could be washed downstream and deposited within the floodplain habitats of the SAC. Toxic and non-toxic contamination may be observed due to pollution events (such as chemical contamination, high levels of turbidity or siltation due to runoff, for example).

Potential invasive species spread during construction works (due to the option and waterbodies proximity) may indirectly affect this site qualifying species due to habitat degradation, increasing the pressures on the conservation objectives of this site.

The adverse effects identified are related to construction systems and in practice, the CEMP will include appropriate mitigation measures to limit to occurrence of the identified effects. Furthermore, the construction works are outside the site boundary therefore the risk of adverse effects related to construction is further reduced. It is further assumed that any affected habitats would be reinstated post-construction.

Therefore, no adverse effects on the site integrity are anticipated provided all mitigation measures outlined below are in place. A summary of the required mitigation is given in Section C.4.3.4. However, as the option is in hydrological connection with the site low temporary effects are possible and therefore this option is included in the in-combination assessment.

Operational effects

Even though this option proposes a new abstraction from the Oxford Canal no operation effects which could affect the qualifying features of this site or result in adverse effects on site integrity are anticipated. The abstraction system is composed of a system of locks to prevent water levels being affected downstream. The canal draws water from the River Cherwell at Thrupp and is a lowering lock at Dukes Cut; no water level changes are likely to be observed at the SAC.

C.4.3.4 Proposed Mitigation

Mitigation measures will follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g. use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.

Standard best practice procedures must also include:

- CIRIA C741 Environmental good practice on site guide
- Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites).
- Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise.

- Best practice such as 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night).
- Biosecurity measures to ensure appropriate removal and/or management control of INNS at source.

Monitoring of pollutants immediately downstream of the proposed works, to adapt mitigation measures as needed, is required to ensure that significant levels of contaminants are not being transferred into the Habitats Site.

Specific monitoring of qualifying features within the Habitats Site to inform mitigation measures during the construction phase is also required, due to the proximity between the sites and the option, as well as the presence of functionally linked habitats (waterbodies such as streams and ponds).

Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage, at which point the mitigation measures will be refined.

C.4.4 Stage 2 Outcomes and Further Studies

Following this HRA AA, it is considered that with adherence to the required mitigation, the proposed works associated with the option are not expected to have any significant adverse effects on the overall integrity of the Habitats Site and its features (acting alone) for the construction and operation phases of the proposed option.

A summary of the AA for this option is given in Table C.4.2.

Table C.4.2: Oxford Canal - Transfer from Duke's Cut to Farmoor – Summary of The HRA Stage 2 Appropriate Assessment

Designated Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
<p>Oxford Meadows SAC (UK0012845) (approximately 0.9Km of the proposed works)</p>	<p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> ● 6510 Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) <p>Annex II species that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> ● 1614 Creeping marshwort (<i>Apium repens</i>) 	<p>This site is hydrologically connected to the option footprint and potential pollution effects may be observed.</p> <p>During construction this option could result in:</p> <ul style="list-style-type: none"> ● Toxic and non-toxic contamination - pollution events leading to water quality degradation and consequently to physical damage (habitat damage related to potential pollution events via hydrological connection). ● Invasive species spread, during construction works impacting on both the gadwall and shoveler population due to habitat degradation, for example. ● Rapid population fluctuations related to direct mortality may be observed. These effects are likely to be associated with all described above. <p>Potential construction pollution events are likely to be localised and of short duration and may result in temporary and permanent effects on this site and its qualifying features.</p> <p>No operational effects are anticipated.</p>	<p>Mitigation measures will follow best practice guidelines to minimise potential impacts e.g. use of sediment screens whenever close to waterbodies, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.</p> <p>Standard best practice procedures must include:</p> <ul style="list-style-type: none"> ● CIRIA C741 Environmental good practice on site guide ● Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). ● Biosecurity measures to ensure appropriate removal and/or management control of INNS at source. ● Monitoring of pollutants immediately downstream of the proposed works, to adapt mitigation measures as needed, is required to ensure that significant levels of contaminants are not being transferred into the Habitats Site. ● Specific monitoring of qualifying features within the Habitats Site to inform mitigation measures during the construction phase is also required, due to the proximity between the sites and the option, as well as the presence of functionally linked habitats (waterbodies such as streams and ponds). ● Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project 	<p>During construction and operation, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> ● 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 each of the qualifying features ● the distribution of qualifying features within the site

Designated Sites

Qualifying features

Potential Adverse Effects

Proposed Mitigation Measures

**Outcome of the Appropriate
Assessment**

stage, at which point measures will be refined.

C.5 South East Water to Guildford

(ID: TWU_GUI_HI-TFR_RZ5_ALL_sewtogui)

C.5.1 Option Description

This option proposes a 10Ml/d transfer from South East Water (Hogsback) to Mount SR Guildford (See Table 2.1 for full option description). An acronyms list is presented at the beginning of this report.

C.5.2 HRA Stage 1 Screening Assessment – Summary

The Stage 1 Screening assessment identified five Habitats Sites within the Zol of this option: Thames Basin Heaths SPA (UK9012141), Thursley, Ash, Pirbright and Chobham SAC (UK0012793), Thursley, Hankley & Frensham Commons SPA (UK9012131), Thursley & Ockley Bogs Ramsar site (UK11074) and Windsor Forest & Great Park SAC (UK0012586). The screening review could not rule out LSE for Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC due to the proximity of the option to the Habitat Sites potentially leading to pollution events, habitat loss and degradation.

The three Habitats Sites with no LSE were assessed as such due to being sufficiently distant for there to be no effects related to light/noise/anthropogenic disturbances during the construction phase of this option. These Habitats Sites are not hydrologically connected to the option footprint. No pathways are identified where this option could affect these Habitats Site and/ or their qualifying features during construction and/ or operational phases.

This option has proceeded to the next HRA stage – AA. A summary of the HRA Stage 1 screening assessment is given in Table C.5.1 including the relative distances of the Habitats Sites from the options. The full HRA Screening assessment is presented in Annex A. Information on the Habitats Sites in this assessment are provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table C.5.1: South East Water to Guildford HRA Stage 1 Screening Assessment Summary

LSE	No LSE
Thames Basin Heaths SPA (UK9012141) (adjacent)	Thursley, Hankley & Frensham Commons SPA (UK9012131) (280 approx.. 5km)
Thursley, Ash, Pirbright and Chobham SAC (UK0012793) (280approx.. 0.05km)	Thursley & Ockley Bogs Ramsar Site (UK11074) (280 approx.. 7km)
	Windsor Forest & Great Park SAC (UK0012586) (280 approx.. 9km)

C.5.3 Stage 2 Appropriate Assessment

C.5.3.1 Scope

The following Habitats Sites were assessed at Stage 2 AA:

- Thames Basin Heaths SPA (UK9012141) (adjacent to the option)
- Thursley, Ash, Pirbright and Chobham SAC (UK0012793) (approximately at. 0.05km from the option)

C.5.3.2 Potential Effects on Habitat Sites

The potential effects of the construction and operation phases of the option are described below, taking into account the type, size and scale of the option, following the methodology described in Chapter 2. An assessment of each potential effect is made in view of the site's conservation objectives. At this stage, a worst-case scenario is assumed. Where adverse effects cannot be ruled out, mitigation will be required to ascertain that the option will not adversely affect the integrity of the Habitats Site. Where stated, mitigation is in addition to the best practice assumptions and mitigation measures already outlined in Section 2.4.4.2.

At this stage, a worst-case scenario is assumed. Where adverse effects on site integrity cannot be ruled out, further necessary mitigation measures are also proposed in the following section, comprising best practice measures and option specific mitigation. These are also outlined in Table C.5.2: .

The Level 2 Water Framework Directive assessment for the groundwater bodies identified minor localised impacts on water quality from below ground construction activities, therefore, effects on the Habitats Sites are unlikely. The option footprint is also not hydrologically connected to either Habitats Sites; therefore changes in the water table and related construction or operational effects or pathways for hydrological pollution events are also considered unlikely. However, potential adverse effects in the absence of mitigation are still identified in relation to:

- The proximity to Habitat Sites may lead to potential pollution events, habitat loss and degradation, affecting these sites and its qualifying features.

C.5.3.3 Thames Basin Heaths SPA (UK9012141) (adjacent)

The Thames Basin Heaths was classified as a SPA in March 2005 and forms part of an extensive complex of lowland heathlands in southern England that support important breeding bird populations.

Designated for supporting migratory populations of birds, the site qualifies under article 4.1 of the Directive (79/409/EEC) as during the breeding season the area regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:

- Nightjar (*Caprimulgus europaeus*) [A224]– 7.8% of the GB breeding population
- Woodlark (*Lullula arborea*) [A246]– 9.9% of the GB breeding population
- Dartford warbler (*Sylvia undata*) [A302]– 27.8% of the GB breeding population

Conservation Objectives

The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified i.e. (the "Qualifying features" listed above).

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 each of the qualifying features
- the distribution of qualifying features within the site

On top of the Conservation Objectives, the SACOs provides a framework to inform the management and measures needed to conserve or restore a Habitats Site and the prevention of deterioration and significant disturbance of its qualifying features. The SACOs for the Thames Basin Heaths SPA⁷³ have been referred to in assessing this option.

Construction Effects

The proposed works may lead to temporary and permanent effects on this site and its qualifying features as a direct result of physical habitat loss, habitat degradation and/ or fragmentation, as the proposed pipeline route is in close proximity of this Habitat Site.

The site is designated for supporting populations of heathland breeding birds. Woodlark, nightjar and Dartford warbler breed in clear-fell and open heath areas, establishing nests on open ground provided by arable cultivation in the spring, as well as on grass-heath. Nests and chicks are vulnerable to construction activities during the breeding season, especially because they are well camouflaged, and chicks tend to stay motionless when disturbed. Additionally, disturbance impacts can result in adult birds being flushed from the nest site, leaving eggs to be predated while they are away. Physical loss and damage, including fragmentation and degradation of functional linked land used by these qualifying species could potentially occur as a result of land clearance during construction.

Birds are likely to avoid areas of qualifying habitat within the vicinity of the works. The use of vehicles, machinery, and movement of personnel within this Habitat Site, or within functionally linked land, may result in adverse effects due to noise and light pollution potentially affecting sensitive ground-breeding bird species. Traffic activity during construction may also exceed critical loads of emissions (such as NO_x, SO_x, and particulates) that can lead to nutrient enrichment and eutrophication having adverse effects on this Habitat Site and its protected bird species (air pollution due to impact of atmospheric nitrogen deposition has been identified as a pressure and threat to the bird species and habitats on site).

Disturbance to qualifying species when foraging may jeopardise adult fitness, survival, and breeding success by displacing birds from preferred feeding and/or roosting areas. Effects of displacement may be temporary or long-lasting and may result in redistribution within or from a site, increased energy expenditure due to more frequent flights, disrupted incubation of eggs and abandonment of nests. The identified effects may also have the potential to reduce the extent and distribution of functional linked habitat used by qualifying species' populations outside the Habitat Site. In case of pollution events, a localised reduction on fish stocks, as well as on macrophytes may be observed, indirectly affecting this site's qualifying bird species due to reduction of food availability. The site is sensitive to invasive species pressure and measures to avoid their spread need to be undertaken during construction.

Given the size of the Habitat Site and the fact that the pipeline route should only affect a very small proportion of the site, with all proposed mitigation measures in place, no adverse effects to the site integrity are expected. A summary of the required mitigation is given in Section C.5.3.5.

Operation effects

No operation effects are anticipated for this option which could affect this Habitat Site and/or its qualifying features.

⁷³ Natural England (2023). The Thames Basin Heaths SPA SACO is available at: [European Site Conservation Objectives for Thames Basin Heaths SPA - UK9012141 \(naturalengland.org.uk\)](https://www.naturalengland.org.uk/conservation-objectives-for-thames-basin-heaths-spa-uk9012141). Last accessed 1/08/2023.

C.5.3.4 Thursley, Ash, Pirbright and Chobham SAC (UK0012793) (approximately 0.05km from the proposed works)

The Thursley, Ash, Pirbright and Chobham site was classified as a SAC in April 2005 and is an extensive complex of heaths with large areas of wet and dry heath, acid mire and bog pools.

Designated for supporting habitats and plant species, the site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

- Depressions on peat substrates of the (*Rhynchosporion*) [7150]
- European dry heaths [4030]
- Northern Atlantic wet heaths with (*Erica tetralix*) [4010] (wet heathland with cross-leaved heath)

This site supports the sole area of lowland northern Atlantic wet heath in south-east England. This habitat supports an important assemblage of animal species, including numerous rare and local invertebrate species, including the Nationally Rare white-faced darter (*Leucorhinia dubia*), as well as sand lizard (*Lacerta agilis*) and smooth snake (*Coronella austriaca*).

Conservation Objectives

The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified i.e. (the "Qualifying features" listed above).

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 each of the qualifying features
- the distribution of qualifying features within the site

On top of the Conservation Objectives, the SACOs provides a framework to inform the management and measures needed to conserve or restore a Habitats Site and the prevention of deterioration and significant disturbance of its qualifying features. The SACOs for the Thursley, Ash, Pirbright and Chobham SAC⁷⁴ have been referred to in assessing this option.

Construction Effects

The site is designated for supporting early successional rare/scarse heathland vegetation.

Construction activities may lead to temporary and permanent loss of qualifying habitat resulting from land clearance around the pipeline construction area. Functionally linked habitats important for qualifying plant species can also be affected during construction due to air pollution (dust) affecting photosynthesis and decreasing productivity.

Critical loads of emissions (such as NO_x, SO_x, and particulates) from increased traffic can lead to nutrient enrichment and eutrophication. The movement of soil during construction may worsen the already ongoing invasion of heath by Rhododendron, Gaultheria and Piri piri burr⁷⁵. Habitat loss and

⁷⁴ Natural England (2023). The Thames Basin Heaths SPA SACO is available at: [European Site Conservation Objectives for Thursley, Ash, Pirbright & Chobham SAC - UK0012793 \(naturalengland.org.uk\)](#). Last accessed 1/08/2023.

⁷⁵ Natural England (2014) Site Improvement Plan: Thames Basin (SIP237) Available at: <http://publications.naturalengland.org.uk/publication/6249258780983296>. Accessed: 15/09/2022.

degradation, including habitat fragmentation during construction may also have adverse effects on some of the smallest heaths and the connectivity between these and the larger heaths creating a hostile landscape to species dispersal.

Given the size of the Habitat Site and the fact that the pipeline route should only affect a very small proportion of the site, it is anticipated that with the application of suitable mitigation, no adverse effects on qualifying features will result, therefore no adverse effects on the integrity of the site are anticipated. A summary of the required mitigation is given in Section C.5.3.5.

Operation Effects

No operational effects are anticipated for this option which could affect this Habitats Site and/ or its qualifying features.

C.5.3.5 Proposed Mitigation

Mitigation measures will follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g. use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.

Standard best practice procedures must also include:

- CIRIA C741 Environmental good practice on site guide
- Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites).
- Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise.
- Best practice such as 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night).
- Biosecurity measures to ensure appropriate removal and/or management control of INNS at source.
- Works should be agreed with Natural England and, if possible, to be undertaken outside the breeding period to avoid effects on this site's qualifying bird species.
- Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage.

Additionally, the following mitigation measures are recommended to provide additional certainty that LSEs can be avoided at the plan-level assessment:

- The project-level HRA will be used to inform project design;
- Ahead of works, surveys must be undertaken to gather information on specific habitats within the SPA, and functionally linked land in the vicinity, that is use by bird species with the intention to inform the best pipeline route to avoid areas mostly used by birds and ensure minimal habitat fragmentation (already a pressure on the site);
- Micro siting at the project design stage will maximise the distance separating the SPA and any asset within the relevant SSSI Impact Risk Zone;
- Where the project-level HRA identifies significant effects, the project design will prioritise the best available construction methods for preventing or minimising environmental impacts;
- The project's CEMP will detail the mitigation measures necessary to safeguard the SPA in accordance with the Natural England's targets set out in 'Supplementary advice on conserving

and restoring site features. Such safeguards will be secured by a pre-commencement planning condition and adaptive management measures within the CEMP;

- Potentially damaging activities (i.e. operations requiring Natural England consent) will not take place in or near the SPA unless a habitat protection and restoration plan is secured by a pre-commencement planning condition;
- Potentially disturbing activities identified in the CEMP will not take place in the relevant SSSI Impact Risk Zone during breeding period (February to September inclusive). Early consultation with Natural England is recommended to discuss timescales.

To refine the mitigation measures at the project stage, further studies are required to better understand how the qualifying species use the functionally linked habitats. Therefore, bird and habitat suitability surveys are required.

Surveys will inform the CEMP which will include all of the above proposed mitigation measures and any further measures identified at the project stage, at which point mitigation will be refined.

Monitoring surveys for qualifying bird species and supporting habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology and refinement of mitigation measures to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies.

Where habitat loss and/or damage occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, must be carried out once the works are concluded.

Given the fact that the pipeline is outside the Habitats Site, no adverse effects to the site integrity are expected if all mitigation measures proposed are in place.

C.5.4 Stage 2 outcomes and further studies

Following this HRA AA, it is considered that with adherence to the proposed mitigation, the proposed works associated with the option will not have AESI of the Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC and its qualifying features alone during the construction and operation phase of this option.

To refine the mitigation measures at the project stage, further studies are required to better understand how the qualifying species use the functionally linked habitats. Therefore, bird and habitat suitability surveys are recommended.

Monitoring surveys for qualifying bird species and supporting habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies.

A summary of the AA for this option is given in Table C.5.2.

Table C.5.2: South East Water to Guildford – Summary of HRA Stage 2 Appropriate Assessment

Habitats Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
Thames Basin Heaths SPA (UK9012141) (adjacent)	<p>Qualifying birds during breeding season: (Article 4.1 / Annex I)</p> <ul style="list-style-type: none"> ● Dartford warbler (<i>Sylvia undata</i>) (A302) ● Nightjar (<i>Caprimulgus europaeus</i>) (A224) ● Woodlark (<i>Lullula arborea</i>) (A246) <p>Non-qualifying species of interest (non-breeding)</p> <ul style="list-style-type: none"> ● Hen harrier (<i>Circus cyaneus</i>), ● Merlin (<i>Falco columbarius</i>) ● Short-eared owl (<i>Asio flammeus</i>) ● Kingfisher (<i>Alcedo atthis</i>) 	<p>The option is likely to affect this Habitats Site as the proposed footprint is close to this site’s boundaries. Therefore, there is the potential for a pathway for effects due to construction, including eventual pollution events and biological disturbances to the qualifying bird species populations.</p> <p>During construction this option could result in:</p> <ul style="list-style-type: none"> ● Physical loss – loss of supporting habitat/habitat damage due to the pipeline construction. ● Physical damage – habitat degradation and edge effects resulting from pipeline construction. ● Non-physical disturbance – air (dust) and light disturbance affecting not only the bird species directly but altering habitats for example; noise and anthropogenic disturbance. ● Toxic contamination – air pollution from vehicle emissions and other airborne pollutants may lead to habitat degradation; ● Invasive species spread, during construction works impacting upon birds’ population due to habitat degradation, for example. ● Biological disturbances – Rapid population fluctuations (habitat avoidance or eventual direct mortality), changes to habitat and prey availability. These effects are likely to be associated with all described above. 	<p>Mitigation measures will follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g., use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.</p> <p>Standard best practice procedures must include:</p> <ul style="list-style-type: none"> ● CIRIA C741 Environmental good practice on site guide; ● Environment Agency’s PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites); ● Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise; ● Biosecurity measures to ensure appropriate removal and/or management control of INNS at source; ● Works will be agreed with Natural England and, if possible, to be undertaken outside the breeding period to avoid effects on this site’s qualifying bird species; <p>Additionally, the following mitigation measures are required to provide additional certainty that AESI can be avoided at the plan-level assessment:</p> <ul style="list-style-type: none"> ● The project-level HRA will be used to inform project design; 	<p>No adverse effects on the integrity of the site are expected that could affect:</p> <ul style="list-style-type: none"> ● The extent and distribution of the habitats of the qualifying features; ● The structure and function of the habitats of the qualifying features; and ● The supporting processes on which the habitats of the qualifying species rely; ● The population of each of the qualifying features; and ● The distribution of the qualifying features within the site. <p>To refine the mitigation measures at the project stage, further studies are required to better understand how the qualifying species use the functionally linked habitats. Therefore, bird and habitat suitability surveys are recommended.</p> <p>Monitoring surveys for qualifying bird species and supporting habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies.</p>

Habitats Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
	<p>Potential construction pollution events are likely to be localised and of short duration and may result in temporary and permanent effects on this site and its qualifying features.</p> <p>No operation pathways are identified for this option which could affect this site and its qualifying features.</p>		<ul style="list-style-type: none"> ● Micro siting at the project design stage will maximise the distance separating the SPA and any asset within the relevant SSSI Impact Risk Zone; ● Where the project-level HRA identifies significant effects, the project design will prioritise the best available construction methods for preventing or minimising environmental impacts; ● The project's CEMP will detail the mitigation measures necessary to safeguard the SPA in accordance with the Natural England's targets set out in 'Supplementary advice on conserving and restoring site features. Such safeguards will be secured by a pre-commencement planning condition and adaptive management measures within the CEMP; ● Potentially damaging activities (i.e. operations requiring Natural England consent) will not take place in or near the SPA unless a habitat protection and restoration plan is secured by a pre-commencement planning condition; ● Potentially disturbing activities identified in the CEMP will not take place in the relevant SSSI Impact Risk Zone during breeding period (February to September inclusive); ● Potentially disturbing activities identified in the CEMP will not take place in the relevant SSSI Impact Risk during severe winter weather if baseline surveys have identified that suitable Dartford warbler habitat is present. ● To refine the mitigation measures at the project stage, further studies are required to 	

Habitats Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
			<p>better understand how the qualifying species use the functionally linked habitats. Therefore, bird and habitat suitability surveys are required.</p> <ul style="list-style-type: none"> • Surveys will inform the CEMP which will include all of the above proposed mitigation measures and any further measures identified at the project stage. • Monitoring surveys for qualifying bird species and supporting habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology and refinement of mitigation measures to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies. • Where habitat loss and/or damage occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, must be carried out once the works are concluded. 	
<p>Thursley, Ash, Pirbright and Chobham SAC (UK0012793) (approx. at 0.05km of the proposed works)</p>	<p>Qualifying habitats: (Article 4.1 / Annex I)</p> <ul style="list-style-type: none"> • Northern Atlantic wet heaths with (<i>Erica tetralix</i>) (4010) • European dry heaths (4030) • Depressions on peat substrates of the 	<p>The option is likely to affect this Habitats Site as the proposed footprint is in close proximity to the Habitats Site boundary (0.05km). Therefore, there is the potential for a pathway for effects due to construction including pollution, habitat fragmentation and dispersal of invasive species.</p> <p>During construction this option could result in:</p>	<p>Mitigation measures will follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g., use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.</p> <p>Standard best practice procedures must include:</p> <ul style="list-style-type: none"> • CIRIA C741 Environmental good practice on site guide 	<p>During construction and operation, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> • 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

Habitats Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
	Rhynchosporion (7150)	<ul style="list-style-type: none"> ● Physical damage - habitat degradation and edge effects resulting from pipeline construction. ● Non-physical disturbance - air (dust) disturbance affecting this site qualifying habitat and plant species. ● Toxic contamination - air pollution from vehicle emissions and other airborne pollutants may lead to habitat degradation; water degradation from air pollution deposition. ● Non-toxic contamination - localised pollution events leading to water quality degradation (from air pollution deposition) and consequently to physical damage and biological disturbances. ● Given the proximity of this site's boundaries, invasive species spread/introduction may occur during construction works/machinery movement. Invasive species may lead to habitat degradation and should be prevented. ● Biological disturbances - Rapid population fluctuations (direct mortality related to pollution events may lead to changes to habitat availability and changes in natural succession, for example. These effects are likely to be associated with all described above. <p>Potential construction pollution events are likely to be localised and of short duration and may result in temporary and permanent effects upon this site and its qualifying features.</p>	<ul style="list-style-type: none"> ● Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). ● Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise. ● Biosecurity measures to ensure appropriate removal and/or management control of INNS at source. ● Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage, at which point mitigation measures will be refined. <p>Additionally, the following mitigation measures are required to provide additional certainty that LSE Effects can be avoided at the plan-level assessment:</p> <ul style="list-style-type: none"> ● The project-level HRA will be used to inform project design ● Micro siting at the project design stage will maximise the distance separating the SAC and any asset within the relevant SSSI Impact Risk Zone ● Where the project-level HRA identifies significant effects, the project design will prioritise the best available construction methods for preventing or minimising environmental impacts ● The project's CEMP will detail the mitigation measures necessary to safeguard the SAC in 	<ul style="list-style-type: none"> ● the populations of each of the qualifying features ● the distribution of qualifying features within the site <p>To refine the mitigation measures at the project stage, further studies are required identify the presence of functionally linked habitat and to allow the refinement of the mitigation measures.</p> <p>Monitoring surveys for qualifying habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies.</p>

Habitats Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
		No operation pathways are identified for this option which could affect this site and its qualifying features.	<p>accordance with the Natural England’s targets set out in ‘Supplementary advice on conserving and restoring site features. Such safeguards will be secured by a pre-commencement planning condition and adaptive management measures within the CEMP.</p> <ul style="list-style-type: none"> ● Potentially damaging activities ((i.e. operations requiring Natural England consent) will not take place in or near the SAC unless a habitat protection and restoration plan is secured by a pre-commencement planning condition. ● Monitoring surveys for qualifying habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology and refinement of mitigation measures to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies. 	

C.6 Thames-Lee Tunnel extension from Lockwood PS to King George V Reservoir intake

Option ID: TWU_LON_HI-TFR_LON_ALL_lockwood ps-kgv res

C.6.1 Option Description

This option proposes conveying abstracted water from the Thames Lee Tunnel (TLT) via Lockwood PS to the River Lee Diversion at the intake of the King George V (KGV) reservoir.

C.6.2 HRA Stage 1 Screening Assessment – Summary

The HRA Stage 1 Screening assessment (Annex A and summarised in Section 2.3) identified three Habitats Sites within the ZoI of this option: Lee Valley SPA (UK9012111), Lee Valley Ramsar Site (UK11034), and Epping Forest SAC (UK0012720). The screening assessment identified LSE for Lee Valley SPA and Lee Valley Ramsar Site due to the proximity of the proposed works within the Lee Valley site. This option has therefore proceeded to the next HRA stage – AA.

A summary of the HRA Stage 1 screening assessment is given in Table C.6.1, including the relative distances of the Habitats Sites from the options. The full HRA Screening assessment is presented in Annex A. Information on the Habitats Sites in this assessment are provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table C.6.1: Thames-Lee Tunnel Extension from Lockwood PS to King George V Reservoir Intake – Summary of HRA Stage 1 Screening Results

LSE	No LSE
Lee Valley SPA (UK9012111) (Option within Habitats Site)	Epping Forest SAC (UK0012720) (1.7km east)
Lee Valley Ramsar (UK11034) (Option within Habitats Site)	

C.6.3 HRA Stage 2: Appropriate Assessment

C.6.3.1 Scope

The following Habitats Sites were assessed at Stage 2 AA:

- Lee Valley SPA (UK9012111) (Option within Habitats Site)
- Lee Valley Ramsar site (UK11034) (Option within Habitats Site)

C.6.3.2 Potential effects on Habitats Sites

The potential effects of the construction and operation phases of the option are described below, taking into account the type, size and scale of the option, following the methodology described in Chapter 2. An assessment of each potential effect is made in view of the site's conservation objectives. Where adverse effects cannot be ruled out, mitigation will be required in order to ascertain that the option will not adversely affect the integrity of the Habitats Site. Where stated, mitigation is in addition to the best practice assumptions and mitigation measures already outlined in Section 2.4.4.2.

C.6.3.3 Lee Valley SPA (UK9012111) (Option within Habitats Site)

The Lee Valley was classified as a SPA in September 2000 and comprises a series of embanked water supply reservoirs, sewage treatment lagoons and former gravel pits that display a range of man-made and semi-natural wetland and valley bottom habitats.

The Lee Valley SPA site comprises bogs, marshes, water fringed vegetation and fens (4%), inland water bodies (67%), humid mesophile grasslands (8%), improved grassland (10%), broad-leaved deciduous woodland (10%) and other land (including manmade urban sites) (1%).

Qualifying Features

Designated for supporting migratory populations of birds, the site qualifies under Article 4.1 of the Directive (79/409/EEC) as over winter the area regularly supports 1% or more of the GB populations of the following species listed in Annex I:

- Great bittern (*Botaurus stellaris*) [A021] - 6% of the GB wintering population

The site also qualifies under Article 4.2 of the Directive (79/409/EEC) as over winter the area regularly supports 1% or more of the GB populations of the following species not listed in Annex I:

- Gadwall (*Anas strepera*) [A051] - 1.5% of the North West European wintering population
- Northern shoveler (*Anas clypeata*) [A056] - 1.0% of the North West/Central European wintering population

Conservation Objectives

The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified (i.e. the "Qualifying features" listed above).

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 each of the qualifying features
- the distribution of qualifying features within the site

On top of the Conservation Objectives, the Supplementary Advice on Conservation Objectives (SACOs) provides a framework to inform the management and measures needed to conserve or restore a Habitats Site and the prevention of deterioration and significant disturbance of its qualifying features. The SACOs for the Lee Valley SPA⁷⁶ have been referred to in assessing this option.

Construction effects

This option proposes the transfer of water from the TLT via Lockwood PS to the River Lee Diversion at the intake of the KGV reservoir. The option is located partially within this Habitats Site, and therefore there is the potential for habitat loss, noise disturbance, air pollution, and pollution run-off during construction to affect the qualifying features.

The site is designated for supporting populations of wintering waterbirds. Great bittern are present in reedbed habitats, gadwall favour gravel pits and reservoirs as feeding locations and shoveler prefer shallow water areas including marshes, flooded pastures, reservoirs and lakes with marginal reeds or emergent vegetation. All three species are also reliant on supporting habitat beyond the SPA boundary. The works therefore adversely affect habitats within the SPA boundary as well as

⁷⁶ Natural England (2018). The Lee Valley SPA SACO is available at: [UK9012111_Lee_Valley_SPA_SACO_final.5_Feb_2018.pdf](#). Last accessed 11/07/2023.

functionally linked habitats outside the boundary. Therefore, physical damage (represented by supporting habitat loss, edge effects and habitat damage) followed by biological disturbances listed above may be observed.

Birds are likely to avoid habitat within the vicinity of the works. The use of vehicles, machinery and movement of personnel within this Habitats Site may result in adverse effects on qualifying birds due to noise and light pollution. Traffic activity during construction may also exceed critical loads of emissions (such as nitrogen oxides (NO_x), sulphur dioxide (SO₂), and particulates) that can lead to nutrient enrichment and eutrophication having adverse effects on this Habitats Site and its protected species. Air pollutants can alter the chemical status of habitat substrates, plant growth and vegetation composition, leading to effects on feeding, or roosting habitat quality and availability. For great bittern, maximum critical loads for nitrogen, ammonia and nitrogen oxides are 25kgN/ha/yr, 3µgm⁻³ and 30µgm⁻³ respectively. For gadwall and northern shovelers within the SPA, ammonia and nitrogen oxide maximum critical loads are also 3µgm⁻³ and 30µgm⁻³.

Disturbance to qualifying species may alter their feeding or roosting behaviour, increasing energy expenditure due to increased flight and desertion of supporting habitat. Effects of displacement may be temporary or long-lasting and may result in redistribution within or from a site, which could jeopardise adult fitness and survival. The identified effects may also have the potential to reduce the extent and distribution of functional linked habitat used by qualifying species' populations outside the Habitats Site. In case of pollution events, a localised reduction in invertebrate, amphibian and fish stocks, as well as on macrophytes may be observed, indirectly affecting this site's qualifying birds due to a reduction in food availability.

Operational effects

The Option proposes abstraction from the TLT via the Lockwood PS, located within the SPA, and transfer to the River Lee Diversion at the KGV Reservoir intake, located approximately 8km north. Therefore, abstraction will not affect water levels within the SPA and hydrological changes resulting from water availability within the Habitats Site are not anticipated. However, there is potential for INNS to be introduced to the SPA due to abstraction of water from the TLT to the River Lee, which is hydrologically connected to the SPA. This could potentially result in degradation of habitats on which qualifying species depend. Invasive species are included as a 'threat' in the Site Improvement Plan for the SPA.

C.6.3.4 Lee Valley Ramsar site (UK11034) (Option within Habitats Site)

Lee Valley was classified as a Ramsar Site on 22 September 2000. The site comprises a series of embanked water supply reservoirs, sewage treatment lagoons and former gravel pits, which support internationally important numbers of wintering gadwall and shoveler and nationally important numbers of several other bird species⁷⁷. The site also supports the nationally scarce plant species whorled water-milfoil (*Myriophyllum verticillatum*) and the rare or vulnerable water-boatman invertebrate (*Micronecta minutissima*).

The Lee Valley Ramsar Site comprises peatlands (4%), reservoirs, barrages and dams (30%), gravel, brick, and clay pits (30%), sewage farms (7%) and other habitats (29%).

Qualifying Features

The site qualifies under Ramsar Criterion 2:

⁷⁷ <https://jncc.gov.uk/jncc-assets/RIS/UK11034.pdf>

- The site supports the nationally scarce plant species whorled water-milfoil (*Myriophyllum verticillatum*) and the rare or vulnerable water-boatman invertebrate (*Micronecta minutissima*)

The site qualifies under Ramsar Criterion 6:

- Over winter the site regularly supports internationally important populations of: gadwall *Anas strepera* and shoveler *Anas clypeata*

Conservation Objectives

As the provisions on the Habitats Regulations relating to HRAs extend to Ramsar sites, Natural England generally considers the conservation advice packages for the overlapping SPA designation to be, in most cases, sufficient to support the management of the Ramsar interests. Therefore, the conservation objectives for the Lee Valley SPA is considered applicable to this Ramsar.

Construction effects

The construction effects on the Lee Valley Ramsar Site and specifically gadwall and shoveler will be similar to the ones listed above for the Lee Valley SPA, as both sites follow the same boundary. Therefore, the assessment below will focus on whorled water-milfoil and *Micronecta minutissima*.

Dust effects during the construction phase have the potential to affect photosynthesis and decrease productivity and growth of the whorled water-milfoil, as well as other vegetation that comprises the habitats supporting the qualifying invertebrate species. This, in turn, could result in changes to habitat availability and biological disturbances, including rapid population fluctuations of water-boatmen and whorled water-milfoil. Traffic activity during construction may also exceed critical loads of emissions (such as NO_x, SO₂, and particulates) that can lead to nutrient enrichment and eutrophication having adverse effects on this Habitat Site and its protected species. Air pollutants can alter the chemical status of habitat substrates, plant growth and vegetation composition, leading to effects on habitat quality and availability.

The works are located within the Ramsar site and therefore there is potential for pollution effects via water degradation (air pollution followed by subsequent deposition in the water surface). Water quality degradation from potential pollution events can lead to temporary changes in turbidity, sedimentation and/or silting associated with run-off during construction directly into Lockwood Reservoir or when construction traffic is crossing waterbodies interconnected to the Habitats Site (such as the River Lee), as well as toxic contamination from dust/air pollution depositing on surface water. Ultimately, pollution events can alter the ecological balance of this site's habitats which may affect bird, plant and invertebrate population survival. There is also the potential for invasive species spread: Himalayan balsam *Polygonum polystachyum* and Japanese knotweed *Reynoutria japonica* both threaten native plant communities and their dependent fauna within the Ramsar⁷⁸.

Operation effects

The Option proposes abstraction from the TLT via the Lockwood PS, located within the Ramsar site, and transfer to the River Lee Diversion at the KGV Reservoir intake, located approximately 8km north. Therefore, abstraction will not affect water levels within the Habitats Site and hydrological changes resulting from water availability are not anticipated. However, there is potential for INNS to be introduced to the Habitats Site due to abstraction of water from the TLT to the River Lee, which is hydrologically connected to the Ramsar. This could potentially result

⁷⁸ Ramsar (2000). Ramsar Information Sheet. Available at: <https://rsis.ramsar.org/RISapp/files/RISrep/GB1037RIS.pdf>. Last accessed: 16/06/2023.

in degradation of habitats on which qualifying species depend. Invasive species are included as a 'threat' in the Site Improvement Plan for the associated SPA.

C.6.3.5 Proposed mitigation

Construction

Mitigation measures will follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g. use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.

Standard best practice procedures must also include:

- CIRIA C741 Environmental good practice on site guide
- Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites).
- Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise.
- Best practice such as 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night).
- Biosecurity measures to ensure appropriate removal and/or management control of INNS at source.

Works will be agreed with Natural England and, if possible, to be undertaken outside the wintering period (September – March inclusive) to avoid effects on these sites' qualifying bird species.

Any works which are undertaken outside of this period may disturb or displace overwintering species from suitable functional land. These works will only be permitted if the population present at risk of disturbance is less than 1% of the cited SPA/ Ramsar population and works will be supervised by an Ecological Clerk of Works (ECoW).

Visual screening barriers should be erected around construction activities and plant movement routes, where works are taking place in or adjacent to habitats which may be considered functionally linked to the Habitats Sites, or there is visual line of sight between construction activities and these habitats.

Additional working methods which will reduce disturbance to overwintering birds during construction include:

- A slow construction start, allowing plant engines to idle for five minutes to allow acclimatisation to additional noise;
- Plant machinery to be painted/ camouflaged to be less conspicuous; it is unlikely that all plant will be effectively screened by barriers due to size. The use of netting or colours in dark greens, grey or black will blend in to the background when moving;
- All plant and equipment will be in good working order to reduce potential engine and machinery noise associated with older equipment. Advances in technology will be utilised, including the use of electric and hybrid alternatives; and
- All flashing beacons will be removed to avoid visual disturbance unless safety critical. White noise reversing warnings will be used instead of typical 'beeps'.

Ahead of works (if undertaken over the wintering period from September – March inclusive), surveys must be undertaken to gather information on habitat use by great bittern, gadwall and shoveler with the intention to inform the best locations for the new infrastructure, in order to avoid areas mostly used by birds and ensure minimal habitat fragmentation.

Monitoring surveys for qualifying bird species, invertebrates and supporting habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies.

Where habitat loss and/or damage occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, must be carried out once the works are concluded. If feasible, enhancement measures within areas of the SPA/ Ramsar to be retained will be completed in advance of works.

Given the size of the Habitats Site and the fact that the works should only directly affect a small proportion of the site, no AESI are anticipated if all mitigation measures outlined above are in place. Refer to Section C.6.3.5 for proposed mitigation.

Operation

At the project stage, an assessment will be undertaken to determine the increase in the risk of INNS transfer as a result of proposed raw water transfer. At this stage, dependant on the assessed risk and species concerned, mitigation measures will be proposed, which may include:

- Discharge of water directly into KGV Reservoir, rather than into the River Lee;
- Mesh screening at source of transfer;
- Mesh screening prior to discharge;
- Creation of habitats along the hydrological pathway to the Habitats Site that are more resilient to the spread on INNS, which may impede their spread;
- Regular monitoring of INNS within the Habitats Site and linked habitats to inform future mitigation or management.

Mitigation measures during construction and operation will be refined at the project stage.

C.6.4 Stage 2 Outcomes and Further Studies

Following this HRA AA, it is considered that with adherence to the proposed mitigation measures (including no construction works during the wintering period from September to March inclusive), AESI on the Lee Valley SPA and Lee Valley Ramsar site as a result of the option (alone) are not anticipated.

However, if construction works are undertaken during the wintering period, adverse effects cannot be ruled out at this stage and further investigation on the loss of any functionally linked habitats, anthropogenic disturbance and exposure to air pollution is required. This includes a detailed review of the baseline ecological data, to determine whether qualifying birds are present/absent within the construction footprint. A desk-based noise assessment and air quality assessment are also recommended, due to the proximity of the option to the Habitats Sites.

Although there is a risk of INNS spread to the Habitats Sites during operation, measures proposed above are deemed sufficient to mitigate adverse effects on the integrity of the Habitats Sites.

As the option is located within the Habitats Sites and temporary habitat loss is likely to arise during the construction phase, this option must be included within any in-combination assessment for the Lee Valley SPA and Ramsar. If there are other options where habitat loss within these Habitats Sites is proposed within a similar time period, there is potential for AESI on the Habitats Sites.

A summary of the AA for this option is given in Table C.6.2.

Table C.6.2: Thames-Lee Tunnel Extension from Lockwood PS to King George V Reservoir Intake – Summary of HRA Stage 2 Appropriate Assessment

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
Lee Valley SPA (UK9012111) (Option within Habitats Site)	<p>Qualifying birds over winter (Article 4.1 / Annex I)</p> <p>Great bittern (A021)</p> <p>Qualifying birds over winter (Article 4.2)</p> <p>Gadwall (A051)</p> <p>Northern shoveler (A056)</p>	<p>The Option has LSE on this Habitat Site as the proposed the proposed tunnel is located within the SPA boundary.</p> <p>Therefore, there is the potential for a pathway for effects due to construction, including pollution events and biological disturbances to the qualifying bird species populations.</p> <p>During construction this option could result in:</p> <ul style="list-style-type: none"> • Physical loss - loss or damage of habitats within the boundary of the Habitats Site, as well as functionally linked habitats outside the boundary, due to the construction works. • Physical damage - habitat degradation and edge effects resulting from construction works. • Non-physical disturbance - air pollution (dust) and light disturbance; noise and anthropogenic disturbance. • Toxic contamination - air pollution from vehicle emissions and other airborne pollutants may lead to habitat degradation; • Invasive species spread, during construction works impacting upon birds' population due to habitat degradation, for example. 	<p>During construction:</p> <p>Mitigation measures will follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g., use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.</p> <p>Standard best practice procedures must include:</p> <ul style="list-style-type: none"> • CIRIA C741 Environmental good practice on site guide • Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). • Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise. • Best practice such as 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night). 	<p>During construction and operation, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> • 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 each of the qualifying features • the distribution of qualifying features within the site <p>No adverse effects on the integrity of the site are anticipated if construction works are undertaken outside of the wintering period (from September – March inclusive). However, if works are undertaken during the wintering period, there is potential for adverse effects due to anthropogenic disturbance of qualifying birds, exposure to air pollution and loss of functionally linked habitat for qualifying birds.</p> <p>Further studies to better understand how the qualifying species use habitats within the construction footprint are required. Therefore, birds</p>

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
	<ul style="list-style-type: none"> Biological disturbances - Rapid population fluctuations (habitat avoidance), changes to habitat and prey availability. These effects are likely to be associated with all described above. <p>Potential construction pollution events are likely to be localised and of short duration and may result in temporary and permanent effects on this site and its qualifying features.</p> <p>During operation this option could result in:</p> <ul style="list-style-type: none"> Invasive species spread, due to abstraction from the TLT into the River Lee, which is connected to the Habitats Site. This could impact upon birds' population due to habitat degradation, for example. 	<ul style="list-style-type: none"> Biosecurity measures to ensure appropriate removal and/or management control of INNS at source. Works should be agreed with Natural England and, if possible, to be undertaken outside the wintering period (September – March inclusive) to avoid effects on this site's qualifying bird species. Any works which are undertaken outside of this period may disturb or displace overwintering species from suitable habitats within the Habitats Site or functionally linked land. These works will only be permitted if the population present at risk of disturbance is less than 1% of the cited SPA population and works will be supervised by an Ecological Clerk of Works (ECoW). Visual screening barriers should be erected around construction activities and plant movement routes, where works are taking place in or adjacent to habitats which may support qualifying bird species of the Habitats Site, or there is visual line of sight between construction activities and these habitats. Additional working methods which will reduce disturbance to 	<p>and habitat suitability surveys to inform the project-level HRA will be required.</p> <p>As the option is located within the Habitats Site and temporary habitat loss is likely to arise during the construction phase, this option must be included within any in-combination assessment for the Lee Valley SPA. If there are other options where habitat loss within this Habitats Site is proposed within a similar time period, there is potential for AESI on the Habitats Site.</p>	

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
			<p>overwintering birds during construction include:</p> <ul style="list-style-type: none"> - A slow construction start, allowing plant engines to idle for five minutes to allow acclimatisation to additional noise; - Plant machinery to be painted/ camouflaged to be less conspicuous; it is unlikely that all plant will be effectively screened by barriers due to size. The use of netting or colours in dark greens, grey or black will blend in to the background when moving; - All plant and equipment will be in good working order to reduce potential engine and machinery noise associated with older equipment. Advances in technology will be utilised, including the use of electric and hybrid alternatives; and - All flashing beacons will be removed to avoid visual disturbance unless safety critical. White noise reversing warnings will be used instead of typical 'beeps'. <ul style="list-style-type: none"> • Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the 	

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
			<p>project stage, at which point mitigation will be refined.</p> <ul style="list-style-type: none"> • Ahead of works (if undertaken over the wintering period), bird surveys must be undertaken to inform the best locations for the new infrastructure, in order to avoid areas mostly used by birds and ensure minimal habitat fragmentation. • Monitoring surveys for qualifying bird species and supporting habitats will be recommended during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies. • Where habitat loss and/or damage occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, must be carried out once the works are concluded. If feasible, enhancement measures within areas of the SPA to be retained will be completed in advance of works. 	
			During operation:	

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
			<p>An INNS risk assessment will be completed at the project stage. Dependant on the assessed risk and species concerned, mitigation measures will be proposed, which may include:</p> <ul style="list-style-type: none"> • Mesh screening at source of transfer; • Mesh screening prior to discharge; • Creation of habitats along the hydrological pathway to the Habitats Site that are more resilient to the spread on INNS, which may impede their spread; • Regular monitoring of INNS within the Habitats Site and linked habitats to inform future mitigation or management. 	
Lee Valley Ramsar (UK11034) (Option within Habitats Site)	<p>Ramsar Criterion 2 Whorled water-milfoil <i>Miconecta minutissima</i></p> <p>Ramsar Criterion 6 Gadwall Shoveler</p>	<p>The Option has LSE on this Habitat Site as the proposed the proposed tunnel is located within the Ramsar boundary. Therefore, there is the potential for a pathway for effects due to construction, including pollution events and biological disturbances to the qualifying species populations.</p> <p>During construction this option could result in:</p> <ul style="list-style-type: none"> • Physical loss – loss or damage of habitats within the boundary of the Habitats Site, as well as functionally linked habitats 	<p>During construction:</p> <p>Mitigation measures will follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g., use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.</p> <p>Standard best practice procedures must include:</p> <ul style="list-style-type: none"> • CIRIA C741 Environmental good practice on site guide 	<p>During construction and operation, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> • 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 each of the qualifying features

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
		<p>outside the boundary, due to the construction works.</p> <ul style="list-style-type: none"> Physical damage – habitat degradation and edge effects resulting from construction works. Non-physical disturbance – air (dust) and light disturbance; noise and anthropogenic disturbance. Toxic contamination – air pollution from vehicle emissions and other airborne pollutants may lead to habitat degradation; Non-toxic contamination – air pollution (dust), temporary changes in turbidity, sedimentation and/or silting associated to run-off during construction. Invasive species spread, during construction works impacting upon qualifying species populations due to habitat degradation, for example. Biological disturbances – Rapid population fluctuations (habitat avoidance), changes to habitat and prey availability. These effects are likely to be associated with all described above. <p>Potential construction pollution events are likely to be localised and of short duration and may result in temporary and permanent effects on this site and its qualifying features.</p>	<ul style="list-style-type: none"> Environment Agency’s PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise. Best practice such as ‘Guidance Notes for the Reduction of Obtrusive Light’ (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night). Biosecurity measures to ensure appropriate removal and/or management control of INNS at source. Works should be agreed with Natural England and, if possible, to be undertaken outside the wintering period (September – March inclusive) to avoid effects on this site’s qualifying bird species. Any works which are undertaken outside of this period may disturb or displace overwintering bird species from. These works will only be permitted if the population present at risk of disturbance is less than 1% of the cited SPA 	<ul style="list-style-type: none"> the distribution of qualifying features within the site <p>No adverse effects on the integrity of the site are anticipated if construction works are undertaken outside of the wintering period (from September – March inclusive). However, if works are undertaken during the wintering period, there is potential for adverse effects due to anthropogenic disturbance of qualifying birds, exposure to air pollution and loss of functionally linked habitat for qualifying birds.</p> <p>Further studies to better understand how the qualifying species use habitats within the construction footprint are required. Therefore, birds and habitat suitability surveys to inform the project-level HRA will be required.</p> <p>As the option is located within the Habitats Site and temporary habitat loss is likely to arise during the construction phase, this option must be included within any in-combination assessment for the Lee Valley Ramsar. If there are other options where habitat loss within this Habitats Site is proposed within a similar time period, there is potential</p>

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
		<p>During operation this option could result in:</p> <ul style="list-style-type: none"> Invasive species spread, due to abstraction from the TLT into the River Lee, which is connected to the Habitats Site. This could impact upon qualifying species populations due to habitat degradation, for example. 	<p>population and works will be supervised by an EcoW.</p> <ul style="list-style-type: none"> Visual screening barriers must be erected around construction activities and plant movement routes, where works are taking place in or adjacent to habitats supporting qualifying species (either within the Habitats Site or within functionally linked habitats), or there is visual line of sight between construction activities and these habitats. Additional working methods which will reduce disturbance to overwintering birds during construction include: <ul style="list-style-type: none"> A slow construction start, allowing plant engines to idle for five minutes to allow acclimatisation to additional noise; Plant machinery to be painted/ camouflaged to be less conspicuous; it is unlikely that all plant will be effectively screened by barriers due to size. The use of netting or colours in dark greens, grey or black will blend in to the background when moving; All plant and equipment will be in good working order to reduce potential engine and machinery noise associated 	

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
			<p>with older equipment. Advances in technology will be utilised, including the use of electric and hybrid alternatives; and</p> <ul style="list-style-type: none"> - All flashing beacons will be removed to avoid visual disturbance unless safety critical. White noise reversing warnings will be used instead of typical 'beeps'. • Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage, at which point the mitigation will be refined. • Ahead of works (if undertaken over the wintering period), bird surveys must be undertaken to inform the best locations for the new infrastructure, in order to avoid areas mostly used by birds and ensure minimal habitat fragmentation. • Monitoring surveys for qualifying species and supporting habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and 	

Habitats Sites	Qualifying Features	Potential Adverse Effects	Proposed Mitigation Measures	Outcome of the Appropriate Assessment
			<p>informed by the results of the above-mentioned studies.</p> <ul style="list-style-type: none"> Where habitat loss and/or damage occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, must be carried out once the works are concluded. If feasible, enhancement measures within areas of the Ramsar to be retained will be completed in advance of works. <p>During operation:</p> <p>An INNS risk assessment will be completed at the project stage. Dependant on the assessed risk and species concerned, mitigation measures will be proposed, which may include:</p> <ul style="list-style-type: none"> Mesh screening at source of transfer; Mesh screening prior to discharge; Creation of habitats along the hydrological pathway to the Habitats Site that are more resilient to the spread on INNS, which may impede their spread; <p>Regular monitoring of INNS within the Habitats Site and linked habitats to inform future mitigation or management.</p>	

C.7 Groundwater Development - Moulsoford Groundwater Source

(ID: TWU_SWX_HI-GRW_ALL_ALL_moulsoford gw)

C.7.1 Option Description

This option proposes the construction of an abstraction borehole in the unconfined Chalk north of Streatley on the west bank of the River Thames.

C.7.2 HRA Stage 1 Screening assessment – Summary

The HRA Stage 1 Screening assessment identified one Habitats Site within the ZoI of this option, namely Hartslock Wood SAC (UK0030164). LSE (as a result of this option alone) could not be ruled out, as it was identified that abstraction from the new borehole could result in drawdown impacts on sensitive habitats in the SAC. Construction-related pollution events during the construction of the pipeline where it crosses the River Thames was also identified as a potential impact. Therefore, this option has proceeded to HRA Stage 2 – AA.

A summary of the HRA Stage 1 screening assessment outcomes is given in Table C.7.1 including the relative distances of the Habitats Sites from the options. The full HRA Screening assessment is presented in Annex A. Information on the Habitats Sites in this assessment are provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table C.7.1: Groundwater Development - Moulsoford Groundwater Source – Summary of HRA Stage 1 Screening Results

LSE	No LSE
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Hartslock Wood SAC (UK0030164) (approx. 2.3km)

C.7.3 Stage 2 Appropriate Assessment

C.7.3.1 Scope

The following Habitats Site was assessed at Stage 2 AA:

- Hartslock Wood SAC (UK0030164) (approx. 2.3km from the option)

C.7.3.2 Potential effects on Habitats Sites

The potential effects of the construction and operation phases of the option are described below, taking into account the type, size and scale of the option, following the methodology described in Chapter 2. An assessment of each potential effect is made in view of the site's conservation objectives. Where adverse effects cannot be ruled out, mitigation will be required in order to ascertain that the option will not adversely affect the integrity of the Habitats Site. Where stated, mitigation is in addition to the best practice assumptions and mitigation measures already outlined in Section 2.4.4.2.

Potential adverse effects on Hartslock Wood SAC were identified in relation to hydrological connectivity between the option and the Habitats Site leading to:

- potential pollution and habitat degradation effects during construction of this option and,
- potential habitat degradation effects as a result of changes in flows on the River Thames during operation of this option (as identified in the WFD Level 2 assessment).

C.7.3.3 Hartslock Wood SAC (UK0030164) (approximately 2.3km from the option)

Hartslock Wood SAC is located approximately 2.3km from the proposed works and is in direct hydrological connection with the proposed pipeline route via the River Thames.

Comprising areas of mosaic of chalk grassland, chalk scrub and broadleaved woodland and mostly composed of calcareous substrates, these grasslands are generally found on thin, well-drained, lime-rich soils associated with underlying chalk and limestone geology. This composition offers support for a large number of rare plant species, justifying this SAC's unique status of "orchid rich sites" for hosting important orchid populations (at least one nationally uncommon orchid species and one or several orchid species considered to be rare, very rare or exceptional in the UK). Associated with this habitat is a noteworthy invertebrate fauna. Hartslock Wood is also one of the few examples remaining of ancient yew wood in the Chilterns. This evergreen tree occurs on shallow, dry soils usually on chalk or limestone slopes, but in a few areas stands /on more mesotrophic soils (see Annex B for further information on site characteristics).

Qualifying Features

The site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following listed habitat and species:

Annex I habitats that are a primary reason for selection of this site

- 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* Important orchid sites)
- 91J0 (*Taxus baccata*) woods of the British Isles (* priority feature)⁷⁹

Conservation Objectives

The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified i.e. (the "Qualifying features" listed above).

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 each of the qualifying features
- the distribution of qualifying features within the site

On top of the Conservation Objectives, the SACOs provides a framework to inform the management and measures needed to conserve or restore a Habitats Site and the prevention of deterioration and significant disturbance of its qualifying features. The SACO for Hartslock Wood SAC⁸⁰ have been referred to in assessing this option.

⁷⁹ * denotes a priority natural habitat or species - considered to be particular priorities for conservation at a European scale and are subject to special provisions in the Habitats Regulations. The term 'priority' is also used in other contexts, for example with reference to particular habitats or species that are prioritised in UK Biodiversity Action Plans. It is important to note however that these are not necessarily the priority natural habitats or species within the meaning of the Habitats Regulations

⁸⁰ Natural England (2016). Hartslock Wood SAC SACO is available at [UK0030164_HartslockWoodSAC_COSA_final_advice_13_03_2017.pdf](#). Last accessed 18/07/2023.

Construction Effects

Hartslock Wood is designated for its semi-natural dry grasslands and scrubland facies habitats, and yew-dominated woodland of the British Isles. The construction works are sufficiently distant from this Habitats Site to exclude construction-related such as from increased air and soil pollution related to machinery traffic.

However, there is potential for pollution events linked to the construction of the new borehole and the pipeline where it crosses the River Thames to result in localised changes to the water quality of the River Thames which must be considered, due to the existing hydrological connection between the site and the option. Toxic and non-toxic contamination related to potential pollution events could result in an increase in turbidity, increase in silting, sedimentation, and changes in water quality, and the WFD Level 2 assessment has indicated that deterioration between WFD status classes on the River Thames (Thames Wallingford to Caversham - GB106039030331) is possible. The WFD assessment concluded that 'modelling of impact of flow changes on habitat, sedimentation and water balance, water quality' is a requirement to improve confidence in the option design. Although there is a hydrological connection between this waterbody and the SAC, the dependencies of the qualifying features on water quality balance in the adjacent River Thames must be considered. It is certain that the qualifying habitats in the SAC are not surface water dependent features, and no targets related to hydrological balance or water quality in the River Thames (or elsewhere) are given in the SACO for this SAC. Furthermore any secondary implications to the water table on which the SAC is located has been ruled out by the WFD assessment, which concluded that there would be no impact on the Chiltern Chalk Scarp groundwater body as a result of this option, and no mitigation to ensure no deterioration would be required.

The construction of shafts will be required on the eastern side of the River Thames to allow for the crossing under the River Thames and railway, during which short term and temporary dewatering is likely to be required. The WFD Level 2 assessment concluded that this dewatering will be short term in duration however, and further unlikely to have a significant impact at (ground) waterbody scale. Therefore, the possibility of the qualifying habitat features for which the SAC is designated being adversely effected by hydrological changes during construction can be disregarded.

Therefore it is concluded that even in the absence of mitigation, the conservation objectives of Hartslock Wood SAC would not be compromised during construction, and therefore no adverse effects on site integrity are anticipated.

Operational effects

The WFD Level 2 assessment (Mott MacDonald 2022) identified potential for minor localised adverse effects on the River Thames (Thames Wallingford to Caversham - GB106039030331) as a result of reduced groundwater levels from abstraction leading to a reduction in baseflow into the river, potentially reducing flow volume and velocity. The proposed abstraction rate is small compared to the river flow at this location (new abstraction 2Ml/d compared to river Q95 of around 285Ml/d) and the water abstracted from this new borehole would be used in supply up-catchment, and therefore expected to be returned to the River Thames in upstream STW discharges. Therefore, it is concluded that any such changes in flow volume or velocity would lead to minor localised effects only, but this is subject to further investigation. The potential for any such changes to adversely affect the qualifying features of the SAC is negligible however, as the habitat features for which Hartslock Wood is designated are not considered to be surface water dependent features, and no measurable change on the Chiltern Chalk Scarp groundwater body on which the SAC is located are predicted.

Thus no pathways have been identified through which this Habitats Site and its qualifying features could be affected by this option during its operation phase. No compromise to the conservation objectives is expected and no adverse effects on the integrity of Hartslock Wood SAC are therefore anticipated.

C.7.3.4 Proposed Mitigation

Although no adverse effects which may compromise the integrity of the Habitats Site have been identified for this option, best practice guidelines to minimise potential construction-related impacts whenever close to waterbodies is nevertheless required, e.g. use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities.

Standard best practice procedures must also include:

- CIRIA C741 Environmental good practice on site guide
- Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites).
- Industry best practice mitigation measures for dust suppression.
- Biosecurity measures to ensure appropriate removal and/or management control of INNS at source.
- Works in the vicinity of this site should be agreed with Natural England and, if possible, to be undertaken outside the dry season, when the plant species are more sensitive to humidity fluctuations.
- Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage.
- Biodiversity risk assessment for the introduction and spread of INNS and mitigation from the findings of the assessment to be included in the CEMP.

Additionally, as a project-level HRA will be required in support of planning consent, the above mitigation measures will be refined in the event the option design changes significantly. The conclusions of this plan-level HRA are caveated as follows:

- Where the project-level HRA identifies significant effects, the project design will prioritise the best available construction methods for preventing or minimising environmental impacts;
- The project's CEMP will detail the mitigation measures necessary to safeguard the SAC in accordance with the Natural England's targets set out in 'Supplementary advice on conserving and restoring site features';
- Potentially damaging activities (i.e. operations requiring Natural England consent) will not take place in or near the SAC unless a habitat protection and restoration plan is secured by a pre-commencement planning condition;
- If required, development of groundwater modelling to predict likely changes in nearby hydrological systems and identify time periods in which significant damage could be caused due to abstraction
- To refine the mitigation measures at the project stage, further studies might be required to inform the assessment. Surveys will inform the CEMP which will include all of the above proposed mitigation measures and any further measures identified at the project stage;
- Monitoring surveys for qualifying habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology and refinement of mitigation measures to be made if necessary. The scope of the

monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies.

- Where habitat loss and/or damage occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, must be carried out once the works are concluded.

C.7.4 HRA Stage 2 outcomes and Further Studies

Following this HRA AA, it is considered that the proposed works associated with the option (acting alone) are not anticipated to have any significant adverse effects on the overall integrity of the Habitats Sites and their conservation objectives for the construction and operation phases of the Moulsoford option.

A summary of the AA for this option is given in Table C.7.2.

Table C.7.2: Groundwater Development - Moulsoford Groundwater Source Option – Summary of the HRA Stage 2 Appropriate Assessment

Habitats Sites	Qualifying features	Potential Adverse Effects	Proposed Mitigation Measures	Conclusion of the Appropriate Assessment
<p>Hartslock Wood SAC (UK0030164) (approx. 2.3km downstream of the proposed works)</p>	<p>Annex I habitats that are a primary reason for selection of this site</p> <ul style="list-style-type: none"> ● 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* Important orchid sites) ● 91J0 (<i>Taxus baccata</i>) woods of the British Isles (* priority feature) 	<p>Hartslock Wood SAC is approximately 2.3km from the proposed works and is in direct hydrological connection with the River Thames. Potential changes in water quality in the River Thames during construction and reduction in water flow and velocity during operation of this option has been identified.</p> <p>During construction, as the SAC is in hydrological connection and located downstream of option, toxic and non-toxic contamination related to potential pollution events may be observed. Therefore, this option has the potential to result in:</p> <ul style="list-style-type: none"> ● Physical damage - habitat damage due to increase in turbidity, increase in silting, sedimentation, and changes in water quality. ● Rapid population fluctuation - due to direct mortality related to toxic and non-toxic contamination. <p>The effects of construction are considered to be of short duration and localised, and the qualifying features of the SAC are not considered to be surface or groundwater dependent. The groundwater body on which the SAC sits will not be adversely affected by the option.</p> <p>It is concluded that there will be no adverse effects on this Habitat Site and its qualifying features during construction.</p>	<p>Although adverse effects on the integrity of the site can be avoided, standard best practice procedures will be followed during construction to limit construction-related disturbance and contamination including (but not limited to) the following:</p> <ul style="list-style-type: none"> ● CIRIA C741 Environmental good practice on site guide ● Environment Agency’s PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). ● Industry best practice mitigation measures for dust suppression. ● Development of groundwater modelling to predict likely impacts to changes in nearby hydrological systems and identify time periods in which significant damage could be caused due to abstraction ● Works in the vicinity of this site will be agreed with Natural England and, if possible, to be undertaken outside the dry season, when the plant species are more sensitive to humidity fluctuations. ● Reinstatement of any lost habitat once the pipeline’s construction is over will ensure any physical loss of habitats is temporary. ● Biodiversity risk assessment for the introduction and spread of INNS and mitigation from the findings of the assessment to be included in the CEMP. 	<p>During construction and operation, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> ● 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 each of the qualifying features ● the distribution of qualifying features within the site

Habitats Sites

Qualifying features

Potential Adverse Effects

Proposed Mitigation Measures

Conclusion of the Appropriate Assessment

No pathways have been identified through which this Habitats Site and its qualifying features could be adversely affected by this option during operation.

- Monitoring surveys for qualifying habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology and refinement of mitigation measures to be made if necessary.
 - Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage, at which point the mitigation will be refined.
-

C.8 Abingdon Reservoir to Farmoor Reservoir pipeline

(ID: TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe)

C.8.1 Option Description

This option proposes the construction of a transfer pipeline to convey 24 MI/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir.

C.8.2 Stage 1 Screening - Review

The Stage 1 Screening carried out in April 2020 identified a total of three Habitats Sites within the ZoI of this option, out of which one site, Cothill Fen SAC (UK0012889), was assessed as resulting in LSE. No LSEs were identified for Oxford Meadows SAC and Little Wittenham SAC. This screening review agrees with previous findings. Therefore, this option progresses to Stage 2 AA.

The full HRA Screening review is presented in Annex A. Information on the Habitats Sites is provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table C8.1: Abingdon Reservoir to Farmoor Reservoir Pipeline Option Stage 1 Screening Results Reviewed

LSE	No LSE
Cothill Fen SAC (UK0012889) (approx. 0.1km)	Oxford Meadows SAC (UK0012845) (approx. 4.8km)
	Little Wittenham SAC (UK0030184) (approx. 8 km)

C.8.3 Stage 2 Appropriate Assessment

C.8.3.1 Scope

The following Habitats Site was assessed at Stage 2 AA:

- Cothill Fen SAC (UK0012889) (approx. 0.1km)

C.8.3.2 Potential effects on Habitats Sites

The following sections describe the potential effects of the construction and operational phases for the Abingdon to Farmoor Reservoir pipeline Option. These consider the type, size, and scale of the option to determine their potential effect upon this Habitats Site and its qualifying features. An assessment of each potential impact on the integrity of the Habitats Sites is made, in view of the sites' structure, function and conservation objectives. Where adverse effects on site integrity cannot be ruled out, further necessary mitigation measures are also proposed in the following section. Where stated these are in addition to the best practice and assumptions outlined in Section 2.4.4.

Potential effects were identified in relation to:

- Proximity between the option footprint and Habitats Sites may lead to potential pollution and habitat degradation effects during construction of this option.

C.8.3.3 Cothill Fen SAC (UK0012889) (approx. 0.1km)

Cothill Fen is an exceptionally important site with an outstanding range of nationally rare habitats which support a large number of rare invertebrates and plants. This SAC habitat indirectly supports over 330 species of vascular plant and over 120 nationally scarce or rare invertebrates, including the nationally rare Southern Damselfly. These habitats consist of calcareous fen, calcareous grassland, woodland, and scrub of varying degrees of wetness.

This site is designated for comprising alkaline fens; calcium-rich spring water-fed fens (7230) and alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in addition to alder woodland on floodplains (91E0).

Water pollution, hydrological changes, and air pollution (nitrogen deposition) are the principal threats to this site's habitats as they directly affect its vegetation and invertebrate communities (for further details please refer to Annex B).

This option proposes the construction of a transfer pipeline to convey 24 Ml/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir. The proposed water transfer itself is not expected to result in significant effects upon this site, as this SAC is not in the same groundwater/surface waterbody as the option new intake/discharge. However, the proposed pipeline is located approximately 100m to the east of Cothill Fen SAC and as such, construction effects from the new pipeline may result in permanent and temporary adverse effects upon this SAC's qualifying habitats and supporting species.

Qualifying Features

Annex I habitats that are a primary reason for selection of this site:

- 7230. Alkaline fens; Calcium-rich spring water-fed fens

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site

- 91E0. Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*); Alder woodland on floodplains

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

Construction effects

Given the proximity between this site and the option footprint, without mitigation, dust during the construction phase has the potential to affect the plant species that are present on this site including: calcareous fen, calcareous grassland, woodland, and scrub thereby impacting on its productivity, photosynthesis and growth. Equally, disturbances from artificial light are expected to result in similar effects upon this site's plant species. Vehicle emissions and other airborne pollutants due to machinery / vehicular movements are known to directly contribute to the increase of nitrogen deposition, which is already listed as a threat to this site. During the construction phase air pollution may affect plant species and lead to direct mortality due to habitat

degradation. Depending on the severity/duration of this impact, effects such as loss of habitat and changes in biological processes including natural succession may be observed.

The hydrological connectivity between the site and the option's footprint is not clear, but likely to be via small, slow-flowing ditches and streams to be crossed by the new pipeline around the Great Park Farm area. In addition, given the proximity of the new pipeline to waterbodies feeding this site (e.g., around the Great Farm Park area), a potential pathway for pollution effects via water degradation (air pollution followed by subsequent deposition in the water surface) cannot be ruled out.

Water quality degradation from potential pollution events is listed as a threat to this SAC and can be represented by temporary changes in turbidity, sedimentation and/or silting associated with run-off during construction when waterbodies are crossed, toxic contamination (dust/air pollution depositing on surface water), among others. These effects may lead to significant effects upon the qualifying vegetation and important invertebrate communities (such as the nationally rare Southern Damselfly) occurring within this site as detailed in Table C.8.2.

Given the fact that construction works are outside the site boundary no AESI are anticipated if all mitigation measures proposed are in place.

Operational effects

This SAC is located within the Sandford Brook (source to Ock) groundwater body (GB106039023410) which is not affected by the proposed new intake/discharge of this option. There is no surface waterbody associated with the new proposed intake/discharge which may be connected to this site. Therefore, no changes in the water table are anticipated. No other operation pathways are identified for this option which could affect this site and its qualifying features.

C.8.3.4 Proposed Mitigation

Standard best practice procedures will be followed during construction to limit construction-related disturbance and contamination. A detailed description of best practice procedures and mitigations of relevance to this option can be found in section 3.3.4. The following provides an overview of these:

- CIRIA C741 Environmental good practice on site guide
- Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites), 'Guidance Notes for the Reduction of Obtrusive Light'.
- Biosecurity measures to ensure appropriate removal and/or management control of INNS (terrestrial) at source.
- At this stage it's not clear how close vehicle movements or supporting area for the construction work will be undertaken. Such activity should be as far from the site as possible given the recognised risk of soil/roots compaction and dust.
- Specific mitigation for night works and artificial lighting will incorporate lighting hoods to minimise the light spill.
- Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified as required at the project stage, at which point the mitigation will be refined.

Habitat surveys are to be conducted ahead of construction to inform the pipeline route in areas where protected habitats may be affected. Surveys will inform the CEMP which will include all the

above proposed mitigation measures and any further measures identified at the project stage. Once the construction is complete habitats will be reinstated.

Monitoring surveys for qualifying habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology and refinement of mitigation measures to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned surveys.

C.8.4 Stage 2 outcomes and Further Studies

Following this HRA AA, it is considered that with adherence to the required mitigation, the proposed works associated with the option are not expected to have any significant adverse effects on the overall integrity of Cothill Fen SAC and their features alone during the construction and operation phase of the proposed option.

A summary of the AA for this option is given in Table C.8.2.

Table C.8.2: Abingdon Reservoir to Farmoor Reservoir Pipeline - Summary of HRA Stage 2 Appropriate Assessment

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
Cothill Fen SAC (UK0012889)	<ul style="list-style-type: none"> 7230. Alkaline fens; Calcium-rich spring water-fed fens 91E0. Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>); Alder woodland on floodplains 	<p>This option is likely to affect this Habitats Site as the proposed footprint is approximately 100m to the south of the proposed pipeline route.</p> <p>Therefore, there is the potential for a pathway for effects due to construction of this option related to pollution events and biological disturbances.</p> <p>The proposed works may lead to temporary and permanent effects on this site and its qualifying features. The identified effects have the potential to reduce the extent and distribution of functional habitat which supports the qualifying species' populations.</p> <p>During construction, this option is likely to result in:</p> <ul style="list-style-type: none"> Physical loss – loss of habitat/habitat damage due to the structure's construction. Physical damage – habitat degradation and edge effects resulting from pipeline / associated structures construction. Non-physical disturbance – air (dust) and light pollution impacting on productivity and vegetation growth/photosynthesis. Toxic contamination – air pollution may lead to habitat degradation; water degradation from air pollution deposition. Vehicle emissions and other airborne pollutants increasing nitrogen deposition. Biological disturbances – direct mortality, rapid population fluctuations, changes to 	<p>Standard best practice procedures will be followed during construction to limit construction-related disturbance and contamination. A detailed description of best practice procedures and mitigations of relevance to this option can be found in section 3.3.4. The following provides an overview of these:</p> <ul style="list-style-type: none"> CIRIA C741 Environmental good practice on site guide Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites), 'Guidance Notes for the Reduction of Obtrusive Light'. Biosecurity measures to ensure appropriate removal and/or management control of INNS (terrestrial) at source. At this stage it's not clear how close vehicle movements or supporting area for the construction work will be undertaken. Such activity should be as far from the site as possible given the recognised risk of soil/roots compaction and dust. Specific mitigation for night works and artificial lighting will incorporate lighting hoods to minimise the light spill. Monitoring of the Habitats Site's qualifying features will be required during the construction phase in order to inform the adaptation of mitigation measures as needed to avoid AESI. 	<p>During construction and operation, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> 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 each of the qualifying features the distribution of qualifying features within the site

Designated Sites

Qualifying features

Potential Significant Effects Alone

Proposed Mitigation Measures

Residual Effects -Alone

habitat availability, changes to habitat natural succession.

No operation pathways are identified for this option which could affect this site and its qualifying features.

- Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified as required at the project stage, at which point the mitigation will be refined.

Habitat surveys are to be conducted ahead of construction to inform the pipeline route in areas where protected habitats may be affected.

Surveys will inform the CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage.

Once the construction is complete habitats will be reinstated.

C.9 TWRM extension - Coppermills to Honor Oak - Construction

(ID: TWU_HON_HI-ROC_NET_CNO_cop'mills-honoroak)

C.9.1 Stage 1 Screening – Review

TWRM extension - Coppermills to Honor Oak Option (ID: TWU_HON_HI-ROC_NET_CNO_cop'mills-honoroak)

The TWRM extension - Coppermills to Honor Oak Option proposes a new extension tunnel connecting to the existing shafts at Coppermills WTW and New Honor Oak. Additional treated water will be supplied from new WTW at Coppermills and/or Kempton, depending on the resource options developed.

The Stage 1 Screening carried out in April 2020 identified a total of three Habitats Sites within the ZoI of this option, of which two sites Lee Valley SPA/Ramsar, were assessed as having LSE. No LSE were identified for Epping Forest SAC (UK0012720). This Screening review agrees with previous findings and this option is recommended to proceed to the next HRA stages – HRA AA. Coppermills to Honor Oak TWRM extension screening results are summarized in Table C.9.1.

Full HRA Screening review is presented in Annex A. Information on the Habitats Sites is provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to their integrity.

Table C9.1: TWRM extension - Coppermills to Honor Oak - Construction Option Stage 1 Screening Results Reviewed

LSE	No LSE
Lee Valley SPA (UK9012111) (approx. 0.2 km)	Epping Forest SAC (UK0012720) (approx. 3.5 km)
Lee Valley Ramsar site (UK11034) (approx. 0.2 km)	

C.9.2 Stage 2 Appropriate Assessment

C.9.2.1 Scope

The following two sites were assessed at Stage 2 AA:

- Lee Valley SPA (UK9012111) (approx. 0.2 km)
- Lee Valley Ramsar (UK11034) (approx. 0.2 km)

C.9.2.2 Potential effects on Habitats Sites

The following sections describe the potential effects of the construction and operational phases for Coppermills to Honor Oak TWRM extension Option. These take into account the type, size and scale of the option to determine their potential effect.

An assessment of each potential impact on the integrity of the designated sites is made, in view of the sites' structure, function and conservation objectives. Where adverse effects on site integrity cannot be ruled out, further necessary mitigation measures are also proposed in the following section. Where stated these are in addition to the best practice outlined in Section 2.4.4.

C.9.2.3 Lee Valley SPA (UK9012111) (approx. 0.2 km)

The Lee Valley was classified as a SPA in September 2000 and comprises a series of embanked water supply reservoirs, sewage treatment lagoons and former gravel pits that display a range of man-made and semi-natural wetland and valley bottom habitats.

The Lee Valley SPA site comprises bogs, marshes, water fringed vegetation and fens (4%), inland water bodies (67%), humid mesophile grasslands (8%), improved grassland (10%), broad-leaved deciduous woodland (10%) and other land (including manmade urban sites) (1%).

Qualifying Features

Designated for supporting migratory populations of birds, the site qualifies under Article 4.1 of the Directive (79/409/EEC) as over winter the area regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:

- Great bittern (*Botaurus stellaris*) [A021] - 6% of the GB wintering population

The site also qualifies under Article 4.2 of the Directive (79/409/EEC) as over winter the area regularly supports 1% or more of the GB populations of the following species not listed in Annex I:

- Gadwall (*Anas strepera*) [A051] - 1.5% of the North West European wintering population
- Northern shoveler (*Anas clypeata*) [A056] - 1.0% of the North West/Central European wintering population

Conservation Objectives

The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified (i.e. the "Qualifying features" listed above).

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 each of the qualifying features
- the distribution of qualifying features within the site

On top of the Conservation Objectives, the Supplementary Advice on Conservation Objectives (SACOs) provides a framework to inform the management and measures needed to conserve or restore a Habitats Site and the prevention of deterioration and significant disturbance of its qualifying features. The SACOs for the Lee Valley SPA⁸¹ have been referred to in assessing this option.

This option proposes a new extension tunnel connecting to the existing shafts at Coppermills WTW and New Honor Oak and is located at 200m south of this Habitat Site. The new pipeline footprint is to cross the River Lee which feeds into this site. However, as changes in the groundwater body are not anticipated and this site is located upstream of the option footprint, no pathways for significant effects due to hydrological connections are identified.

⁸¹ Natural England (2018). The Lee Valley SPA SACO is available at: [UK9012111_Lee_Valley_SPA_SACO_final.5_Feb_2018.pdf](#). Last accessed 11/07/2023.

Construction

Given the construction area proximity of this Habitat Site (approximately 200m distance), this option has the potential to result in LSE on the SPA as a result of noise, light anthropogenic presence and other related disturbances both within the Habitats Site or within functionally linked habitats.

In relation to birds, noise effects from construction activities could be significant up to 1km from the boundary of the Habitats Site, including any functionally linked habitats outside the Habitats Site. Disturbances to qualifying bird species cannot be ruled out unless noise disturbance is kept to under 50dB(A) and no human presence is visible within 250m of the site. This unlikely to be the case, as the proposed works are within 200m of site.

During construction phase air pollution may reduce plant species physiological processes, such as photosynthesis and transpiration. This may lead to a loss of habitat availability for qualifying bird species. Air pollution may also lead to habitat degradation, negatively affecting the life cycle of this site bird species during winter by reducing habitat and prey availability and increasing energy expenditure due to more frequent flights. Alterations in feeding or roosting behaviours may be observed, as well as displacing birds from their preferred feeding grounds. In addition, vehicle emissions and other airborne pollutants due to machinery / vehicular movements are known to directly contribute to the increase of nitrogen deposition, which is already listed as a threat to this site. This may result in redistribution of bird population within or from the site during wintering (this site does not support bird species during breeding season).

Construction effects (including effects of displacement), although are likely to be temporary, may result in temporary or permanent effects upon this site and its qualifying features as detailed in Table 5.2.

Operation

No operation pathways are identified for this option which could affect this site and its qualifying features.

C.9.2.4 Lee Valley Ramsar (UK11034) (approx. 0.2km)

Lee Valley was classified as a Ramsar Site on 22 September 2000. The site comprises a series of embanked water supply reservoirs, sewage treatment lagoons and former gravel pits, which support internationally important numbers of wintering gadwall and shoveler and nationally important numbers of several other bird species⁸². The site also supports the nationally scarce plant species whorled water-milfoil (*Myriophyllum verticillatum*) and the rare or vulnerable water-boatman invertebrate (*Micronecta minutissima*).

The Lee Valley Ramsar Site comprises peatlands (4%), reservoirs, barrages and dams (30%), gravel, brick, and clay pits (30%), sewage farms (7%) and other habitats (29%).

Qualifying Features

The site qualifies under Ramsar Criterion 2:

- The site supports the nationally scarce plant species whorled water-milfoil (*Myriophyllum verticillatum*) and the rare or vulnerable water-boatman invertebrate (*Micronecta minutissima*)

The site qualifies under Ramsar Criterion 6:

⁸² <https://jncc.gov.uk/jncc-assets/RIS/UK11034.pdf>

- Over winter the site regularly supports internationally important populations of: gadwall *Anas strepera* and shoveler *Anas clypeata*

Conservation Objectives

As the provisions on the Habitats Regulations relating to HRAs extend to Ramsar sites, Natural England generally considers the conservation advice packages for the overlapping SPA designation to be, in most cases, sufficient to support the management of the Ramsar interests. Therefore, the conservation objectives for the Lee Valley SPA is considered applicable to this Ramsar.

Construction

As Lee Valley Ramsar overlaps entirely with Lee Valley SPA and in relation to birds encompasses same species (northern shoveler and gadwall), please refer to Lee Valley SPA for construction and operation effects related to the option location, hydrological connections and birds evaluation.

The proposed construction area is located approximately 200m south of this Habitats Site and in relation to this Ramsar's qualifying plant and invertebrate species significant effects as a result of artificial light and air pollution within the Habitats Site or functionally linked habitats cannot be dismissed.

Whorled water-milfoil is a robust, perennial plant of clear or slightly turbid, still or slowly flowing calcareous water in lakes, streams, canals and ditches. It occurs over both peaty and inorganic substrates and it is typical of lowland vegetation⁸³. During construction phase air pollution (dust) may cumulate on the surface of whorled water-milfoil, which will affect its physiological processes (photosynthesis and transpiration). This may lead to severe effects, such as direct mortality and rapid population fluctuations which could represent loss of habitat and changes to natural succession in the long term. However, whorled water-milfoil is an aquatic and perennial species and considering this site is upstream of the option footprint, these effects may be attenuated.

Water boatmen are common and widespread aquatic invertebrate found throughout Britain, mostly in weedy ponds, lakes and slow-flowing rivers. They spend most of their time at the bottom, coming to the surface only to renew their air supply⁸⁴. Air pollution may negatively affect the life cycle of this site species by reducing habitat and prey availability, increasing its energy expenditure due to food/good habitat quality sourcing, which may result in redistribution of their population within or from this site. Construction effects (including effects of displacement), although are likely to be temporary, may result in temporary or permanent effects upon this site and its qualifying features as detailed in Table 5.2.

Operation

No operation pathways are identified for this option which could affect this site and its qualifying features.

C.9.2.5 Proposed Mitigation Measures

Standard best practice procedures will be followed during construction to limit construction-related disturbance and contamination. A detailed description of best practice procedures and mitigations of relevance to this option can be found in in section 3.3.4. The following provides an overview of these:

⁸³ Online Atlas of the British and Irish Flora ([Myriophyllum verticillatum | Online Atlas of the British and Irish Flora \(brc.ac.uk\)](http://Myriophyllum_verticillatum | Online Atlas of the British and Irish Flora (brc.ac.uk)))

⁸⁴ The Royal Society for the Protection of Birds (RSPB) (<https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/other-garden-wildlife/insects-and-other-invertebrates/beetles-and-bugs/water-boatman>)

- CIRIA C741 Environmental good practice on site guide
- Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites)
- Biosecurity measures to ensure appropriate removal and/or management control of INNS (terrestrial) at source.
- At this stage it's not clear how close vehicle movements or supporting area for the construction work will be undertaken. Such activity should be as far from the Habitats Sites as possible given the recognised risk of soil/roots compaction and dust.
- Works will be agreed with Natural England and, if possible, to be undertaken outside the wintering period (September – March inclusive) to avoid effects on these sites' qualifying bird species.
- Any works which are undertaken outside of this period may disturb or displace overwintering species from suitable functional land. These works will only be permitted if the population present at risk of disturbance is less than 1% of the cited SPA/ Ramsar population and works will be supervised by an Ecological Clerk of Works (ECoW).
- Visual screening barriers should be erected around construction activities and plant movement routes, where works are taking place in or adjacent to habitats which may be considered functionally linked to the Habitats Sites, or there is visual line of sight between construction activities and these habitats.

Additional working methods which will reduce disturbance to overwintering birds during construction include:

- A slow construction start, allowing plant engines to idle for five minutes to allow acclimatisation to additional noise;
- Plant machinery to be painted/ camouflaged to be less conspicuous; it is unlikely that all plant will be effectively screened by barriers due to size. The use of netting or colours in dark greens, grey or black will blend in to the background when moving;
- All plant and equipment will be in good working order to reduce potential engine and machinery noise associated with older equipment. Advances in technology will be utilised, including the use of electric and hybrid alternatives; and
- All flashing beacons will be removed to avoid visual disturbance unless safety critical. White noise reversing warnings will be used instead of typical 'beeps'.

Ahead of works (if undertaken over the wintering period from September – March inclusive), surveys must be undertaken to gather information on functionally linked habitat use, outside the boundary of the Habitats Sites, by great bittern, gadwall and shoveler with the intention to inform the best locations for the new infrastructure, in order to avoid areas mostly used by birds and ensure minimal habitat fragmentation.

Monitoring surveys for qualifying bird species, invertebrates and supporting habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies.

Where loss or damage of functionally linked habitat occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, must be carried out once the works are concluded.

A CEMP will be developed, which will include all the above proposed mitigation measures and any further measures identified at the project stage, at which point the mitigation will be refined.

C.9.3 Stage 2 Outcomes and Further Studies

Following this HRA AA, it is considered that with adherence to the required mitigation, the proposed works associated with the option are not anticipated to have any significant adverse effects on the overall integrity of the designated sites and their features alone for the construction and operation phases of the proposed option.

A summary of the AA for this option is given in Table C.9.2.

Table C.9.2: TWRM extension - Coppermills to Honor Oak - Construction - Summary of HRA Stage 2 Appropriate Assessment

Designated sites	Qualifying features	Possible adverse effects before mitigation	Mitigation measures	Adverse effects after mitigation
Lee Valley SPA (UK9012111) (approx. 0.2 km)	A021 <i>Botaurus stellaris</i> ; Great bittern (Non-breeding) A051 <i>Anas strepera</i> ; Gadwall (Non-breeding) A056 <i>Anas clypeata</i> ; Northern shoveler (Non-breeding)	<p>This option is likely to affect this Habitats Site as the proposed footprint is approximately 200m south. Therefore, there is the potential for a pathway for effects due to construction associated pollution events and biological disturbances. The proposed works may lead to temporary and permanent effects on this site and its qualifying features. The identified effects have the potential to reduce the extent and distribution of functional habitat which supports the qualifying species' populations.</p> <p>During construction, this option is likely to result in:</p> <ul style="list-style-type: none"> Physical damage – habitat degradation causing reduction of habitat availability for its qualifying species (disturbance should be considered up to 1km for birds). Non-physical disturbance – Light, noise effects and human disturbances from construction activities. Toxic contamination – air pollution (dust); Vehicle emissions and other airborne pollutants increasing nitrogen deposition. Biological disturbances – works are likely to affect birds using the designated site potentially causing habitat avoidance (rapid population fluctuations), changes to species distributions (habitat and prey availability), etc. 	<p>Standard best practice procedures will be followed during construction to limit construction-related disturbance and contamination. A detailed description of best practice procedures and mitigations of relevance to this option can be found in in section 3.3.4. The following provides an overview of these:</p> <ul style="list-style-type: none"> CIRIA C741 Environmental good practice on site guide Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites) Biosecurity measures to ensure appropriate removal and/or management control of INNS (terrestrial) at source. Construction activities will be as far from the Habitats Site as possible given the recognised risk of soil/roots compaction and dust. Works will be agreed with Natural England and, if 	<p>During construction and operation, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> 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 each of the qualifying features the distribution of qualifying features within the site

Designated sites	Qualifying features	Possible adverse effects before mitigation	Mitigation measures	Adverse effects after mitigation
		No operation pathways are identified for this option which could affect this site and its qualifying features.	<p>possible, to be undertaken outside the wintering period (September – March inclusive) to avoid effects on the site's qualifying bird species.</p> <ul style="list-style-type: none"> • Any works which are undertaken outside of this period may disturb or displace overwintering species from suitable functional land. These works will only be permitted if the population present at risk of disturbance is less than 1% of the cited SPA/ Ramsar population and works will be supervised by an Ecological Clerk of Works (ECoW). • Visual screening barriers will be erected around construction activities and plant movement routes, where works are taking place in or adjacent to habitats which may be considered functionally linked to the Habitats Site, or there is visual line of sight between construction activities and these habitats. <p>Additional working methods which will reduce disturbance to overwintering birds during construction include:</p>	

Designated sites	Qualifying features	Possible adverse effects before mitigation	Mitigation measures	Adverse effects after mitigation
			<ul style="list-style-type: none"> • A slow construction start, allowing plant engines to idle for five minutes to allow acclimatisation to additional noise; • Plant machinery to be painted/ camouflaged to be less conspicuous; it is unlikely that all plant will be effectively screened by barriers due to size. The use of netting or colours in dark greens, grey or black will blend in to the background when moving; • All plant and equipment will be in good working order to reduce potential engine and machinery noise associated with older equipment. Advances in technology will be utilised, including the use of electric and hybrid alternatives; and • All flashing beacons will be removed to avoid visual disturbance unless safety critical. White noise reversing warnings will be used instead of typical 'beeps'. • Ahead of works (if undertaken over the wintering period from September – March inclusive), surveys must be undertaken to 	

Designated sites	Qualifying features	Possible adverse effects before mitigation	Mitigation measures	Adverse effects after mitigation
			<p>gather information on functionally linked habitat use, outside the boundary of the Habitats Site, by great bittern, gadwall and shoveler with the intention to inform the best locations for the new infrastructure, in order to avoid areas mostly used by birds and ensure minimal habitat fragmentation.</p> <ul style="list-style-type: none"> • Monitoring surveys for qualifying bird species, invertebrates and supporting habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies. • Where loss or damage of functionally linked habitat occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, must be carried out once the works are concluded. 	

Designated sites	Qualifying features	Possible adverse effects before mitigation	Mitigation measures	Adverse effects after mitigation
			<ul style="list-style-type: none"> A CEMP will be developed, which will include all the above proposed mitigation measures and any further measures identified at the project stage, at which point the mitigation will be refined. 	
Lee Valley Ramsar (UK11034) (approx. 0.2 km)	<p>Ramsar criterion 6 – species/populations occurring at levels of international importance.</p> <p>Qualifying Species/populations (as identified at designation):</p> <p>Species with peak counts in spring/autumn:</p> <p>Northern shoveler, <i>Anas clypeata</i>, NW & C Europe; 287 individuals, representing an average of 1.9% of the GB population (5 year</p>	As listed above for Lee Valley SPA	As listed above for Lee Valley SPA	<p>During construction and operation, assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> 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 each of the qualifying features

Designated sites	Qualifying features	Possible adverse effects before mitigation	Mitigation measures	Adverse effects after mitigation
	<p>peak mean 1998/9- 2002/3).</p> <p>Species with peak counts in winter:</p> <p>Gadwall, <i>Anas strepera strepera</i>, NW Europe; 445 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9- 2002/3).</p>			<ul style="list-style-type: none"> the distribution of qualifying features within the site
	<p>Ramsar Criterion 2 The site supports the nationally scarce plant species whorled water-milfoil <i>Myriophyllum verticillatum</i> and the rare or vulnerable invertebrate <i>Micronecta minutissima</i> (a water-boatman).</p>	<p>This option is likely to affect this designated site as the proposed footprint is approximately 200m south of the Habitat Site. Therefore, there is the potential for a pathway for effects due to construction activities, including eventual pollution events and biological disturbances. The proposed works may lead to temporary and permanent effects on this site and its qualifying features.</p> <p>During construction, this option is likely to result in:</p> <ul style="list-style-type: none"> Physical damage – habitat degradation and edge effects due to construction activities. 	<p>Standard best practice procedures will be followed during construction to limit construction-related disturbance and contamination. A detailed description of best practice procedures and mitigations of relevance to this option can be found in in section 3.3.4. The following provides an overview of these:</p> <ul style="list-style-type: none"> CIRIA C741 Environmental good practice on site guide Environment Agency's PPGs (PPG1: General Guide to 	

Designated sites	Qualifying features	Possible adverse effects before mitigation	Mitigation measures	Adverse effects after mitigation
		<ul style="list-style-type: none"> • Non-physical disturbance - Emissions of dust during the earthworks and the construction of tunnel/pipeline potentially affecting nationally scarce plant species like whorled water-milfoil; Light effects affecting both, the whorled water-milfoil and the rare invertebrate water-boatman. • Toxic contamination – air pollution (dust); Vehicle emissions and other airborne pollutants increasing nitrogen deposition. • Biological disturbances –Works may result in habitat avoidance for the mobile water-boatman; have also the potential to cause changes in vegetation succession as a result of direct mortality / changes in soil composition. <p>No operation pathways are identified for this option which could affect this site and its qualifying features.</p>	<p>Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites)</p> <ul style="list-style-type: none"> • Biosecurity measures to ensure appropriate removal and/or management control of INNS (terrestrial) at source. • Construction activities will be as far from the Habitats Site as possible given the recognised risk of soil/roots compaction and dust. • Monitoring surveys for invertebrates and supporting habitats will be required during and post-construction to assess the effectiveness of proposed mitigation and allow adaptations to construction methodology to be made if necessary. The scope of the monitoring surveys will be refined at the project stage and informed by the results of the above-mentioned studies. • Where loss or damage of functionally linked habitat occurs, despite measures to avoid or minimise this, the reinstatement of habitats, to be enhanced where feasible, 	

Designated sites	Qualifying features	Possible adverse effects before mitigation	Mitigation measures	Adverse effects after mitigation
			<p>must be carried out once the works are concluded.</p> <ul style="list-style-type: none"> • A CEMP will be developed, which will include all the above proposed mitigation measures and any further measures identified at the project stage 	



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