MOTT MACDONALD

# Thames to Southern Transfer (T2ST)

## Habitat Regulations Assessment

28 June 2021

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## Habitat Regulations Assessment

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# Glossary

| Acronym | Definition |
|---|---|
| AA | Appropriate Assessment |
| BPT | Break Pressure Tank |
| CEMP | Construction Environmental Management Plan |
| CHSR | Conservation of Habitats and Species Regulations |
| EAR | Environmental Assessment Report |
| HRA | Habitats Regulations Assessment |
| INNS | Invasive Non-Native Species |
| IROPI | Imperative reasons of overriding public interest |
| NPPF | National Planning Policy Framework |
| PS | Pumping Station |
| RAPID | Regulators' Alliance for Progressing Infrastructure Development |
| SAC | Special Area of Conservation |
| SCI | Site of Community Importance |
| SEA | South East Water |
| SESRO | South East Strategic Reservoir Option |
| SEW | South East Water |
| SPA | Special Protection Area |
| SRO | Strategic Resource Option |
| STT | Severn Thames Transfer |
| T2ST | Thames to Southern Transfer |
| UKWIR | UK Water Industry Research |
| WRSE | Water Resources South East |
| WSR | Water supply reservoir |
| WTW | Water Treatment Works |
| ZoI | Zone of Influence |

# Executive summary

This report presents the results of the Habitats Regulations Assessment (HRA) Stage 2/ Appropriate Assessment (AA) undertaken at plan level for the six options in the Thames to Southern Transfer (T2ST) Strategic Resource Option (SRO). This report assesses the potential impacts of the options on UK's habitats sites.

This Annex supports the Environmental Assessment Report (EAR) that accompanies the Gate 1 submission to Regulators' Alliance for Progressing Infrastructure Development (RAPID).

The aim of the T2ST study is to transfer available water from either the Severn Thames Transfer (STT) or the South East Strategic Reservoir Option (SESRO) at Culham from the Thames Water supply zone to Southern Water's Hampshire area. The outputs of the initial route options appraisal identified six unconstrained options for transferring water from the Thames Water region to the Southern Water region. These options include raw water and potable water options.

This HRA report presents the outputs of the Screening exercise undertaken by Water Resources South East (WRSE) and presents the results of the AA undertaken as part of the T2ST SRO.

The WRSE screening was undertaken in January 2021 and updated in March 2021, using data from the T2ST Options Appraisal (ref: T2ST SRO, Option Appraisal, 3 November 2020, 5201578/9.1/DG/004), and following the methodology in the WRSE Regional Plan Environmental Assessment Methodology Guidance, July 2020. The screening identified a number of potential 'likely significant effects', and a number of 'uncertain effects' for each of the options.

Following the AA, all six options were identified as having 'no likely significant effects' (alone), after mitigation is implemented.

This result depends on the implementation of the proposed mitigation measures including:

- Directional drilling: The current design of all options includes a pipeline route that will cross watercourses that are either designated as a habitats site (River Lambourn SAC in Options 1, 2, 3 and 4) or that feed into a habitats sites (River Test, Options 5 and 6). The identified result of 'no likely significant effects' depends on the use of directional drilling in all options, in order to avoid effects on watercourses;
- Review and alteration of the pipeline route: The pipeline route currently proposed for Options 5 and 6 crosses two designated sites (the Solent and Southampton Water Ramsar and SPA sites). It is recommended that the route layout should be revisited to avoid intersecting the designated sites, thus avoiding effects on the habitats sites and features for which they are designated. The identified result of 'no likely significant effects' on these sites depends on the proposed route alteration;
- Standard best practice pollution control measures;
- Standard best practice biosecurity measures;
- Disturbance mitigation measures: including light, noise and visual mitigation measures; and
- A Construction Environmental Management Plan (CEMP) must be in place that will include the proposed mitigation measures in this AA as well as any other specific measures identified following an HRA undertaken at project level.

This AA does not include an in-combination assessment with other plans or projects and therefore must be regarded as provisional. The reason for this is the lack of knowledge at this stage, of other SROs that might result in in-combination effects with T2ST options. This AA will be updated at Gate 2 stage to include potential in-combination effects with other SROs. Following this a further in-combination AA will be conducted to review external projects and plans, not related to SROs.

Aside from the in-combination assessment, following this AA, and provided that all mitigation measures are taken forward and no changes are made to the options, no further assessment is required.

# 1 Introduction

## 1.1 Overview

This report presents the results of the Habitats Regulations Assessment (HRA) Stage 2/ Appropriate Assessment (AA) undertaken for the six options in the Thames to Southern Transfer (T2ST) Strategic Resource Option (SRO). This report assesses the potential impact of the options on the UK's habitats sites.

This assessment is presented as an Annex to the Environmental Assessment Report (EAR) that accompanies the Gate 1 submission to the Regulators' Alliance for Progressing Infrastructure Development (RAPID).

This document reports the results of the HRA Screening undertaken by Water Resources South East (WRSE) and presents the results of the AA undertaken as additional work in developing the T2ST SRO.

## 1.2 Thames to Southern Transfer Options

The outputs of the initial route options appraisal identified six unconstrained options for transferring water from the Thames Water region to the Southern Water region. These options include raw water and potable water options as shown in Table 1.1. Further details on the options are set out in Section 2: Scheme Description.

**Table 1.1: T2ST options**

| Option ref | Option name |
|---|---|
| 1 | Potable water transfer from Culham to Otterbourne North Water Treatment Works (WTW) (50, 80 and 120Ml/d) |
| 2 | Raw water transfer from Culham to Otterbourne North WTW (50, 80 and 120Ml/d) |
| 3 | Raw water transfer from the River Thames at Reading to Otterbourne North WTW (50, 80 and 120Ml/d) |
| 4 | Potable water transfer from the River Thames at Reading to Otterbourne North WTW (50, 80 and 120Ml/d) |
| 5 | Raw water transfer from Culham to Testwood |
| 6 | Raw water transfer from the River Thames at Reading to Testwood |

## 1.3 The purpose of the Habitats Regulation Assessment

This report contains all the information necessary for the competent authority to undertake an AA in accordance with Part 6 of the Conservation of Habitats and Species Regulations 2017 (as amended) (abbreviated to CHSR).

A HRA includes several stages as detailed in the Conservation of Habitats and Species Regulations 2017 (as amended), known as the Habitats Regulations, to determine if a plan or project may affect the protected features of a designated site before deciding whether to undertake, permit or authorise it. Changes to the Habitats Regulations came into force in 1 January 2021 introduced by the Conservation of Habitats and Species Amendment (EU Exit) Regulations 2019.

A key result from the implementation of the Habitats Regulations is the designation and conservation of sites to maintain the favourable conservation status of protected habitats and

species. These are listed in Annex I to the Habitats Directive, and the species listed in Annex II to that Directive as well as the threatened birds and regularly occurring migratory birds listed in the Annex I to the Birds Directive which naturally occur in the United Kingdom's territory. These sites are known as the National Site Network and are referred to as 'habitats sites', in accordance with the government guidance on AA and the National Planning Policy Framework (NPPF).

For any plan or project that could affect one or more habitats sites, the provisions of Part 6 of the CHSR establish the procedure that a competent national authority must follow before agreeing to the implementation of a plan or project. The procedure, known as an 'appropriate assessment', requires such plans or projects to undergo a stepwise impact assessment against the habitats sites' conservation objectives.

The HRA process follows the stages detailed below:

- Stage 1 - The first stage identifies 'likely significant effects' by identifying the presence or absence of significant pathways through which the project or plan can affect the habitats sites. If the conclusion of Stage 1 is that there will be no likely significant impacts on the European site(s), there is no requirement to undertake further stages. If the conclusion of Stage 1 is that the plan **is** likely to give rise to likely significant effects on the European site, the plan continues to Stage 2.
- Stage 2 - Where a plan is likely to give rise to likely significant effects on the European site, an assessment must be made of the implications on the integrity of that site in view of that site's structure, function and conservation objectives (Stage 2 or Appropriate Assessment). Furthermore, where adverse impacts are possible, an assessment of potential mitigation measures will also be required at Stage 2.
- Stage 3 - If it is concluded that adverse impacts are likely to remain after mitigation, there must be an examination of alternative ways to complete the plan that avoids adverse impacts on the integrity of the site. Where alternatives exist, these should be subjected to Stage 1 and/or Stage 2 assessments.
- Stage 4 - Where no alternatives exist, it is necessary under Article 6(4) of the Habitats Directive to identify if there are, or are not, imperative reasons for overriding public interest (IROPI). If there are IROPI then compensatory measures must be assessed (Stage 4). In making this assessment, it is important to recognise that it should be appropriate to the likely scale, importance and impact of the plan.

The competent authority can only agree to the plan or project if, based on the findings of the AA, it has demonstrated the absence (rather than the potential presence) of an adverse effect on the integrity of the habitats sites concerned.

In exceptional circumstances, a plan or project having an adverse effect on the integrity of a habitats site can be approved under Part 6 of the CHSR, if it can be demonstrated that there is an absence of less damaging alternatives and the plan or project is necessary for imperative reasons of overriding public interest. In such cases, adequate compensation measures must be secured to ensure that the overall coherence of the habitats site is maintained.

The National Site Network includes Special Areas of Conservation (SAC) and Special Protection Areas (SPA). HRAs are also required, as a matter of UK Government policy, for potential SPAs (pSPA), candidate SACs (cSAC) and Site of Community Importance (SCI). In England Ramsar sites and proposed Ramsar sites are also included in the assessment in accordance with the NPPF.

This document reports the Stage 1 Screening assessment completed by WRSE and presents the outcomes of Stage 2 AA.

## 1.4 Assumptions and limitations

The WRSE outputs discussed in Section 3 do not include an assessment for the additional components described in Section 4.2.

No consultation with the competent authority has been undertaken regarding the outcomes of this Gate 1 report. 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 HRA (Assessment of Alternative Solutions) would be required.

At this stage an in-combination assessment to identify potential effects in-combination with other plans or projects not related with the T2ST plan has not been conducted. This is because it needs to take into account other schemes which are still being developed at the moment. An in-combination assessment will be conducted at Gate 2 to include an assessment between different schemes. Following this a further in-combination assessment will be conducted to review external projects and plans.

# 2 Scheme Description

## 2.1 Overview

The aim of the T2ST study is to investigate options for transferring available water from either the Severn Thames Transfer (STT) or the South East Strategic Reservoir Option (SESRO) at Culham from the Thames Water supply zone to Southern Water's Hampshire area.

It should be noted that the SESRO is a proposed reservoir and therefore is not shown on existing baseline maps.

A full scheme description can be found in the RAPID Gate 1 Report, however a summary of the main aspects of the options are included below.

## 2.2 Option descriptions

For Gate 1, there are 6 unconstrained options for T2ST as described in Table 2.1. A map of the options is shown in Figure 2.1.

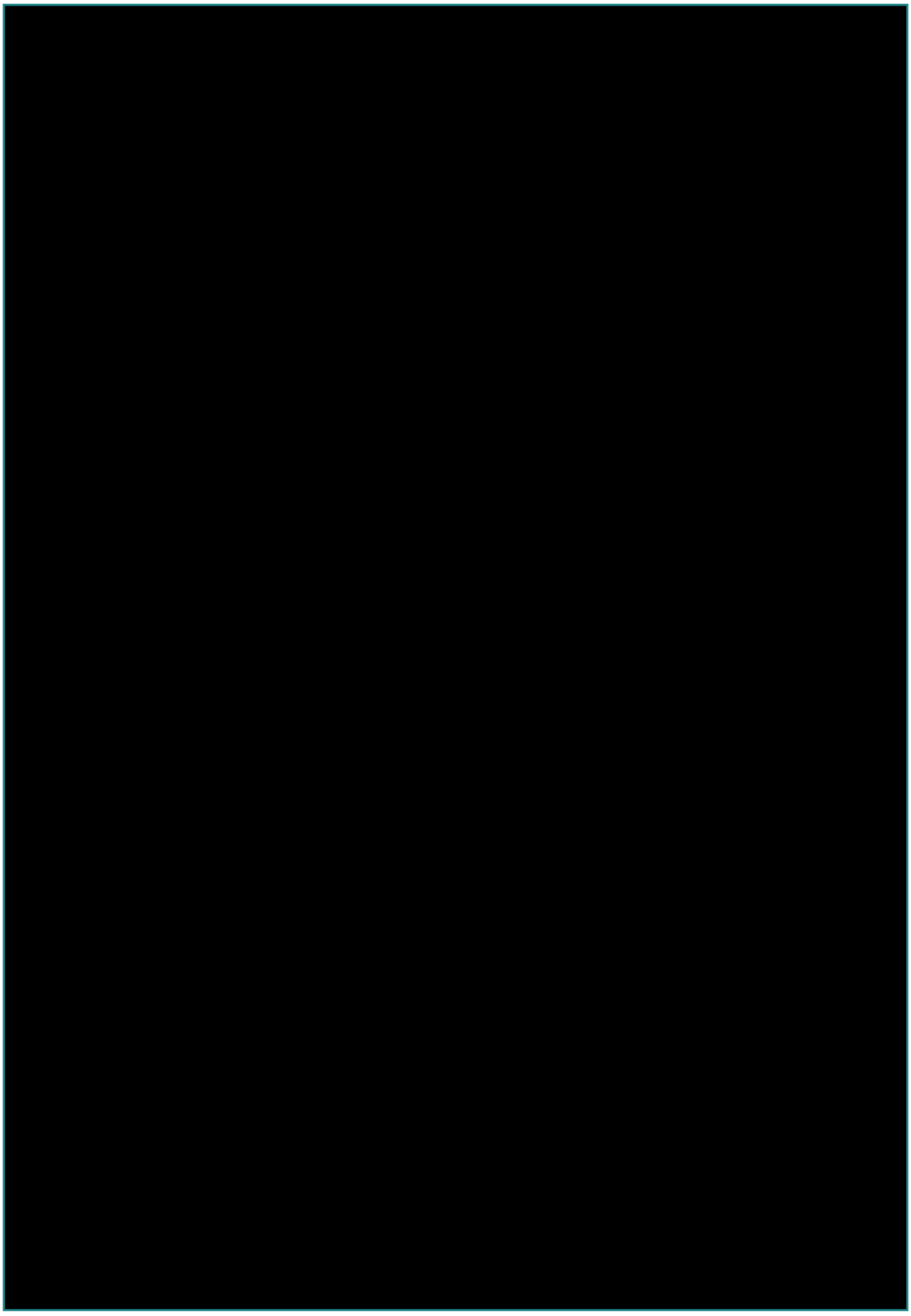
**Table 2.1: T2ST Gate 1 unconstrained options description**

| Option ref | Option name | Option description |
|---|---|---|
| 1 | Potable water transfer from Culham to Otterbourne North WTW<br>(50, 80 and 120Ml/d) | Transfer of potable water from the River Thames at Culham near Abingdon to Otterbourne. Water provided from either STT or SESRO.<br>Water treatment will be required at Culham and potable water will be transferred to Otterbourne North WTW, a new WTW which will be located between South Winchester and Otterbourne North.<br>This option includes offtakes for delivery of potable water as follows:<br>• 10Ml/d offtake to Kingsclere Water supply reservoir (WSR)<br>• 10Ml/d offtake to Micheldever WSR<br>• 10-20Ml/d offtake to the South East Water (SEW) Basingstoke supply zone at Northgate WSR<br>• 50 – 120 Ml/d to a new WTW at Otterbourne North – treated water will be delivered to a new storage tank for distribution into the supply network.<br>A new WTW will be required at Culham.<br>A new WTW will be required at Otterbourne North.<br>Service reservoir extensions will be required at Kingsclere WSR and Micheldever WSR.<br>New pumping stations (PS) will be required at:<br>• Culham WTW<br>• Newton Common<br>New break pressure tanks (BPT) will be required at:<br>[redacted]<br>An alternative option for the Andover connection is being considered where potable water is received at Upper Enham WSR rather than Micheldever WSR. |
| 2 | Raw water transfer from Culham to Otterbourne North WTW<br>(50, 80 and 120Ml/d) | Transfer of raw water from the River Thames at Culham near Abingdon to Otterbourne. Water provided from either STT or SESRO. The transferred raw water will require treatment at new WTW sites at Otterbourne, Kingsclere and Andover.<br>This option includes offtakes for delivery of raw water as follows:<br>• 10Ml/d offtake to a new WTW at Kingsclere<br>• 10Ml/d offtake to a new WTW at Andover<br>• 10-20Ml/d offtake to SEW at Northgate WTW<br>• 50 – 120 Ml/d to a new WTW at Otterbourne North |

| Option ref | Option name | Option description |
|---|---|---|
| | | New WTW will be required at:<br>• Kingsclere<br>• Andover<br>• Otterbourne<br>North New PS will be required at:<br>• Culham WTW [redacted]<br>New BPT will be required at:<br>• [redacted] |
| 3 | Raw water transfer from the River Thames at Reading to Otterbourne North WTW (50, 80 and 120Ml/d) | Transfer of raw water from the River Thames at Reading [redacted] to Otterbourne. Water provided from either STT or SESRO. The transferred raw water will require treatment at new WTW sites at Otterbourne, Kingsclere and Andover .<br>This option includes offtakes for delivery of raw water as follows:<br>• 10Ml/d offtake to a new WTW at Kingsclere<br>• 10Ml/d offtake to a new WTW at Andover<br>• 10-20Ml/d offtake to SEW at Northgate WTW<br>• 50 – 120 Ml/d to a new WTW at Otterbourne North<br>A new river abstraction intake and pumping station will be required at Reading at the abstraction point.<br>New WTW will be required at:<br>• Kingsclere<br>• Andover<br>• Otterbourne North<br>A new PS will be required at [redacted]<br>A new BPT will be required at:<br>• [redacted] |
| 4 | Potable water transfer from the River Thames at Reading to Otterbourne North WTW (50, 80 and 120Ml/d) | Transfer of potable water from [redacted] Reading to Otterbourne. Water provided from either the Severn to Thames Transfer or SESRO.<br>Water treatment will be required [redacted] and potable water will be transferred to Otterbourne WTW.<br>This option includes offtakes for delivery of potable water as follows:<br>• 10Ml/d offtake to Kingsclere WSR<br>• 10Ml/d offtake to Micheldever WSR<br>• 10-20Ml/d offtake to SEW at Northgate WSR<br>• 50 – 120 Ml/d to a new WTW at Otterbourne North –treated water will be delivered to a new storage tank for distribution into the supply network<br>A new river abstraction intake and pumping station will be required at Reading at the abstraction point.<br>Service reservoir extensions will be required at Kingsclere WSR and Micheldever WSR.<br>New WTW will be required at:<br>• Otterbourne North<br>A new PS will be required at [redacted]<br>A new BPT will be required at:<br>[redacted]<br>An alternative option for the Andover connection is being considered where potable water is received at Upper Enham WSR rather than Micheldever WSR. |
| 5 | Raw water transfer from Culham to Testwood | As Option 2, except raw water is treated at Testwood not Otterbourne.<br>Transfer of raw water from the River Thames at Culham near Abingdon to Testwood. Water provided from either STT or SESRO. The transferred raw water will require treatment at new WTW sites at Testwood, Kingsclere and Andover. |

| Option ref | Option name | Option description |
|---|---|---|
| | | This option includes offtakes for delivery of raw water as follows:<br>• 10Ml/d offtake to a new WTW at Kingsclere<br>• 10Ml/d offtake to a new WTW at Andover<br>• 10-20Ml/d offtake to SEW at Northgate WTW<br>• 50 – 120 Ml/d to a new WTW as an extension to the existing Testwood WTW.<br>New WTW will be required at:<br>• Kingsclere<br>• Andover<br>• Testwood<br>New PS will be required at:<br>• Culham WTW<br>• [redacted]<br>New BPT will be required at:<br>[redacted]<br>• [redacted] |
| 6 | Raw water transfer from the River Thames at Reading to Testwood | As Option 3, except raw water is treated at Testwood not Otterbourne.<br>Transfer of raw water from the River Thames at Reading [redacted] to Testwood. Water provided from either STT or SESRO. The transferred raw water will require treatment at new WTW sites at Testwood, Kingsclere and Andover.<br>This option includes offtakes for delivery of raw water as follows:<br>• 10Ml/d offtake to a WTW works at Kingsclere<br>• 10Ml/d offtake to a new WTW at Andover<br>• 10-20Ml/d offtake to SEW at Northgate WTW<br>• 50 – 120 Ml/d to a new WTW as an extension to the existing Testwood WTW.<br>A new river abstraction intake and pumping station will be required at Reading at the abstraction point.<br>New WTW will be required at:<br>• Kingsclere<br>• Andover<br>• Testwood<br>A new PS will be required at [redacted]<br>A new BPT will be required at [redacted] |

**Figure 2.1: Map of the T2ST options**



# 3 Stage 1: Test of Likely Significance - Screening Principles

## 3.1 Description

The purpose of screening is to identify the likely significant effects that arise from the interaction between actions of the T2ST options and sensitive receptors through impact pathways.

A significant effect should be considered likely if it cannot be excluded on the basis of objective information and it might undermine a site's conservation objectives. A risk or a possibility of such an effect is enough to warrant the need for an AA (Stage 2).

## 3.2 The WRSE review

An options appraisal was undertaken for the T2ST SRO in November 2020 (ref: Thames to Southern Transfer (T2ST) SRO, Option Appraisal, 3 November 2020, 5201578/9.1/DG/004). The data from the options appraisal was sent to WRSE who undertook a HRA screening exercise for the options in January 2021, which was updated in March 2021, following the methodology in the WRSE Regional Plan Environmental Assessment Methodology Guidance, July 2020.

The outputs of this assessment are summarised in Table 3.1 and the output tables received from WRSE are contained in Annex B.2.A. The results of this assessment were used to identify the T2ST options that were carried forward to Stage 2 AA. Maps showing the location of a number of these designations are included in Figure 3.1 and Figure 3.2.

In accordance with the methodology, as all options are considered to either result in a likely significant effect and / or an uncertain effect, all options are carried forward to Stage 2 assessment.

**Table 3.1: Summary of WRSE HRA output – Likely significant effects and Uncertain effects**

| Option | Likely Significant Effect | Uncertain Effect |
|---|---|---|
| 1 | River Lambourn SAC (0km - option intersects SAC) | Mottisfont Bats SAC (12.0km W of option) |
| | Kennet and Lambourn Floodplain (0km - option intersects SAC) | Solent Maritime SAC (12.7km SW of option) |
| | Kennet Valley Alderwoods SAC (0.17km W of option) | Solent and Southampton Water Ramsar Site (10.6km S of option) |
| | River Itchen SAC (0.34km east of option) | Solent and Dorset Coast Potential SPA (8.4km S of option) |
| | | Salisbury Plain SPA is located approx. 15.7km west of the pipeline route at the offtake to Andover |
| | | Porton Down SPA is located approx. 13.5km west of the pipeline route. |
| 2 | River Lambourn SAC (0km - option intersects SAC) | Mottisfont Bats SAC (12.0km W of option) |
| | Kennet and Lambourn Floodplain (0km - option intersects SAC) | Solent Maritime SAC (12.7km SW of option) |

| Option | Likely Significant Effect | Uncertain Effect |
|---|---|---|
| | Kennet Valley Alderwoods SAC (0.19km W of option) | Solent and Southampton Water Ramsar Site (10.6km S of option) |
| | River Itchen SAC (0.34km east of option) | Solent and Dorset Coast Potential SPA (8.4km S of option) |
| | | Salisbury Plain SPA is located approx. 15.7km west of the pipeline route at the offtake to Andover |
| | | Porton Down SPA is located approx. 13.5km west of the pipeline route. |
| 3 | (None) | River Itchen SAC (0.2km SE of the proposed option) |
| | | Solent Maritime SAC (12.5km SW of proposed option) |
| | | Solent and Southampton Water SPA (10.5km S of proposed option) |
| | | Solent and Southampton Water Ramsar site (10.5km S of proposed option) |
| | | Solent and Dorset Coast Potential SPA (3.6km SE of proposed works |
| 4 | (None) | River Itchen SAC (0.2km SE of the proposed option) |
| | | Solent Maritime SAC (13km SW of proposed option) |
| | | Solent and Southampton Water SPA (10.5km S of proposed option) |
| | | Solent and Southampton Water Ramsar site (10.5km S of proposed option) |
| | | Solent and Dorset Coast Potential SPA (3.6km SE of proposed works |
| 5 | The pipeline route crosses through the River Lambourn SAC | Salisbury Plain SPA is located approx. 15.7km west of the pipeline route at the offtake to Andover |
| | The pipeline route crosses through the Kennet and Lambourn Floodplain SAC | Porton Down SPA is located approx. 13.5km west of the pipeline route. |
| | Kennet Valley Alderwoods SAC is located approx. 200m west of the pipeline route | Mottisfont Bats SAC is located approx. 8.1km east of the pipeline route |
| | Solent Maritime SAC is located approx. 640m southeast of the pipeline | River Itchen SAC is located approx. 3.2km east of the pipeline route |
| | The pipeline crosses a section of the Solent and Southampton Water SPA | Emer Bog SAC is located approx. 340m east of the pipeline route |
| | The pipeline crosses a section of the Solent and Southampton Water Ramsar Site | Solent and Dorset Coast Potential SPA (2km SE of proposed works |
| | | New Forest SAC is located approx. 3.4km east of the pipeline route |

| Option | Likely Significant Effect | Uncertain Effect |
|---|---|---|
| | | New Forest SPA is located approx. 4.7km south of the pipeline route |
| | | New Forest Ramsar site is located approx. 4.7km south of the pipeline route |
| 6 | Solent Maritime SAC (0.5km SE of the proposed option) | River Itchen SAC (3.2km SE of the proposed option) |
| | Solent and Southampton Water SPA (0km proposed option is within the site) | Solent and Dorset Coast Potential SPA (2km SE of proposed works |
| | Solent and Southampton Water Ramsar site (0km proposed option is within the site) | Emer Bog SAC (0.3km E of option) |
| | | New Forest SAC is located approx. 3.4km east of the pipeline route |
| | | New Forest SPA is located approx. 4.7km south of the pipeline route |
| | | New Forest Ramsar site is located approx. 4.7km south of the pipeline route |

**Figure 3.1: Designated sites near Options 1, 2 and 5**

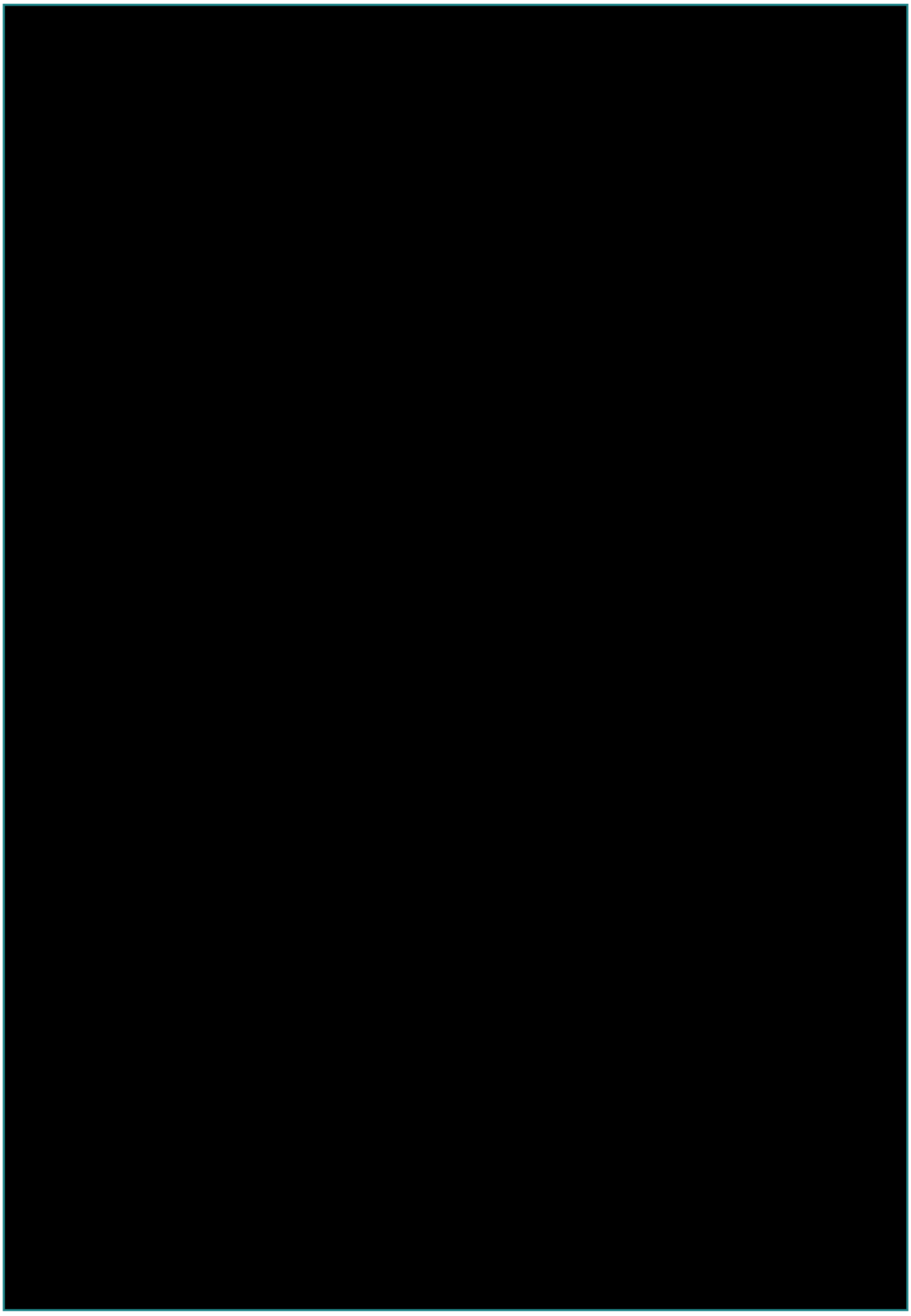
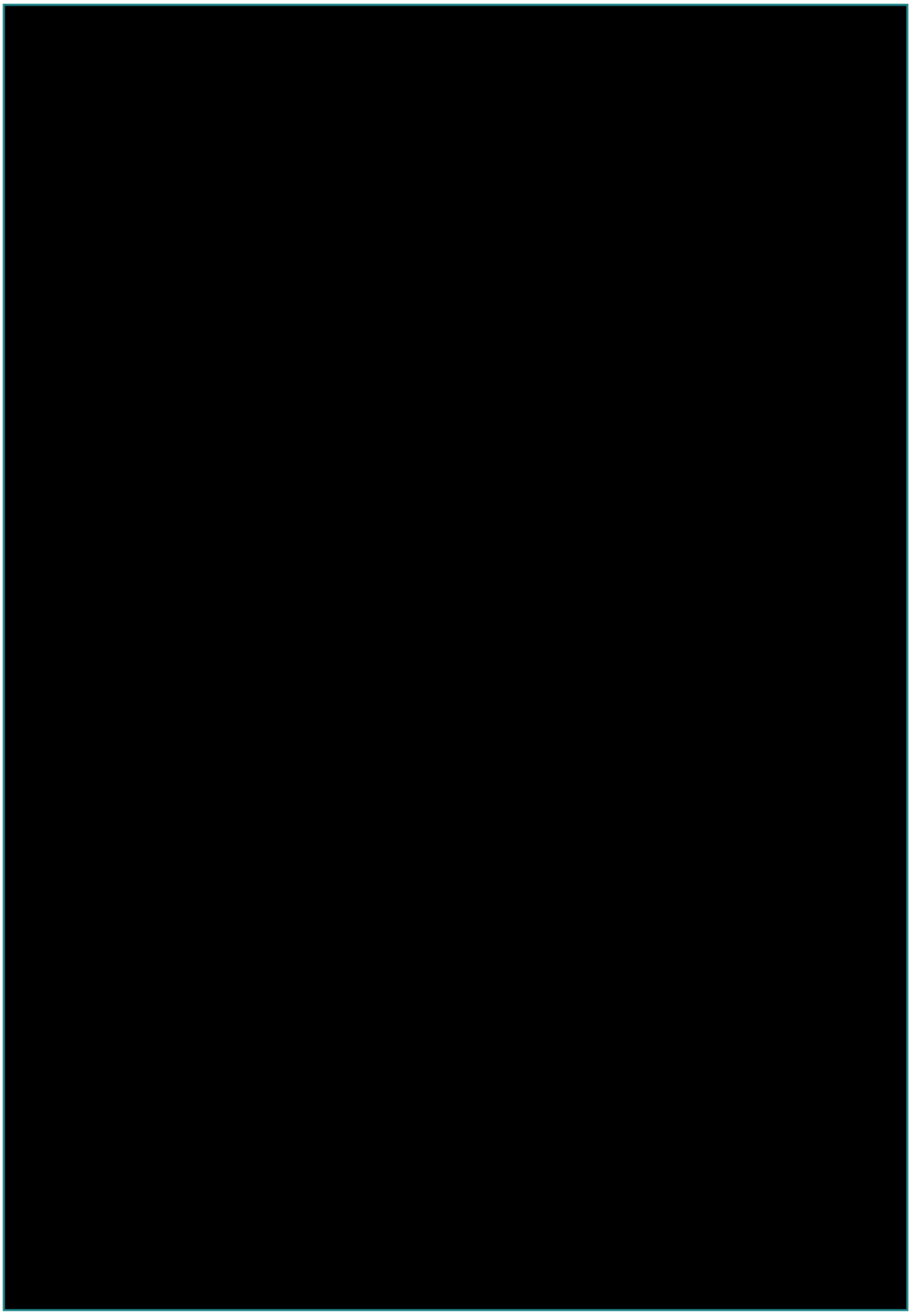


**Figure 3.2: Designated sites near Options 3, 4 and 6**



# 4 Stage 2: Appropriate Assessment

## 4.1 Methodology

For options where likely significant effects could not be excluded an AA needs to be carried out to:

- Consider the impact of the project on the integrity of the habitats sites, either alone or in combination with other projects and plans, with respect to the conservation objectives of the site and its structure and function; and
- Assess potential mitigation strategies where adverse impacts are identified, including setting out a timescale and identifying mechanisms through which the mitigation measures will be secured, implemented and monitored.

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

Potential impacts on the qualifying features of the habitats sites are evaluated with respect to the scale, extent and nature of the impact, for example the area of habitat affected, changes in hydrodynamics, potential changes in species distribution, and the duration of the impact. Given the high level nature of the assessment at 'Plan level' 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 competent authority must determine whether the proposal will not adversely affect the integrity of the site(s). The integrity of a site is the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was designated.

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 HRA (Assessment of Alternative Solutions) would be required.

This report will be updated at Gate 2 in light of further details on the proposed options.

At this stage an in-combination assessment to identify potential effects in-combination with other plans or projects not related with the T2ST plan has not been conducted. This is because it needs to take into account other schemes which are still being developed at the moment. An in-combination assessment will be conducted at Gate 2 to include an assessment between different schemes. Following this a further in-combination assessment will be conducted to review external projects and plans.

This Stage 2 Assessment has been formulated using the following approach for each option:

- Identify the study area: Review the habitats sites identified in the WRSE Stage 1 Screening and confirm any additions or exclusions. Assess the habitats sites' characteristics and identify their conservation objectives;
- Assess the potential impacts of the T2ST options on the habitats sites during construction and operation (before mitigation);

- Identify mitigation measures that should be followed at project level to avoid or mitigate the impacts; and
- Identify the aspects of the T2ST options that will significantly impact the conservation objectives of the habitats sites after identified mitigation is applied.

This assessment has been undertaken in accordance with the following guidance (with the exception of completing an in-combination assessment):

- UK Water Industry Research (2012). *Strategic Environmental Assessment and Habitats Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans (12/WR/02/7)*; and
- EU (2018) *Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.*

Following UK Water Industry Research (UKWIR) (2012) guidance and given the nature of the proposed options the potential impacts considered in this assessment are summarized in Table 4.1. Proposed distances are also provided following the same guidance to ascertain if, where a pathway has been identified, the impact is likely to affect the habitats or species for which the habitats site has been qualified. It should be noted that, in some cases, it was appropriate to use a larger Zone of Influence (ZoI) than defined in Table 4.1, for example, where a pipeline transfer crosses a watercourse which runs into a habitats site, water quality and water quantity changes may affect habitats sites hydrologically connected downstream.

**Table 4.1: Potential Impacts Considered in this assessment**

| Broad categories of potential impacts on European sites (with examples) | Examples of operations resulting in impacts and proposed ZOI |
|---|---|
| **Physical loss**<br>Destruction (including offsite impacts) e.g. foraging habitat, smothering | Development of built infrastructure associated with the pipelines, access routes.<br>Physical loss is only likely 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). |
| **Physical damage**<br>Habitat degradation<br>Erosion<br>Trampling<br>Fragmentation<br>Severance/barrier impacts<br>Edge impacts | Development of built infrastructure associated with the option, e.g. reservoir embankments, water treatment plants, pipelines, pumping stations.<br>Physical damage is only likely to be significant 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). |
| **Non-physical disturbance**<br>Noise<br>Visual presence<br>Light pollution | Noise from vehicular traffic during construction of the option.<br>Plant and personnel involved in construction and operation of the option e.g. for maintenance.<br>Development of built infrastructure associated with the option, which includes artificial lighting. Effects from light pollution are only likely to be significant where the boundary of the option is within 500m of the boundary of the habitats site. Noise from construction traffic is only likely to be significant where the transport route to and from the option is within 500m of the boundary of the habitats site.<br>Noise visual /human presence are only likely to be significant where the boundary of the option is within 500m of 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). |
| **Water table/ availability**<br>Drying | Change to water levels and flows due to water abstraction, storage and drainage interception associated with inland options. |

| Broad categories of potential impacts on European sites (with examples) | Examples of operations resulting in impacts and proposed ZOI |
|---|---|
| Flooding/storm water<br>Changes to surface water levels and flows<br>Changes to groundwater level and flows | These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the habitats site. However, these effects are dependent on hydrological continuity between the option and the habitats site. |
| **Toxic contamination**<br>Water pollution<br>Soil contamination<br>Air pollution | Air emissions associated with vehicular traffic during construction of options. This effect is only likely to be significant where the transport route to and from the option is within 200 metres of the boundary of the habitats site.<br>Water pollution resulting from pollution incidents and/or discharges<br>Soil contamination due to pollution events |
| **Non-toxic contamination**<br>Nutrient enrichment (e.g. of soils and water)<br>Algal blooms<br>Changes in turbidity<br>Changes in sedimentation/silting<br>Air pollution (dust) | Changes to nutrient levels, turbidity, storage, or inter-catchment transfers.<br>These effects are only likely to be of significance 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.<br>Emissions of dust during the earthworks, construction of plant and tunnel/pipeline construction associated with options. |
| **Biological Disturbances**<br>Direct mortality<br>Changes to habitat availability<br>Out-competition by non-native species<br>Introduction of disease<br>Introduction of invasive species | Potential for changes to habitat availability, e.g. reductions in wetted width of rivers leading to desiccation of macrophyte beds due to changes in abstraction or reduced compensation flow.<br>This effect is only likely to be significant where the receiving water for the option is the habitats site or a tributary of the habitats site.<br>Potential for the spread of INNS either through construction activities or from water transfers for example. |

Source: Adapted from: UK Water Industry Research (2012)[1].

## 4.2 Updates to the scheme since WRSE undertook their review

The WRSE review was undertaken in January and March 2021, using data from the T2ST Options Appraisal (ref: Thames to Southern Transfer (T2ST) SRO, Option Appraisal, 3 November 2020, 5201578/9.1/DG/004).

As part of the additional work undertaken in order to produce the RAPID Gate 1 Report, it has been identified that the six options require additional components in order for them to transfer water. The components associated with each option are set out in Table 4.2.

These components have been assessed within this HRA for likely significant effects.

**Table 4.2: Additional areas of work since WRSE assessment**

| Option ref | Changes since WRSE assessment |
|---|---|
| 1 | • New start point and section of pipeline route at Culham<br>• Possible alternative offtake to Upper Enham<br>• Slight modification of the pipeline route to Andover WTW<br>• Modification of offtake to Otterbourne North (not Otterbourne WTW)<br>• Additional areas for works at:<br>  ○ Culham WTW<br>  [redacted]<br>  ○ Upper Enham Reservoir<br>  ○ Andover WTW<br>  [redacted] |

[1] UK WIR (2012). *Strategic Environmental Assessment and Habitats Regulations Assessment* - Guidance for Water Resources Management Plans and Drought Plans (12/WR/02/7). UK Water Industry Research, 2012.

| Option ref | Changes since WRSE assessment |
|---|---|
| | ○ Otterbourne North WTW |
| 2 | • New start point and section of pipeline route at Culham<br>• Slight modification of the pipeline route to Kingsclere WTW<br>• Slight modification of the pipeline route to Andover WTW<br>• Modification of offtake to Otterbourne North (not Otterbourne WTW)<br>• Additional areas for works at:<br>○ Culham WTW<br>[redacted]<br>○ Kingsclere WTW<br>○ Andover WTW<br>[redacted]<br>○ Otterbourne North WTW |
| 3 | • Modification of the pipeline route to Kingsclere WTW<br>• Slight modification of the pipeline route to Northgate WSR<br>• Modification of offtake to Otterbourne North (not Otterbourne WTW)<br>• Additional areas for works at:<br>[redacted]<br>○ Kingsclere WTW<br>○ Andover WTW<br>[redacted]<br>○ Otterbourne North WTW |
| 4 | • Possible alternative offtake to Upper Enham<br>• Modification of the pipeline route to Kingsclere WTW<br>• Slight modification of the pipeline route to Northgate WSR<br>• Modification of offtake to Otterbourne North (not Otterbourne WTW)<br>• Additional areas for works at:<br>[redacted]<br>○ Kingsclere WTW<br>○ Andover WTW<br>[redacted]<br>○ Otterbourne North WTW |
| 5 | • New start point and section of pipeline route at Culham<br>• Slight modification of the pipeline route to Kingsclere WTW<br>• Slight modification of the pipeline route to Andover WTW<br>• Slight modification of the pipeline route to Testwood<br>• Additional areas for works at:<br>○ Culham WTW<br>[redacted]<br>○ Andover WTW<br>[redacted]<br>○ Testwood |
| 6 | • Modification of the pipeline route to Kingsclere WTW<br>• Slight modification of the pipeline route to Northgate WSR<br>• Additional areas for works at:<br>[redacted]<br>○ Kingsclere WTW<br>○ Andover WTW<br>[redacted]<br>○ Testwood |

# 5 Option 1 - Appropriate Assessment

**Potable water transfer from Culham to Otterbourne North WTW (50, 80 and 120Ml/d)**

## 5.1 Study Area

The WRSE Stage 1 Screening identified ten habitats sites within the ZoI of Option 1. This Stage 2 assessment identifies nine habitats sites within the ZoI of Option 1.

Information on the designated sites are provided in Appendix B which includes their qualifying features, conservation objectives and threats and pressures affecting the habitats sites.

Likely significant effects were identified for four habitats sites and qualifying features for which they were designated, as follows:

- River Lambourn SAC (0km - option intersects SAC)
- Kennet and Lambourn Floodplain (0km - option intersects SAC)
- Kennet Valley Alderwoods SAC (0.17km W of option)
- River Itchen SAC (0.34km east of option)

Uncertain effects were identified for five habitats sites and qualifying features for which they were designated as follows:

- Mottisfont Bats SAC (12.0km W of option)
- Solent Maritime SAC (12.7km SW of option)
- Solent and Dorset Coast Potential SPA (8.4km S of option)
- Solent and Southampton Water Ramsar Site (10.6km S of option)
- Solent and Southampton Water SPA (10.6km S of option) (Note that this site is in addition to the WRSE identified sites and included due to its proximity to the works and its position within hydrological connection to waterbodies within the zone of influence of this option)

The WRSE HRA screening identified Uncertain effects for a further two habitats sites and qualifying features for which they were designated as follows:

- Salisbury Plain SPA is located approx. 15.7km west of the pipeline route at the offtake to Andover
- Porton Down SPA is located approx. 13.5km west of the pipeline route.

These sites 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 impacts from this option on these habitats sites are negligible, and therefore these habitats sites are not considered further.

## 5.2 Potential impacts and mitigation measures

### 5.2.1 Potential impacts

The potential impacts of the construction and operational phases for Option 1 are described below, taking into account the type, size and scale of the option.

An assessment of each potential impact on the integrity of the designated sites are made, in view of the sites' structure, function and conservation objectives. Where adverse impacts are deemed significant, mitigation measures are also proposed in the following section.

### Construction

Construction activities associated with Option 1 include trenching and new pipeline layout as well as the building of new reservoirs and new infrastructure. These activities have the potential to result in permanent and temporary habitat loss as well as habitat degradation. For some species habitat degradation outside the site boundary can also result in indirect effects by changes to foraging habitat for example. In the particular case of river crossings, construction activities can result in temporary habitat degradation through in-channel works or potentially due to river diversions.

Construction activities are also likely to result in disturbance due to noise, light and visual presence from human activities. Standard mitigation is described in Section 5.2.2 are considered adequate to reduce disturbance impacts during construction to levels that will not result in significant effects to habitats and species. This is particularly relevant to bird and bat species which are a qualifying feature of the habitats sites.

Similarly, during construction there is the potential for pollution resulting from increased traffic to and from construction sites and potential accidents that can result in contamination of watercourses and habitats. In addition, where works are undertaken near watercourses or in-channel there is potential for increased sedimentation and silting of watercourses.

Spread of invasive species may occur during construction where workers move between and within sites. The presence and increase in Invasive Non-Native Species (INNS) can lead to loss of habitat and overtake native species affecting habitats and qualifying species they support.

Details of each of the potential impacts are given in Table 5.1.

The following sites were identified with potential likely significant effects during the construction of new infrastructure or extension of existing infrastructure:

- River Lambourn SAC (0km - option intersects SAC)
- Kennet and Lambourn Floodplain (0km - option intersects SAC)
- Kennet Valley Alderwoods SAC (0.17km W of option)

For these habitats sites mitigation measures need to be put in place to avoid likely significant effects. Proposed mitigation and avoidance measures are described in the following section.

No likely significant effects have been identified for the following sites:

- Mottisfont Bats SAC (12.0km W of option)
- River Itchen SAC (0.34km E of option)

Four habitats sites have been identified at the screening stage that could be affected by this option due to hydrological connection with the River Itchen SAC. As no likely significant effects are identified for the River Itchen SAC it is considered that there is no pathway for these site to be affected by this option and therefore they are not included in Table 5.1.

- Solent Maritime SAC (12.7km SW of option)
- Solent and Dorset Coast Potential SPA (8.4km S of option)
- Solent and Southampton Water Ramsar Site (10.6km S of option)
- Solent and Southampton Water SPA (10.6km S of option)

### Operation

The proposed water transfer will include increased abstraction in the Thames River which could lead to impacts on river levels with associated impacts on river habitats and species. However, there are no habitats sites in the River Thames in the vicinity of this option's proposed intake that could be affected by changes in water flows. Although a new abstraction licence will be

required for any new intake at Culham this is not expected to affect habitats sites named under the National Site Network.

Water transfers between different water bodies can result in the spread of INNS and species diseases. Option 1 proposes to transfer potable water and consequently the risks associated with the spread of INNS and pathogens is considered negligible and not considered further.

### 5.2.2 Assumptions and mitigation measures

Potential adverse impacts on the designated sites and qualifying features have been identified that can compromise the integrity of the sites. The high-level nature of this assessment undertaken at plan level means that there is a lack in detail for all options considered. By law any option being taken forward to be implemented will be subject to an AA at project level in the light of more information relating to the proposed scheme and baseline data. At this stage different results may arise.

Based on the current level of information detail a number of assumed and established mitigation measures are proposed below that will need to be followed at project level to avoid or mitigate impacts.

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 impacts in so far as is reasonably possible.

**Construction mitigation measures**

*Scheme design*

- Assumed that watercourse crossings will be carried out using directional drilling to avoid direct impacts on riverbed and permanent habitat loss; and
- Pipeline routes will be sufficiently distant to watercourses and designated sites boundaries to offer a buffer limiting pathways through disturbance and pollution runoff.

*Pollution control*

- Indirect pollution is identified as one key pathway through which designated sites may be affected. Environment good practice measures have been identified though guidance such as CIRIA and must be followed in all construction sites (*Environmental good practice on site guide,* CIRIA[2] );
- In addition, all measures will be in line with the requirements set out within the Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water)[3][4]; and
- The need for the installation of sediment traps near or in watercourses or the use of cofferdams should also be considered at project level.

*Biosecurity*

- Biosecurity measures will be in place to ensure the management of invasive non-native species on construction sites and during controlled activities. The following considerations will be given pre-construction:

[2] Charles P. and Edwards P (2015) *Environmental good practice on site guide.* CIRIA 260p.

[3] Note: this guidance has been removed in 2015 but it is still regarded as a good source of information on mitigation measures for pollution events.

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

  - 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 CESMP 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), 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 (EA) (Environment Agency document).

*Disturbance - noise*

- Construction activities will be conducted in accordance with noise limits to avoid disturbance.
- Programme activities likely to result in disturbance (within 500m of the site boundary), will be conducted outside of the bird breeding season, in the period April to mid-September inclusive; and
- Construction related noise disturbance can be further minimised by implementing best practice such as BS 5228-1:2009+A1:2014 (2008)[5].

*Disturbance - light*

- Lighting will be kept to a minimum to reduce disturbance. Should the works be undertaken at night and flood lighting required, lighting must be kept to a minimum and hooded spotlights directed away from potential suitable habitat, to reduce disturbance while ensuring standards for health and safety; and
- 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, 2020[6]).

*Construction and Environmental Management Plan*

A Construction Environmental Management Plan (CEMP) must be developed at project level, recommending 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 measures listed above and additional ones identified during the project Habitats Regulations Assessment.

**Operation**

No mitigation measures are expected to be required during operation as there will be no likely significant effects.

[5] 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.

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

**Table 5.1: Option 1 Likely significant effects on designated sites and qualifying features**

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| **River Lambourn SAC (0km - option intersects the site)** | • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | The proposed pipeline route will cross the River Lambourn SAC with potential temporary effects likely during the construction of the pipeline. These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent;<br>• Changes to the water table – Significant changes to water quantity and velocity during construction;<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks;<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering. Air pollution may also affect habitat vegetation due to dust deposition; and<br>• Biological disturbance – potential for invasive species spread.<br><br>The impacts are considered to be temporary and localized<br>This designated site is already suffering from similar pressures from other sources and therefore the proposed works may further prevent the improvement of the site condition (currently unfavourable-recovering).<br>The identified effects have the potential to reduce the extent and distribution of this habitat as well as affecting its structure and function compromising the integrity of the River Lambourn SAC.<br><br>No significant effects are identified during operation | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Lambourn SAC to avoid direct impacts on the banks and riverbed;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Sediment traps near or in watercourses or the cofferdams will be implemented to control sediment runoff;<br>• Biosecurity measures will be implemented;<br>• 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) will be followed to avoid significant effects due to increased light; and<br>• Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level.<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>• The extent and distribution of habitats; and<br>• The structure and function of the habitats | NO |
| | • Bullhead *Cottus gobio*<br>• Brook lamprey *Lampetra planeri* | Habitats that support fish species may potential be affected during the construction phase through:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of suitable fish habitat extent  This may affect the availability of habitat for different life cycle stages in particular breeding, nursery and feeding habitat;<br>• Changes to the water table – Significant changes to water quantity and velocity during construction;<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks;<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering;<br>• Biological disturbance – potential for invasive species and pathogen spread;<br>• Habitat loss and habitat degradation can result in habitat fragmentation with potential consequences for the completion of fish life cycle particular for brook lamprey if it prevents upstream migration to reach spawning grounds  Bullhead is vulnerable to water quality changes and substrate modification. In addition, changes to habitats has the potential to affect food resources such as macroinvertebrates communities.<br><br>The impacts are considered to be temporary and localized.<br>The identified effects have the potential to reduce the extent and distribution of the qualifying species as well as affecting its structure and function compromising the integrity of the River Lambourn SAC<br><br>No significant effects are identified during operation. | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Lambourn SAC to avoid direct impacts on the banks and riverbed;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Sediment traps near or in watercourses or the use of cofferdams will be implemented to control sediment runoff;<br>• Biosecurity measures will be implemented;<br>• Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) will be followed to avoid significant effects due to noise;<br>• 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) will be followed to avoid significant effects due to increased light (if works are programmed at night); and<br>• Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>• The extent and distribution of habitats of qualifying species;<br>• The structure and function of the habitats of qualifying species; and<br>• The supporting processes on which habitats of qualifying species rely | NO |

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| **Kennet and Lambourn Floodplain SAC (0km - option intersects the site)** | • Desmoulin's whorl snail *Vertigo moulinsiana* Desmoulin's whorl snail *Vertigo moulinsiana* | During construction, where the proposed pipeline route overlaps with the Kennet and Lambourn Floodplain SAC, there is potential for significant changes to the habitats that support this species These changes may include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent;<br>• Changes to water quality and water table – changes to the water table during construction due to pipeline laying activities;<br>• Toxic contamination- potential for pollution from contaminants due to the use of heavy machinery;<br>• Non-toxic contamination –air pollution may also affect habitat vegetation due to dust deposition; and<br>• Biological disturbance – mortality during pipeline laying activities within the habitats site<br><br>This species is particularly affected by changes in water table. The Desmoulin's whorl snail inhabits a particular 'zone' in the transition between truly aquatic habitat and terrestrial habitat where ground conditions are permanently wet and humid therefore changes in the water table level may significantly affect the conditions of this species habitat Inappropriate water levels are currently a pressure affecting this SAC's habitats<br>Impacts resulting from this option would be temporary and would affect one unit of the habitats site.<br><br>No pathways have been identified during operation that could lead to significant effects to the integrity of this SAC. | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Lambourn SAC to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Biosecurity measures will be implemented; and<br>• Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level.<br><br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>• The extent and distribution of habitats of qualifying species;<br>• The structure and function of the habitats of qualifying species;<br>• The supporting processes on which habitats of qualifying species rely; and<br>• The populations and distribution of qualifying species. | NO |
| **Kennet Valley Alderwoods SAC (0.34km W of option)** | • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) * Priority feature | Inappropriate water level is identified as a threat to this habitat. The proposed pipeline route would be located less than 350m from the site boundary. The River Kennet runs through the site and the pipeline would cross the river downstream of the site, consequently direct effects are not considered. Given the nature of the work at this location and distance from the designated site it is considered that water levels in the designated site will not be significantly affected.<br><br>No pathways have been identified during operation that could lead to significant effects to the integrity of this SAC. | N/A | NO |
| **River Itchen SAC (0.34km east of option)** | • Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation<br>• Southern damselfly *Coenagrion mercuriale*<br>• Bullhead *Cottus gobio*<br>• White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*<br>• Brook lamprey *Lampetra planeri*<br>• Atlantic salmon *Salmo salar*<br>• Otter *Lutra lutra* | Although this designated site is located in the vicinity of the Otterbourne WTW it is not in hydrological connectivity with watercourse directly affected by this option.<br>Given its location is less than 500m of the pipeline route and the Otterbourne WTW where extension works will occur it is possible that disturbance during construction may affect habitats.<br><br>Standard mitigation measures associated with the construction of the pipeline as described in section 5.2.2 are considered sufficient to reduce effects that may occur due to disturbance and therefore it is considered there will not be a significant change in the structure and function of qualifying natural habitats and species they support as well as qualifying species distribution | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Lambourn SAC to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Biosecurity measures will be implemented; and<br>• Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level.<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>• The extent and distribution of habitats of qualifying species;<br>• The structure and function of the habitats of qualifying species;<br>• The supporting processes on which habitats of qualifying species rely; and<br>• The populations and distribution of qualifying species | NO |
| Mottisfont Bats SAC (12 0km W of option) | • Barbastelle *Barbastella barbastellus* | The site is designated for the presence of a colony of barbastelle bats, *Barbastella barbastellus* which use trees in the woodlands as summer maternity roost The bats also use the site as a foraging area and have known navigation routes through the woodlands to (predominantly) riverine areas and subsequent feeding areas in the surrounding landscape A target has been to support off-site habitat (foraging areas) by restoring any core areas of | N/A | NO |

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| | | feeding habitat outside of the SAC boundary that are critical to Barbastelles during their breeding period<br>The proposed works in relation with the laying of the pipeline is more than 12km away from this designated site and although no direct or indirect effects are expected to impact the site, Barbastelle bats are known to travel long distances to forage. The River Test and River Dun located close to the site (within 1km), along with the fens, marshy areas, wet grassland and flowing ditches found in the surrounding valley floors are identified as the main foraging habitats for Barbastelle bats. It is therefore unlikely that the areas surrounding the proposed pipeline route located much further away will be of importance to this population of bats<br>The proposed option is therefore unlikely to affect the structure and function of the habitats (outside the habitats site boundary) that support this species | | |

## 5.3 Stage 2 Outcomes for Option 1

No adverse impacts resulting from the implementation of this option (alone) are reasonably foreseeable on the integrity of the following habitats sites, if the suggested mitigation measures are observed:

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

The following designated sites were not assessed at Stage 2. The reason for this is the lack of significant effects identified for the River Itchen SAC. The Solent sites are located downstream of the River Itchen and as there are no identifiable likely significant effects on this river, there is no pathway through which the four Solent estuary sites could be affected. The sites are:

- Solent Maritime SAC
- Solent and Dorset Coast Potential SPA
- Solent and Southampton Water Ramsar Site
- Solent and Southampton Water SPA

In conclusion, provided that the proposed mitigation measures are taken forward at project level, no residual impacts on the habitats sites are likely to occur, and therefore no further stages in the HRA process are necessary for Option 1.

# 6 Option 2 - Appropriate Assessment

**Raw water transfer from Culham to Otterbourne North WTW (50, 80 and 120Ml/d)**

## 6.1 Study Area

The screening for Option 2 resulted in the same assessment as Option 1. An additional note was made for the INNS risk as this option requires a raw water transfer.

## 6.2 Potential impacts and mitigation measures

### 6.2.1 Potential impacts

The potential impacts of the construction and operational phases for Option 2 are described below, taking into account the type, size and scale of the option.

An assessment of each potential impact on the integrity of the designated sites are made, in view of the sites' structure, function and conservation objectives. Where adverse impacts are deemed significant, mitigation measures are also proposed in the following section.

**Construction**

This option results in the same impacts as described for Option 1 in section 5.2.1 of this report. Details of each of the potential impacts are given in Table 6.1.

**Operation**

The proposed water transfer will include increased abstraction from the River Thames which could lead to impacts on river levels with associated impacts on river habitats and species. However, there are no habitats sites in the River Thames in the vicinity of this option's proposed intake that could be affected by changes in water flows. Although a new abstraction licence will be required for any new intake at Culham this is not expected to affect habitats sites named under the National Site Network.

Water transfers between different water bodies can result in the spread of INNS and species diseases. Water abstracted from the River Thames will be screened at Culham WTW before it is transferred via pipeline to a number of off-takes. It is not possible to identify at this stage if this pathway will lead to the spread of any INNS and fish diseases for example as it will depend on the level of water treatment undertaken at the WTW.

However, there are no planned discharges to water bodies that are designated as habitats sites or that feed into habitats sites. A possible pathway may arise due to accident from a pipeline burst that could leak into the River Lambourn; however, using directional drilling will reduce the potential for contamination of the designated site.

The following sites were identified with potential LSE during the construction of new infrastructure or extension of existing infrastructure:

- River Lambourn SAC (0km - option intersects SAC)
- Kennet and Lambourn Floodplain (0km - option intersects SAC)
- Kennet Valley Alderwoods SAC (0.19km W of option)

For these habitats sites mitigation measures need to be put in place to avoid LSE. Proposed mitigation and avoidance measures are described in the following section.

No likely significant effects have been identified for the following sites:

- Mottisfont Bats SAC (12.0km W of option)
- River Itchen SAC (0.34km east of option)

Four habitats sites have been identified at the screening stage that could be affected by this option due to hydrological connection with the River Itchen SAC. As no likely significant effects are identified for the River Itchen SAC it is considered that there is no pathway for these site to be affected by this option and therefore they are not included in Table 6.1.

- Solent Maritime SAC (12.7km SW of option)
- Solent and Dorset Coast Potential SPA (8.4km S of option)
- Solent and Southampton Water Ramsar Site (10.6km S of option)
- Solent and Southampton Water SPA (10.6km S of option).

### 6.2.2 Assumptions and mitigation measures

Assumptions and mitigation measures are identical to the ones proposed for Option 1 in Section 5.2.2 of this report.

**Table 6 1: Option 2 Likely significant effects on designated sites and qualifying features**

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| **River Lambourn SAC**<br><br>**(0km - option intersects the site)** | • Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | The proposed pipeline route will cross the River Lambourn SAC with potential temporary effects likely during the construction of the pipeline These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent;<br>• Changes to the water table – Significant changes to water quantity and velocity during construction;<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks;<br>• Non-toxic contamination increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering Air pollution may also affect habitat vegetation due to dust deposition; and<br>• Biological disturbance – potential for invasive species spread.<br><br>This designated site is already suffering from similar pressures from other sources and therefore the proposed works may further prevent the improvement of the site condition (currently unfavourable-recovering).The identified effects have the potential to reduce the extent and distribution of this habitat as well as affecting its structure and function compromising the integrity of the River Lambourn SAC<br><br>During operation biological disturbance is the main risk through the potential spread of invasive species | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Lambourn SAC to avoid direct impacts on the banks and riverbed;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Sediment traps near or in watercourses or the use of cofferdams will be implemented to control sediment runoff;<br>• Biosecurity measures will be implemented;<br>• 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) will be followed to avoid significant effects due to increased light; and<br>• Development of a Construction and Environmental Management Plan at Project level<br><br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats;<br>– The structure and function of the habitats; and<br>– The populations and distribution of qualifying species. | NO |
| | • Bullhead *Cottus gobio*<br>• Brook lamprey *Lampetra planeri* | Habitats that support fish species may potentially be affected during the construction phase through:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of suitable fish habitat extent. This may affect the availability of habitat for different life cycle stages in particular breeding, nursery and feeding habitat;<br>• Changes to the water table Significant changes to water quantity and velocity during construction;<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks;<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering; and<br>• Biological disturbance – potential for invasive species and pathogen spread.<br><br>Habitat loss and habitat degradation can result in habitat fragmentation with potential consequences for the completion of fish life cycles particularly for brook lamprey if it prevents upstream migration to reach spawning grounds Bullhead is vulnerable to water quality changes and substrate modification<br><br>The impacts are considered to be temporary and localized.<br><br>During operation biological disturbance is the main risk through the potential spread of invasive species. | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Lambourn SAC to avoid direct impacts on the banks and riverbed;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Sediment traps near or in watercourses or the use of cofferdams will be implemented to control sediment runoff;<br>• Biosecurity measures will be implemented;<br>• Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) will be followed to avoid significant effects due to noise;<br>• 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) will be followed to avoid significant effects due to increased light (if works are programmed at night); and<br>• Development of a Construction and Environmental Management Plan at Project level.<br><br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species; | NO |

| | | | | |
|---|---|---|---|---|
| | | | – The structure and function of the habitats of qualifying species;<br>The supporting processes on which habitats of qualifying species rely; and<br>The populations and distribution of qualifying species | |
| **Kennet and Lambourn Floodplain SAC (0km - option intersects the site)** | • Desmoulin's whorl snail *Vertigo moulinsiana* | During construction, where the proposed pipeline route overlaps with the Kennet and Lambourn Floodplain SAC there is potential for significant changes to the habitats that support this species These changes may include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent;<br>• Changes to water quality and water table –Changes to the water table during construction due to pipeline laying activities.<br>• Toxic contamination- potential for pollution from contaminants due to the use of heavy machinery.<br>• Non-toxic contamination –air pollution may also affect habitat vegetation due to dust deposition<br>• Biological disturbance mortality during pipeline laying activities within the habitats site<br>This species is particularly affected by changes in water table. The Desmoulin's whorl snail inhabits a particular 'zone' in the transition between truly aquatic habitat and terrestrial habitat where ground conditions are permanently wet and humid therefore changes in the water table level may significantly affect the conditions of this species habitat. Inappropriate water levels are currently a pressure affecting this SAC's habitats.<br>Impacts resulting from this option would be temporary and would affect one unit of the habitats site.<br>No pathways have been identified during operation that could lead to significant effects to the integrity of this SAC | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Lambourn SAC to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Biosecurity measures will be implemented; and<br>• Development of a Construction and Environmental Management Plan at Project level<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species;<br>– The structure and function of the habitats of qualifying species; and<br>– The supporting processes on which habitats of qualifying species rely. | NO |
| **Kennet Valley Alderwoods SAC (0.34km W of option)** | • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) * Priority feature | Inappropriate water level is identified as a threat to this habitat. The proposed pipeline route would be located less than 350m from the site boundary, the River Kennet runs through the site, and the pipeline would cross the river downstream of the site, so consequently direct effects are not considered Given the nature of the work at this location and distance from the designated site it considered that water levels in the designated site will not be significantly affected.<br>No pathways have been identified during operation that could lead to significant effects to the integrity of this SAC. | N/A | NO |
| **River Itchen SAC (0.34km east of option)** | • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation<br>• Southern damselfly *Coenagrion mercuriale*<br>• Bullhead *Cottus gobio*<br>• White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*<br>• Brook lamprey *Lampetra planeri*<br>• Atlantic salmon *Salmo salar*<br>• Otter *Lutra lutra* | Although this designated site is located in the vicinity of the Otterbourne WTW it is not in hydrological connectivity with watercourses directly affected by this option.<br>Given its location is less than 500m of the pipeline route and the Otterbourne WTW where extension works will occur it is possible that disturbance during construction may affect habitats.<br>Standard mitigation measures associated with the construction of the pipeline as described in section 5 2 2 are considered sufficient to reduce effects that may occur due to disturbance, and therefore it is considered there will not be a significant change in the structure and function of qualifying natural habitats and species they support as well as qualifying species distribution. | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Lambourn SAC to avoid habitat loss and direct mortality..<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination<br>• Biosecurity measures will be implemented.<br>• Development of a Construction and Environmental Management Plan at Project level.<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>The extent and distribution of habitats of qualifying species;<br>– The structure and function of the habitats of qualifying species;<br>– The supporting processes on which habitats of qualifying species rely; and | NO |

| | | | | | |
|---|---|---|---|---|---|
| | | | | – The populations and distribution of qualifying species. | |
| Mottisfont Bats SAC (12.0km W of option) | • | Barbastelle *Barbastella barbastellus* | The site is designated for the presence of a colony of barbastelle bats, *Barbastella barbastellus* which use trees in the woodlands as a summer maternity roost. The bats also use the site as a foraging area and have known navigation routes through the woodlands to (predominantly) riverine areas and subsequent feeding areas in the surrounding landscape. A target has been to support off-site habitat (foraging areas) by restoring any core areas of feeding habitat outside of the SAC boundary that are critical to Barbastelles during their breeding period<br><br>The proposed works in relation to the laying of the pipeline are more than 12km away from this designated site and although no direct or indirect effects are expected to impact the site, Barbastelle bats are known to travel long distances to forage. The River Test and River Dun, along with the fens, marshy areas, wet grassland and flowing ditches found in the surrounding valley floors are identified as foraging habitats for Barbastelle bats. It is therefore unlikely that the areas surrounding the proposed pipeline route will be of importance to this population of bats<br><br>The proposed option is therefore unlikely to affect the structure and function of the habitats (outside the habitats site boundary) that support this species | NA | NO |

## 6.3 Stage 2 Outcomes for Option 2

No adverse impacts resulting from the implementation of this option (alone) are reasonably foreseeable on the integrity of the following habitats sites, if the suggested mitigation measures are observed:

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

The following four designated sites were not assessed at AA stage. The reason for this is the lack of significant effects identified for the River Itchen SAC. The Solent sites are located downstream of the River Itchen and as there are no identifiable likely significant effects on this river there is no pathway through which the Solent estuary could be affected. The four sites are:

- Solent Maritime SAC
- Solent and Dorset Coast Potential SPA
- Solent and Southampton Water Ramsar and SPA

In conclusion, provided that the proposed mitigation measures are taken forward at project level, no residual impacts on the habitats sites are likely to occur, and therefore no further stages in the HRA process are necessary for Option 2.

# 7 Option 3 Appropriate Assessment

**Raw water transfer from the River Thames at Reading to Otterbourne North WTW (50, 80 and 120Ml/d)**

## 7.1 Study Area

The WRSE Stage 1 Screening identified five habitats sites within the ZoI of Option 3. This Stage 2 assessment identifies five habitats sites within the ZoI of Option 3.

Information on the designated sites are provided in Appendix B which includes their qualifying features, conservation objectives and threats and pressures affecting the habitats sites.

No likely significant effects were identified. Uncertain effects were identified for five habitats sites and qualifying features for which they were designated as follows:

- River Itchen SAC (0.34km east of option)
- Solent Maritime SAC (12.7km SW of option)
- Solent and Dorset Coast Potential SPA (8.4km S of option)
- Solent and Southampton Water Ramsar (10.6km S of option)
- Solent and Southampton Water SPA (10.6km S of option)

## 7.2 Potential impacts and sensitivity of qualifying features

### 7.2.1 Potential impacts

The potential impacts of the construction and operational phases for Option 3 are described below, taking into account the type, size and scale of the option.

An assessment of each potential impact on the integrity of the designated sites are made, in view of the sites' structure, function and conservation objectives. Where adverse impacts are deemed significant, mitigation measures are also proposed in the following section.

**Construction**

Construction activities associated with trenching and pipeline layout as well as the building of new infrastructure, have the potential to result in permanent and temporary habitat loss as well as habitat degradation. These activities have the potential to result in permanent and temporary habitat loss as well as habitat degradation. For some species habitat degradation outside the site boundary can also result in indirect effects by changes to foraging habitat for example. In the particular case of river crossings, construction activities can result in temporary habitat degradation through in-channel works or potentially due to river diversions.

Construction activities are also likely to result in disturbance due to noise, light and visual presence from human activities. Standard mitigation is described in Section 5.2.2 are considered adequate to reduce disturbance impacts during construction to levels that will not result in significant effects to habitats and species.

Similarly, during construction there is the potential for pollution resulting from increased traffic to and from construction sites and potential accidents that can result in contamination of watercourses and habitats. In addition, where works are undertaken near watercourses or in-channel there is potential for increased sedimentation and silting of watercourses.

Spread of invasive species may occur during construction where workers move between and within sites. The presence and increase in INNS can lead to loss of habitat and overtake native species affecting habitats and qualifying species they support. This option proposes to transfer raw water which increases the risk of INNS spread.

Water transfers between different catchments also introduces the risk of spreading pathogens and fish diseases for example. The risk will depend on the presence/absence of pathogens in the donor catchment and the level of water treatment carried out.

Details of each of the potential impacts are given in Table 7.1.

The following site was identified with potential LSE during the construction of new infrastructure or extension of existing infrastructure:

- River Itchen SAC (0.34km east of option).

For this habitats site mitigation measures need to be put in place to avoid LSE. Proposed mitigation and avoidance measures are described in the following section.

Four habitats sites have been identified at the screening stage that could be affected by this option due to hydrological connection with the River Itchen SAC. As no likely significant effects (after mitigation) are identified for the River Itchen SAC it is considered that there is no pathway for these sites to be affected by this option and therefore they are not included in Table 7.1.

- Solent Maritime SAC (12.7km SW of option)
- Solent and Dorset Coast Potential SPA (8.4km S of option)
- Solent and Southampton Water Ramsar Site (10.6km S of option)
- Solent and Southampton Water SPA Site (10.6km S of option)

**Operation**

The proposed water transfer will include increased abstraction from the River Thames at Reading; however, there are no habitats sites in the River Thames in the vicinity of this option that could be affected by changes in water flows.

Water transfers between different water bodies can result in the spread of INNS and species diseases. Water abstracted from the River Thames will be screened at the new [redacted] before it is transferred via pipeline to a number of off-takes. It is not possible to identify at this stage if this pathway will lead to the spread of any INNS and fish diseases for example, as it will depend on the level of water treatment undertaken at the WTW. However, there are no planned discharges to water bodies that are designated as habitats sites.

### 7.2.2 Assumptions and mitigation measures

Potential adverse impacts on the designated sites and qualifying features have been identified that can compromise the integrity of the sites. The high-level nature of this assessment undertaken at plan level means that there is a lack of detail for all options considered. By law any option being take forward to be implemented will be subject to an AA at project level in the light of more information in relation to the proposed scheme and baseline data. At this stage different results may arise.

Based on current level of information detail a number of mitigation measures are proposed below that will need to be followed at project level to avoid or mitigate impacts.

**Construction mitigation measures**

Assumptions and mitigation measures are identical to the ones proposed for Option 1 in section 5.2.2 of this report.

**Table 7 1: Option 3 Likely significant effects on designated sites and qualifying features**

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| River Itchen SAC (0.34km east of option) | • Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation<br>• Southern damselfly *Coenagrion mercuriale*<br>• Bullhead *Cottus gobio*<br>• White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*<br>• Brook lamprey *Lampetra planeri*<br>• Atlantic salmon *Salmo salar*<br>• Otter *Lutra lutra* | Although this designated site is located in the vicinity of the Otterbourne WTW it is not in hydrological connectivity with watercourses directly affected by this option.<br>Given its location is less than 500m of the pipeline route and the Otterbourne WTW where extension works will occur it is possible that disturbance during construction may affect habitats<br>Standard mitigation measures associated with the construction of the pipeline as described in section 5.2.2 are considered sufficient to reduce effects that may occur due to disturbance, and therefore it is considered there will not be a significant change in the structure and function of qualifying natural habitats and species they support as well as qualifying species distribution. | The following measures will be implemented to avoid or reduce significant effects:<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination; and<br>• Development of a Construction and Environmental Management Plan at Project level.<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>The extent and distribution of habitats of qualifying species;<br>The structure and function of the habitats of qualifying species; and<br>– The supporting processes on which habitats of qualifying species rely | NO |

## 7.3 Stage 2 Outcomes for Option 3

No adverse effects resulting from the implementation of this option (alone) are reasonably foreseeable on the integrity of the River Itchen SAC, if the suggested mitigation measures are observed:

The following four designated sites were not assessed at AA stage. The reason for this is the lack of significant effects identified for the River Itchen SAC. The Solent sites are located downstream of the River Itchen, and as there are no identifiable likely significant effects on this river there is no pathway through which the Solent estuary could be affected. The sites are:

- Solent Maritime SAC
- Solent and Southampton Water SPA Site
- Solent and Southampton Water Ramsar Site
- Solent and Dorset Coast Potential SPA

In conclusion, with the proposed mitigation measures in place no residual impacts on the River Itchen SAC are likely to occur, and therefore no further stage in the HRA process is necessary for Option 3.

# 8 Option 4 – Appropriate Assessment

**Potable water transfer from the River Thames at Reading to Otterbourne North WTW (50, 80 and 120Ml/d)**

## 8.1 Study Area

The screening for Option 4 resulted in the same assessment as Option 3, with a reduced INNS risk as this option requires a potable water transfer.

## 8.2 Potential impacts and sensitivity of qualifying features

### 8.2.1 Potential impacts

The potential impacts of the construction and operational phases for Option 4 are described below, taking into account the type, size and scale of the option.

An assessment of each potential impact on the integrity of the designated sites are made, in view of the sites' structure, function and conservation objectives. Where adverse impacts are deemed significant, mitigation measures are also proposed in the following section.

**Construction**

This option results in the same impacts as described for Option 3 in section 5.2.1 of this report.

Details of each of the potential impacts are given in Table 8.1.

The following site was identified with potential LSE during the construction of new infrastructure or extension of existing infrastructure:

- River Itchen SAC (0.34km east of option).

For this habitats site mitigation measures needs to be put in place to avoid LSE. Proposed mitigation and avoidance measures are described in the following section.

Four habitats sites have been identified at the screening stage that could be affected by this option due to hydrological connection with the River Itchen SAC. As no likely significant effects (after mitigation) are identified for the River Itchen SAC it is considered that there is no pathway for these site to be affected by this option and therefore they are not included in Table 8.1.

- Solent Maritime SAC (12.7km SW of option)
- Solent and Southampton Water SPA (8.4km S of option)
- Solent and Southampton Water Ramsar Site (10.6km S of option)
- Solent and Dorset Coast Potential SPA

**Operation**

The proposed water transfer will include increased abstraction from the River Thames at Reading; however, there are no habitats sites in the River Thames in the vicinity of this option that could be affected by changes in water flows.

Water transfers between different water bodies can result in the spread of INNS and species diseases. Option 4 proposes to transfer potable water and consequently the risks associated with the spread of INNS and pathogens is considered negligible and not considered further.

### 8.2.2 Assumptions and mitigation measures

Assumptions and mitigation measures are identical to the ones proposed for Option 1 in section 5.2.2 of this report.

**Table 8 1: Option 4 Likely significant effects on designated sites and qualifying features**

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| River Itchen SAC (0.34km east of option) | • Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation<br>• Southern damselfly *Coenagrion mercuriale*<br>• Bullhead *Cottus gobio*<br>• White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*<br>• Brook lamprey *Lampetra planeri*<br>• Atlantic salmon *Salmo salar*<br>• Otter *Lutra lutra* | Although this designated site is located in the vicinity of the Otterbourne WTW, it is not in hydrological connectivity with watercourses directly affected by this option.<br>Given its location less than 500m of the pipeline route and the Otterbourne WTW where extension works will occur, it is possible that disturbance during construction may affect habitats<br>Standard mitigation measures associated with the construction of the pipeline as described in section 5 2 2 are considered sufficient to reduce effects that may occur due to disturbance and therefore it is considered there will not be a significant change in the structure and function of qualifying natural habitats and species they support as well as qualifying species distribution. | The following measures will be implemented to avoid or reduce significant effects:<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination<br>• Biosecurity measures will be implemented.<br>• Development of a Construction and Environmental Management Plan at Project level.<br><br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species;<br>– The structure and function of the habitats of qualifying species;<br>– The supporting processes on which habitats of qualifying species rely; and<br>– The supporting processes on which habitats of qualifying species rely. | NO |

## 8.3 Stage 2 Outcomes for Option 4

No adverse effects resulting from the implementation of this option (alone) are reasonably foreseeable on the integrity of the River Itchen SAC, if the suggested mitigation measures are observed:

The following four designated sites were not assessed at AA stage. The reason for this is the lack of significant effects identified for the River Itchen SAC. The Solent sites are located downstream of the River Itchen and as there are no identifiable likely significant effects on this river there is no pathway through which the Solent estuary could be affected. The sites are:

- Solent Maritime SAC
- Solent and Dorset Coast Potential SPA
- Solent and Southampton Water Ramsar Site
- Solent and Southampton Water SPA Site

In conclusion, with the proposed mitigation measures in place no residual impacts on the River Itchen SAC are likely to occur, and therefore no further stage in the HRA process is necessary for Option 4.

# 9 Option 5 – Appropriate Assessment

**Raw water transfer from Culham to Testwood**

## 9.1 Study Area

The WRSE Stage 1 Screening identified 15 habitats sites within the ZoI of Option 5. This Stage 2 assessment identifies ten habitats sites within the ZoI of Option 5.

Information on the designated sites are provided in Appendix B which includes their qualifying features, conservation objectives and threats and pressures affecting the habitats sites.

Likely Significant Effects were identified for five habitats sites and qualifying features for which they were designated as follows:

- River Lambourn SAC (0km - option intersects SAC)
- Kennet and Lambourn Floodplain SAC (0km - option intersects SAC)
- Solent Maritime SAC (0.64km SW of option)
- Solent and Southampton Water SPA (option crosses this site)
- Solent and Southampton Water Ramsar Site (option crosses this site)

Uncertain effects were identified for five habitats sites and qualifying features for which they were designated as follows:

- Kennet Valley Alderwoods SAC (0.2km W of option)
- River Itchen SAC (3.2km east of option)
- Mottisfont Bats SAC (8.1km W of option)
- Emer Bog SAC (0.34m of option)
- Solent and Dorset Coast Potential SPA (2km S of option)

The WRSE HRA screening identified Uncertain effects for a further five habitats sites and qualifying features for which they were designated. These sites are as follows:

- Salisbury Plain SPA is located approx. 15.7km W of the pipeline route at the offtake to Andover
- Porton Down SPA is located approx. 13.5km W of the pipeline route
- New Forest SAC is located approx. 3.4km E of the pipeline route
- New Forest SPA is located approx. 4.7km S of the pipeline route
- New Forest Ramsar site is located approx. 4.7km S of the pipeline route

These sites 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 impacts from this option on these habitats sites are negligible, and therefore these habitats sites are not considered further.

## 9.2 Potential impacts and sensitivity of qualifying features

### 9.2.1 Potential impacts

The potential impacts of the construction and operational phases for Option 5 are described below, taking into account the type, size and scale of the option.

An assessment of each potential impact on the integrity of the designated sites are made, in view of the sites' structure, function and conservation objectives. Where adverse impacts are deemed significant, mitigation measures are also proposed in the following section.

**Construction**

Construction activities associated with trenching and pipeline layout as well as the building of new reservoirs and new infrastructure, have the potential to result in permanent and temporary habitat loss as well as habitat degradation. The proposed pipeline route as it currently proposed will overlap two habitats sites, the Solent and Southampton Water Ramsar and SPA, potentially resulting in temporary habitat loss and degradation as well as habitat fragmentation. In addition, it may result in species displacement.

For some species habitat degradation outside the site boundary can also result in indirect impacts, by changes to foraging habitat for example. In the particular case of river crossings construction activities can result in temporary habitat degradation through in-channel works or potentially due to river diversions.

Construction activities are also likely to result in disturbance due to noise, light and visual presence from human activities. Standard mitigation is described in Section 5.2.2 and considered adequate to reduce disturbance impacts during construction to levels that will not result in significant effects.

Similarly, during construction there is the potential for pollution resulting from increased traffic to and from construction sites and accidents that can result in contamination of watercourses and habitats. Where works are undertaken near watercourses or in-channel there is potential for increased sedimentation and silting of watercourses.

Spread of invasive species may occur during construction where workers move between and within sites. The presence and increase in INNS can lead to loss of habitat and overtake native species affecting habitats and qualifying species they support. This option proposes to transfer raw water which increases the risk of INNS spread.

Water transfers between different catchments also introduces the risk of spreading pathogens and fish diseases for example. The risk will depend on the presence/absence of pathogens in the donor catchment and the level of water treatment carried out.

Details of each of the potential impacts are given in Table 9.1.

The following sites were identified with potential likely significant effects during the construction of new infrastructure or extension of existing infrastructure:

- River Lambourn SAC
- Kennet and Lambourn Floodplain
- Kennet Valley Alderwoods SAC
- Solent Maritime SAC
- Solent and Dorset Coast Potential SPA
- Solent and Southampton Water Ramsar Site
- Solent and Southampton Water SPA.

For these habitats sites mitigation measures need to be put in place to avoid likely significant effects. Proposed mitigation and avoidance measures are described in the following section.

No likely significant effects have been identified for the following sites:

- Mottisfont Bats SAC; and
- River Itchen SAC.

**Operation**

The proposed water transfer will include increased abstraction from the River Thames; however, there are no habitats sites in the River Thames in the vicinity of this option that could be affected by changes in water flows. Although a new abstraction licence will be required for any new intake at Culham, this is not expected to affect habitats sites named under the National Site Network.

Water transfers between different water bodies can result in the spread of INNS and species diseases. Water abstracted from the River Thames will be screened at Culham WTW before it is transferred via pipeline to a number of offtakes. It is not possible to identify at this stage if this pathway will lead to the spread of any INNS and fish diseases for example as it will depend on the level of water treatment undertaken at the WTW. However, there are no planned discharges to water bodies that are designated as habitats sites. A possible pathway may arise due to accident from a pipeline burst that could leak into the River Lambourn; however, using directional drilling will reduce the potential for contamination of the designated site. Risks are also identified for the Solent and Southampton Water Ramsar and SPA sites were the pipeline is proposed to cross the site.

### 9.2.2 Assumptions and mitigation measures

Assumptions and mitigation measures are identical to the ones proposed for Option 1 in section 5.2.2 of this report.

In addition to these measures it is proposed that a review of the pipeline route layout is undertaken so that it avoids the Solent and Southampton Water Ramsar and SPA sites. Ideally the new route layout should be more than 500m away from the designated sites.

**Table 9 1: Option 5 Likely significant effects on designated sites and qualifying features**

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| River Lambourn SAC (0km - option intersects the site) | • Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | The proposed pipeline route will cross the River Lambourn SAC with potential temporary effects likely during the construction of the pipeline. These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent;<br>• Changes to the water table Significant changes to water quantity and velocity during construction;<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near river banks;<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering. Air pollution may also affect habitat vegetation due to dust deposition; and<br>• Biological disturbance – potential for invasive species spread.<br><br>This designated site is already suffering from similar pressures from other sources and therefore the proposed works may further prevent the improvement of the site condition (currently unfavourable-recovering).<br>The identified effects have the potential to reduce the extent and distribution of this habitat as well as affecting its structure and function compromising the integrity of the River Lambourn SAC.<br><br>During operation biological disturbance is the main risk through the potential spread of invasive species | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Lambourn SAC to avoid direct impacts on the banks and riverbed;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Sediment traps near or in watercourses or the use of cofferdams will be implemented to control sediment runoff;<br>• Biosecurity measures will be implemented;<br>• 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) will be implemented to avoid significant effects due to increased light; and<br>• Development of a Construction and Environmental Management Plan at Project level.<br><br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats; and<br>– The structure and function of the habitats. | NO |
| | • Bullhead *Cottus gobio*<br>• Brook lamprey *Lampetra planeri* | Habitats that support fish species may potential be affected during the construction phase through:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of suitable fish habitat extent This may affect the availability of habitat for different life cycle stages in particular breeding, nursery and feeding habitat;<br>• Changes to the water table – Significant changes to water quantity and velocity during construction;<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks;<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering; and<br>• Biological disturbance potential for invasive species and pathogen spread<br><br>Habitat loss and habitat degradation can result in habitat fragmentation with potential consequences for the completion of fish life-cycles; in particular for brook lamprey if it prevents upstream migration to reach spawning grounds. Bullhead is vulnerable to water quality changes and substrate modification.<br><br>The impacts are considered to be temporary and localized.<br><br>During operation biological disturbance is the main risk through the potential spread of invasive species | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Lambourn SAC to avoid direct impacts on the banks and riverbed;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Sediment traps near or in watercourses or the use of cofferdams will be implemented to control sediment runoff;<br>• Biosecurity measures will be implemented;<br>• Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) will be followed to avoid significant effects due to noise;<br>• 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) will be followed to avoid significant effects due to increased light (if works are programmed at night).; and<br>• Development of a Construction and Environmental Management Plan at Project level<br><br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species;<br>– The structure and function of the habitats of qualifying species; and<br>– The supporting processes on which habitats of qualifying species rely | NO |

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| Kennet and Lambourn Floodplain SAC<br>(0km - option intersects the site) | • Desmoulin's whorl snail *Vertigo moulinsiana* | During construction, where the proposed pipeline route overlaps with the Kennet and Lambourn Floodplain SAC there is potential for significant changes to the habitats that support this species These changes may include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent.<br>• Changes to water quality and water table –Changes to the water table during construction due to pipeline laying activities.<br>• Toxic contamination- potential for pollution from contaminants due to the use of heavy machinery<br>• Non-toxic contamination –air pollution may also affect habitat vegetation due to dust deposition<br>• Biological disturbance – mortality during pipeline laying activities within the habitats site<br>This species is particularly affected by changes in water table. The Desmoulin's whorl snail inhabits a particular 'zone' in the transition between truly aquatic habitat and terrestrial habitat where ground conditions are permanently wet and humid - therefore changes in the water table level may affect significantly the conditions of this species habitat. Inappropriate water levels are currently a pressure affecting this SAC habitats<br>Impacts resulting from this option would be temporary and would affect one unit of the habitats site<br>No pathways have been identified during operation that could lead to significant effects to the integrity of this SAC. | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Lambourn SAC to avoid habitat loss and direct mortality.<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination<br>• Biosecurity measures will be implemented<br>• Development of a Construction and Environmental Management Plan at Project level<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species;<br>The structure and function of the habitats of qualifying species; and<br>– The supporting processes on which habitats of qualifying species rely | NO |
| Kennet Valley Alderwoods SAC<br>(0.34km W of option) | • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) * Priority feature | Inappropriate water level is identified as a threat to this habitat The proposed pipeline route would be located less than 350m from the site boundary, the River Kennet runs through the site and the pipeline would cross the river downstream of the site, consequently direct effects are not considered. Given the nature of the work at this location and distance from the designated site it considered that water levels in the designated site will not be significantly affected.<br>No pathways have been identified during operation that could lead to significant effects to the integrity of this SAC | N/A | NO |
| River Itchen SAC<br>(3.2km east of option) | • Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation<br>• Southern damselfly *Coenagrion mercuriale*<br>• Bullhead *Cottus gobio*<br>• White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*<br>• Brook lamprey *Lampetra planeri*<br>• Atlantic salmon *Salmo salar*<br>• Otter *Lutra lutra* | This site is not directly affected by the option. Following UKIWR guidance on ZoI distances for indirect effects due to disturbance it is unlikely that the habitats and species for which this site has been designated will be significantly affected by this option either during construction and/or operation | N/A | NO |
| Mottisfont Bats SAC<br>(8.1km W of option) | • Barbastelle *Barbastella barbastellus* | The site is designated for the presence of a colony of Barbastelle bats, *Barbastella barbastellus* which use trees in the woodlands as summer maternity roost. The bats also use the site as a foraging area and have known navigation routes through the woodlands to (predominantly) riverine areas and subsequent feeding areas in the surrounding landscape A target has been to support off-site habitat (foraging areas) by restoring any core areas of feeding habitat outside of the SAC boundary that are critical to Barbastelles during their breeding period | N/A | NO |

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| | | The proposed works in relation with the laying of the pipeline is more than 12km away from this designated site, and although no direct or indirect effects are expected to impact the site, Barbastelle bats are known to travel long distances to forage The River Test and River Dun, along with the fens, marshy areas, wet grassland and flowing ditches found in the surrounding valley floors are identified as foraging habitats for Barbastelle bats. It is therefore unlikely that the areas surrounding the proposed pipeline route will be of importance to this population of bats.<br>The proposed option is therefore unlikely to affect the structure and function of the habitats (outside the habitats site boundary) that support this species | | |
| Emer Bog SAC<br>(0.3m east of option) | • Transition mires and quaking bogs | The proposed pipeline route will cross a small drain that runs adjacent to the north boundary of the SAC. The pipeline route is more than 300m from the site boundary and therefore no direct impacts are likely to occur during construction.<br>Temporary effects likely during the construction of the pipeline include:<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks.; and<br>• Non-toxic contamination Air pollution may also affect habitat vegetation due to dust deposition.<br>The identified effects have the potential to result in local impacts associated with water quality degradation in the ditch<br>During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts. | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the ditch to avoid indirect impacts on the site;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination; and<br>• Development of a Construction and Environmental Management Plan at Project level. | NO |
| Solent Maritime SAC<br>(proposed pipeline route crosses the site) | • Spartina swards (*Spartinion maritimae*)<br>• Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)<br>• Sandbanks which are slightly covered by sea water all the time<br>• Mudflats and sandflats not covered by seawater at low tide<br>• Coastal lagoons* Priority feature<br>• Annual vegetation of drift lines<br>• Perennial vegetation of stony banks<br>• Salicornia and other annuals colonizing mud and sand<br>• Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") | The proposed pipeline route will cross the River Test, which runs into the Ramsar site, in three points and it also overlaps with the habitats site For this route, although the area affected is negligible in relation to the overall site area (<0.01%), local effects can be significant due to habitat loss and/or degradation as well as fragmentation.<br>Significant temporary effects likely during the construction of the pipeline. These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent;<br>• Changes to the water table – Significant changes to water quantity and velocity during construction;<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks;<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering with potential to affect the macroinvertebrates communities for which the site is designated. Air pollution may also affect habitat vegetation due to dust deposition; and<br>• Biological disturbance – potential for invasive species spread.<br>The identified effects have the potential to reduce the extent and distribution of local habitats for which the site is designated, as well as affecting its structure and function compromising the integrity of the Solent Maritime SAC.<br>During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts. | The following measures will be implemented to avoid or reduce significant effects:<br>• Alteration of pipeline route to avoid direct impacts on the Solent Maritime SAC habitats;<br>• Directional drilling will be undertaken where the pipeline crosses the River Test to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Biosecurity measures will be implemented; and<br>• Development of a Construction and Environmental Management Plan at Project level.<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>The extent and distribution of habitats; and<br>The structure and function of the habitats. | NO |
| | • Desmoulin's whorl snail *Vertigo moulinsiana* | The proposed pipeline route will cross the River Test, which runs into the Ramsar site, in three points and it also overlaps with the habitats site. For this route, although the area affected is negligible in relation to the overall site area (<0.01%), local effects can be significant due to habitat loss and/or degradation as well as fragmentation.<br>Significant temporary effects likely during the construction of the pipeline. These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent;<br>• Changes to the water table Significant changes to water quantity and velocity during construction;<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks; | The following measures will be implemented to avoid or reduce significant effects:<br>• Alteration of pipeline route to avoid direct impacts on the Solent Maritime SAC habitats;<br>• Directional drilling will be undertaken where the pipeline crosses the River Test to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination; | NO |

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| | | • Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering with potential to affect the macroinvertebrate communities for which the site is designated. Air pollution may also affect habitat vegetation due to dust deposition;<br>• Biological disturbance – potential for invasive species spread.<br><br>During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts. | • Biosecurity measures will be implemented;<br>• Development of a Construction and Environmental Management Plan at Project level<br><br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species;<br>– The structure and function of the habitats of qualifying species; and<br>The supporting processes on which habitats of qualifying species rely | |
| Solent and Dorset Coast Potential SPA (2km S of option) | • Common tern *Sterna hirundo,*<br>• Sandwich tern *Sterna sandvicensis* and<br>• Little tern *Sterna albifrons*. | The proposed pipeline route will cross the River Test, which runs into the Ramsar site in three points and it also overlaps with the habitats site For this route although the area affected is negligible in relation to the overall site area (<0.01%), local effects can be significant due to habitat loss and/or degradation as well as fragmentation<br>Significant temporary effects likely during the construction of the pipeline. These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent;<br>• Changes to the water table – Significant changes to water quantity and velocity during construction;<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks;<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering with potential to affect the macroinvertebrate communities for which the site is designated. Air pollution may also affect habitat vegetation due to dust deposition; and<br>• Biological disturbance – potential for invasive species spread.<br>The identified effects have the potential to reduce the extent and distribution of this habitat as well as affecting its structure and function, compromising the integrity of the River Lambourn SAC<br>During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Test to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Biosecurity measures will be implemented;<br>• Construction works will be undertaken at appropriate time of the year to avoid disturbance impacts on the bird species; and<br>• Development of a Construction and Environmental Management Plan at Project level.<br><br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species; and<br>– The structure and function of the habitats of qualifying species; and<br>The supporting processes on which habitats of qualifying species rely | NO |
| Solent and Southampton Water *Ramsar Site* (proposed pipeline route crosses the site) | • Ramsar criterion 1<br>Wetland habitats characteristic of the biogeographic region: saline lagoons, saltmarshes, estuaries, intertidal flats, shallow coastal waters, grazing marshes, reedbeds, coastal woodland and rocky boulder reefs.<br>• Ramsar criterion 2<br>The site supports an important assemblage of rare plants and invertebrates<br>• Ramsar criterion 5- Assemblages of international importance:<br>• Ramsar criterion 6 – species/populations occurring at levels of international importance.<br>Ringed plover, *Charadrius hiaticula*,<br>• Species with peak counts in winter: | The proposed pipeline route will cross the River Test, which runs into the Ramsar site, in three points and it also overlaps with the habitats site For this route, although the area affected is negligible in relation to the overall site area (<0.01%), local effects can be significant due to habitat loss and/or degradation as well as fragmentation.<br>Significant temporary effects likely during the construction of the pipeline. These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent;<br>• Changes to the water table – Significant changes to water quantity and velocity during construction;<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks;<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering with potential to affect the macroinvertebrate communities for which the site is designated. Air pollution may also affect habitat vegetation due to dust deposition; and<br>• Biological disturbance – potential for invasive species spread.<br>The identified effects have the potential to reduce the extent and distribution of this habitat as well as affecting its structure and function and consequently affecting the integrity of the River Lambourn SAC<br>During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts. | The following measures will be implemented to avoid or reduce significant effects:<br>• Alteration of pipeline route to avoid direct impacts on the Ramsar habitats;<br>• Directional drilling will be undertaken where the pipeline crosses the River Test to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Biosecurity measures will be implemented;<br>• Construction works will be undertaken at an appropriate time of the year to avoid disturbance impacts on the bird species; and<br>• Development of a Construction and Environmental Management Plan at Project level.<br><br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species; and<br>– The structure and function of the habitats of qualifying species; and | NO |

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| | ○ Dark-bellied brent goose, *Branta bernicla bernicla*,<br>○ Eurasian teal, *Anas crecca*,<br>○ Black-tailed godwit , *Limosa limosa islandica* | | The supporting processes on which habitats of qualifying species rely | |
| Solent and Southampton Water SPA<br>(proposed pipeline route crosses the site) | During the breeding season the area regularly supports:<br>• *Larus melanocephalus* 15.4% of the GB breeding population<br>• *Sterna albifrons* 2% of the GB breeding population<br>• *Sterna dougallii* 3.1% of the GB breeding population<br>• *Sterna hirundo* 2 2% of the GB breeding population<br>• *Sterna sandvicensis* 1.7% of the GB breeding population<br>*Article 4.2 Qualification*<br>• Over winter the area regularly supports:<br>• *Anas crecca* 1.1% of the population<br>• *Branta bernicla bernicla* 2 5% of the population<br>• *Charadrius hiaticula* 1.2% of the population<br>• *Limosa limosa islandica* 1 7% of the population<br>*An internationally important assemblage of birds*<br>• Over winter the area regularly supports: 51361 waterfowl including: *Branta bernicla bernicla, Anas crecca, Charadrius hiaticula, Limosa limosa islandica* | The current pipeline route crosses the site at its northmost point following the site boundary For this route, although the area affected is negligible in relation to the overall site area (<0.01%), local effects can be significant due to habitat loss and/or degradation as well as fragmentation. This route also crosses the River Test, which runs downstream into the designated site, in three different points which may result in changes water quality and can affect habitats downstream.<br>Potential temporary effects are likely during the construction of the pipeline. These will include:<br>• Physical loss/damage significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks.<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering. Air pollution may also affect habitat vegetation due to dust deposition.<br>• Non-physical disturbance- construction activities within the site can result in increased noise from vehicular traffic and workers presence within the site. Light pollution during works as well as disturbance form visual disturbance<br>• Biological disturbance – potential for invasive species spread<br>During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts. | The following measures will be implemented to avoid or reduce significant effects:<br>• Alteration of pipeline route to avoid direct impacts on the Ramsar habitats;<br>• Directional drilling will be undertaken where the pipeline crosses the River Test to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Biosecurity measures will be implemented.<br>• Construction works will be undertaken at an appropriate time of the year to avoid disturbance impacts on the bird species; and<br>• Development of a Construction and Environmental Management Plan at Project level.<br><br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species;<br>– The structure and function of the habitats of qualifying species; and<br>– The supporting processes on which habitats of qualifying species rely. | NO |

## 9.3 Stage 2 Outcomes for Option 5

No adverse effects resulting from the implementation of this option (alone) are reasonably foreseeable on the integrity of the following habitats sites, if the suggested mitigation measures and assumptions are observed. This includes the following sites:

- River Lambourn SAC
- Kennet and Lambourn Floodplain
- Kennet Valley Alderwoods SAC
- River Itchen SAC
- Mottisfont Bats SAC
- Emer Bog SAC
- Solent Maritime SAC
- Solent and Southampton Water SPA
- Solent and Southampton Water Ramsar Site
- Solent and Dorset Coast Potential SPA

In conclusion, provided that the proposed mitigation measures are taken forward at project level, no residual impacts on the habitats sites are likely to occur, and therefore no further stages in the HRA process are necessary for Option 5.

# 10 Option 6 – Appropriate Assessment

**Raw water transfer from the River Thames at Reading to Testwood**

## 10.1 Study Area

The WRSE Stage 1 Screening identified nine habitats sites within the ZoI of Option 6. This Stage 2 assessment identifies five habitats sites within the ZoI of Option 6.

Information on the designated sites are provided in Appendix B which includes their qualifying features, conservation objectives and threats and pressures affecting the habitats sites.

Likely Significant Effects were identified for four habitats sites and qualifying features for which they were designated as follows:

- Solent Maritime SAC (0.5km SE of option)
- Solent and Southampton Water SPA (option crosses this site)
- Solent and Southampton Water Ramsar Site (option crosses this site)
- Emer Bog SAC (0.3km E of option)

Uncertain effects were identified for one habitats sites and qualifying features for which they were designated as follows:

- Solent and Dorset Coast Potential SPA (2km SE of option)

The WRSE HRA screening identified Uncertain effects for a further four habitats sites and qualifying features for which they were designated as follows:

- River Itchen SAC (3.2km SE of the proposed option);
- New Forest SAC is located approx. 3.4km east of the pipeline route
- New Forest SPA is located approx. 4.7km south of the pipeline route
- New Forest Ramsar site is located approx. 4.7km south of the pipeline route

These sites are not in hydrological connection with the waterbodies likely to be affected by this option. As such, following UKWIR guidance, it is considered that impacts from this option on these habitats sites are negligible, and therefore these habitats sites are not considered further.

## 10.2 Potential impacts and sensitivity of qualifying features

### 10.2.1 Potential impacts

The potential impacts of the construction and operational phases for Option 6 are described below, taking into account the type, size and scale of the option.

An assessment of each potential impact on the integrity of the designated sites are made, in view of the sites' structure, function and conservation objectives. Where adverse impacts are deemed significant, mitigation measures are also proposed in the following section.

**Construction**

The potential impacts of the construction and operational phases for Option 6 are similar to those identified for Option 5 described in section 9.2.1.

Details of each of the potential impacts are given in Table 10.1.

The following sites were identified with potential likely significant effects during the construction of new infrastructure or extension of existing infrastructure:

- Emer Bog SAC
- Solent Maritime SAC (0.6 km SW of option)
- Solent and Dorset Coast Potential SPA (2km S of option)
- Solent and Southampton Water Ramsar Site (0km pipeline crosses the site)
- Solent and Southampton Water SPA (0km pipeline crosses the site)

For these habitats sites mitigation measures need to be put in place to avoid likely significant effects. Proposed mitigation and avoidance measures are described in the following section.

**Operation**

The proposed water transfer will include increased abstraction from the River Thames at Reading; however there are no habitats sites in the River Thames in the vicinity of this option that could be affected by changes in water flows.

Water transfers between different water bodies can result in the spread of INNS and species diseases. Water abstracted from the River Thames will be screened at the new [redacted] before it is transferred via pipeline to a number of off-takes. It is not possible to identify at this stage if this pathway will lead to the spread of any INNS and fish diseases for example, as it will depend on the level of water treatment undertaken at the WTW. However, there are no planned discharges to water bodies that are designated as habitats sites.

### 10.2.2 Assumptions and mitigation measures

Assumptions and proposed mitigation measures are similar to those proposed for Option 1 in section 5.2.1 and Option 5 in section 9.2.1.

As noted in Section 9.2.1, it is proposed that a review of the pipeline route layout is undertaken so that it avoids the Solent and Southampton Water Ramsar and SPA sites. Ideally the new route layout should be more than 500m away from the designated sites.

**Table 10 1: Option 6 Likely significant effects on designated sites and qualifying features**

| Designated sites | Qualifying features | Likely significant effects before mitigation | Mitigation measures | Likely significant effects after mitigation |
|---|---|---|---|---|
| Emer Bog SAC<br>(0.3m east of option) | • Transition mires and quaking bogs | The proposed pipeline route will cross a small drain that runs adjacent to the north boundary of the SAC. The pipeline route is more than 300m from the site boundary and therefore no direct impacts are likely to occur during construction.<br>Temporary effects likely during the construction of the pipeline include:<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks.<br>• Non-toxic contamination – Air pollution may also affect habitat vegetation due to dust deposition.<br>The identified effects have the potential to result in local impacts associated with water quality degradation in the ditch.<br>During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the ditch to avoid indirect impacts on the site;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination; and<br>• Development of a Construction and Environmental Management Plan at Project level.<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>• The extent and distribution of habitats; and<br>• The structure and function of the habitats. | **NO** |
| Solent Maritime SAC<br>(proposed pipeline route crosses the site) | • Spartina swards (*Spartinion maritimae*)<br>• Atlantic salt meadows *(Glauco-Puccinellietalia maritimae*)<br>• Sandbanks which are slightly covered by sea water all the time<br>• Mudflats and sandflats not covered by seawater at low tide<br>• Coastal lagoons* Priority feature<br>• Annual vegetation of drift lines<br>• Perennial vegetation of stony banks<br>• Salicornia and other annuals colonizing mud and sand<br>• Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") | The proposed pipeline route will cross the River Test, which runs into the Ramsar site, in three points and it also overlaps with the habitats site For this route, although the area affected is negligible in relation to the overall site area (<0.01%), local effects can be significant due to habitat loss and/or degradation as well as fragmentation.<br>Significant temporary effects likely during the construction of the pipeline. These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent<br>• Changes to the water table – Significant changes to water quantity and velocity during construction.<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks.<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering with potential to affect the macroinvertebrates communities for which the site is designated. Air pollution may also affect habitat vegetation due to dust deposition.<br>• Biological disturbance – potential for invasive species spread.<br>The identified effects have the potential to reduce the extent and distribution of local habitats for which the site is designated, as well as affecting its structure and function, compromising the integrity of the Solent Maritime SAC.<br>During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts. | The following measures will be implemented to avoid or reduce significant effects:<br>• Alteration of pipeline route to avoid direct impacts on the Solent Maritime SAC habitats;<br>• Directional drilling will be undertaken where the pipeline crosses the River Test to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Biosecurity measures will be implemented; and<br>• Development of a Construction and Environmental Management Plan at Project level.<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>The extent and distribution of habitats; and<br>– The structure and function of the habitats. | NO |
| | • Desmoulin's whorl snail *Vertigo moulinsiana* | The proposed pipeline route will cross the River Test, which runs into the Ramsar site, in three points and it also overlaps with the habitats site. For this route, although the area affected is negligible in relation to the overall site area (<0.01%), local effects can be significant due to habitat loss and/or degradation as well as fragmentation.<br>Significant temporary effects likely during the construction of the pipeline. These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent.<br>• Changes to the water table Significant changes to water quantity and velocity during construction<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks.<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering with potential to affect the macroinvertebrate communities for which the site is designated Air pollution may also affect habitat vegetation due to dust deposition<br>• Biological disturbance – potential for invasive species spread. | The following measures will be implemented to avoid or reduce significant effects:<br>• Alteration of pipeline route to avoid direct impacts on the Solent Maritime SAC habitats;<br>• Directional drilling will be undertaken where the pipeline crosses the River Test to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Biosecurity measures will be implemented; and<br>• Development of a Construction and Environmental Management Plan at Project level<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in: | NO |

| | | | | |
|---|---|---|---|---|
| | | During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts | – The extent and distribution of habitats of qualifying species;<br>The structure and function of the habitats of qualifying species; and<br>– The supporting processes on which habitats of qualifying species rely. | |
| Solent and Dorset Potential Coast SPA (2km S of option) | • Common tern *Sterna hirundo,*<br>• Sandwich tern *Sterna sandvicensis* and<br>• Little tern *Sterna albifrons*. | The proposed pipeline route will cross the River Test, which runs into the Ramsar site, in three points and it also overlaps with the habitats site For this route, although the area affected is negligible in relation to the overall site area (<0.01%), local effects can be significant due to habitat loss and/or degradation as well as fragmentation.<br>Significant temporary effects likely during the construction of the pipeline. These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent.<br>• Changes to the water table – Significant changes to water quantity and velocity during construction<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks.<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering with potential to affect the macroinvertebrates communities for which the site is designated. Air pollution may also affect habitat vegetation due to dust deposition.<br>• Biological disturbance – potential for invasive species spread.<br>The identified effects have the potential to reduce the extent and distribution of this habitat as well as affecting its structure and function compromising the integrity of the River Lambourn SAC<br>During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts. | The following measures will be implemented to avoid or reduce significant effects:<br>• Directional drilling will be undertaken where the pipeline crosses the River Test to avoid habitat loss and direct mortality.<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination<br>• Biosecurity measures will be implemented<br>• Construction works will be undertaken at an appropriate time of the year to avoid disturbance impacts on the bird species<br>• Development of a Construction and Environmental Management Plan at Project level.<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species;<br>– The structure and function of the habitats of qualifying species; and<br>The supporting processes on which habitats of qualifying species rely. | NO |
| Solent and Southampton Water *Ramsar Site* (proposed pipeline route crosses the site) | • Ramsar criterion 1<br>Wetland habitats characteristic of the biogeographic region: saline lagoons, saltmarshes, estuaries, intertidal flats, shallow coastal waters, grazing marshes, reedbeds, coastal woodland and rocky boulder reefs.<br>• Ramsar criterion 2<br>The site supports an important assemblage of rare plants and invertebrates<br>• Ramsar criterion 5- Assemblages of international importance:<br>• Ramsar criterion 6 – species/populations occurring at levels of international importance.<br>Ringed plover, *Charadrius hiaticula*,<br>• Species with peak counts in winter:<br>○ Dark-bellied brent goose, *Branta bernicla bernicla*,<br>○ Eurasian teal, *Anas crecca*,<br>○ Black-tailed godwit, *Limosa limosa islandica* | The proposed pipeline route will cross the River Test, which runs into the Ramsar site, in three points and it also overlaps with the habitats site For this route, although the area affected is negligible in relation to the overall site area (<0.01%), local effects can be significant due to habitat loss and/or degradation as well as fragmentation.<br>Significant temporary effects likely during the construction of the pipeline. These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent.<br>• Changes to the water table Significant changes to water quantity and velocity during construction<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks.<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering with potential to affect the macroinvertebrate communities for which the site is designated. Air pollution may also affect habitat vegetation due to dust deposition.<br>• Biological disturbance potential for invasive species spread<br>The identified effects have the potential to reduce the extent and distribution of this habitat as well as affecting its structure and function compromising the integrity of the River Lambourn SAC.<br>During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts. | The following measures will be implemented to avoid or reduce significant effects:<br>• Alteration of pipeline route to avoid direct impacts on the Ramsar habitats;<br>• Directional drilling will be undertaken where the pipeline crosses the River Test to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Biosecurity measures will be implemented;<br>• Construction works will be undertaken at an appropriate time of the year to avoid disturbance impacts on the bird species; and<br>• Development of a Construction and Environmental Management Plan at Project level<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species;<br>– The structure and function of the habitats of qualifying species; and<br>– The supporting processes on which habitats of qualifying species rely. | NO |
| Solent and Southampton Water SPA | During the breeding season the area regularly supports: | The current pipeline route crosses the site at its northmost point following the site boundary. For this route, although the area affected is negligible in relation to the overall site area (<0.01%), local effects can be significant due to habitat loss and/or degradation as well as fragmentation. This route also crosses the River Test, which runs downstream into the | The following measures will be implemented to avoid or reduce significant effects:<br>• Alteration of pipeline route to avoid direct impacts on the Ramsar habitats; | NO |

| | | | |
|---|---|---|---|
| (proposed pipeline route crosses the site) | • *Larus melanocephalus* 15.4% of the GB breeding population<br>• *Sterna albifrons* 2% of the GB breeding population<br>• *Sterna dougallii* 3 1% of the GB breeding population<br>• *Sterna hirundo* 2.2% of the GB breeding population<br>• *Sterna sandvicensis* 1 7% of the GB breeding population<br>*Article 4.2 Qualification*<br>• Over winter the area regularly supports:<br>• *Anas crecca* 1 1% of the population<br>• *Branta bernicla bernicla* 2.5% of the population<br>• *Charadrius hiaticula* 1 2% of the population<br>• *Limosa limosa islandica* 1.7% of the population<br>*An internationally important assemblage of birds*<br>• Over winter the area regularly supports: 51361 waterfowl including: *Branta bernicla bernicla*, *Anas crecca*, *Charadrius hiaticula*, *Limosa limosa islandica* | designated site, in three different points which may result in changes water quality and can affect habitats downstream<br>• Potential temporary effects are likely during the construction of the pipeline These will include:<br>• Physical loss/damage – significant localized habitat loss and/or habitat degradation leading to reduction of habitat extent.<br>• Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks.<br>• Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering Air pollution may also affect habitat vegetation due to dust deposition<br>• Non-physical disturbance- construction activities within the site can result in increased noise from vehicular traffic and workers presence within the site. Light pollution during works as well as disturbance form visual disturbance.<br>• Biological disturbance – potential for invasive species spread.<br>During operation biological disturbance is the main risk through the potential spread of invasive species due to potential pipe bursts. | • Directional drilling will be undertaken where the pipeline crosses the River Test to avoid habitat loss and direct mortality;<br>• CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimize significant toxic contamination;<br>• Biosecurity measures will be implemented;<br>• Construction works will be undertaken at an appropriate time of the year to avoid disturbance impacts on bird species; and<br>• Development of a Construction and Environmental Management Plan at Project level<br>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:<br>– The extent and distribution of habitats of qualifying species;<br>– The structure and function of the habitats of qualifying species; and<br>The supporting processes on which habitats of qualifying species rely |

## 10.3 Stage 2 Outcomes for Option 6

No adverse effects resulting from the implementation of this option (alone) are reasonably foreseeable on the integrity of the following habitats sites, if the suggested mitigation measures are observed:

- Emer Bog SAC
- Solent Maritime SAC
- Solent and Dorset Coast Potential SPA
- Solent and Southampton Water Ramsar Site
- Solent and Southampton Water SPA Site

In conclusion, provided that the proposed mitigation measures are taken forward at project level, no residual impacts on the habitats sites are likely to occur, and therefore no further stages in the HRA process are necessary for Option 6.

# 11 Conclusion and Recommendations

## 11.1 Conclusion

This Habitats Regulation Assessment Stage 2 Appropriate Assessment, undertaken at plan level, finds that all options were identified as having 'no likely significant effects' (alone) after mitigation is implemented.

The current design of all options includes a pipeline route that will cross watercourses that are either designated as a habitats site (River Lambourn SAC in Options 1, 2, 3 and 4) or that feed into habitats sites (River Test, Options 5 and 6). The identified result of 'no likely significant effects' depends on the use of directional drilling in all options, in order to avoid impacts on watercourses.

The pipeline route currently proposed for Options 5 and 6 crosses two designated sites (the Solent and Southampton Water Ramsar and SPA sites). It is recommended that the route layout should be revisited to avoid intersecting the designated sites, thus avoiding impacts on the habitats sites and features for which they are designated. The identified result of 'no likely significant effects' on these sites depends on the proposed route alteration.

Other mitigation measures proposed aim to avoid impacts mostly at construction phase including pollution control measures, biosecurity and disturbance mitigations. It is also recommended that a Construction Environmental Management Plan (CEMP) be in place that will include the proposed mitigation measures in this AA as well as any other specific measures identified following an HRA undertaken at project level.

The results are presented as single projects (i.e. alone) and the current assessment does not yet include an in-combination assessment with other plans or projects. The reason for this is the lack of knowledge at this stage of other schemes that might result in in-combination effects with T2ST options. This assessment will be updated at Gate 2 stage to include potential in-combination effects with other schemes. Following this a further in-combination assessment will be conducted to review external projects and plans.

Following this AA and provided that all mitigation measures are taken forward and no changes are made to the options, no further assessment is required. However, further design iteration will require revision to this AA and may affect the outcome.

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 HRA (Assessment of Alternative Solutions) would be required.

## 11.2 Recommendations

Directional drilling is recommended for all options, in order to avoid impacts on watercourses that are either designated as a habitats site (River Lambourn SAC in Options 1, 2, 3 and 4) or that feed into a habitats sites (River Test, Options 5 and 6).

The pipeline route for Options 5 and 6 should be revisited to avoid intersecting the Solent and Southampton Water Ramsar and SPA sites.

An in-combination assessment should be undertaken at Gate 2 stage to include potential in-combination effects with other plans or projects not related to T2ST.

The HRA should be reviewed at Gate 2 stage to support optioneering refinements and the selection of a preferred design for T2ST.

# A. WRSE HRA Output tables

This data has been redacted

# B. Designated Sites

## B.1 River Itchen SAC

### B.1.1 Conservation objectives

With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

### B.1.2 Qualifying Features

- H3260. Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho Batrachion* vegetation; Rivers with floating vegetation often dominated by water-crowfoot
- S1044. *Coenagrion mercuriale*; Southern damselfly
- S1092. *Austropotamobius pallipes*; White-clawed (or Atlantic stream) crayfish
- S1096. *Lampetra planeri*; Brook lamprey
- S1106. *Salmo salar*; Atlantic salmon
- S1163. *Cottus gobio*; Bullhead
- S1355. *Lutra lutra*; Otter

### B.1.3 Site Description

The River Itchen is one of the ‘classic’ chalk rivers of southern England, drawing most of its character from this geological stratum. The watercourses with *Ranunculion* and *Batrachion* habitat comprises the river channel, its banks and parts of its riparian zone. In addition, parts of the floodplain are notified for their wetland habitat, and the river discharges via Southampton Water into the Solent which has a range of habitat designations. The site is additionally notified for a number of Habitats Directive Annex II species features, including invertebrate assemblages and a key breeding population of the nationally rare southern damselfly *Coenagrion mercuriale*, white-clawed crayfish *Austropotamobius pallipes* (one of the last remaining strongholds in central southern England), Atlantic salmon *Salmo salar*, Bullhead *Cottus gobio* and Brook lamprey *Lampetra planeri*, and an expanding population of Otter *Lutra lutra*.

### B.1.4 Vulnerabilities

The Itchen faces numerous pressures from water abstraction and flow diversions, discharges, agricultural runoff, channel modifications, fisheries management and human impacts associated with the urbanisation alongside much of the river's valley.

## B.2 River Lambourn SAC

### B.2.1 Conservation Objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

### B.2.2 Qualifying features

- Annex I habitats that are a primary reason for selection of this site;
  - Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation;
- Annex II species that are a primary reason for selection of this site
  - Bullhead *Cottus gobio*
- Annex II species present as a qualifying feature, but not a primary reason for site selection
  - Brook lamprey *Lampetra planeri*

### B.2.3 Site description

The River Lambourn is a classic example of a lowland chalk river. It rises in Lynch Wood, north of Lambourn and flows down to a confluence with the River Kennet east of Newbury. The catchment is almost entirely chalk which results in a predominantly gravelly river bed. A key feature is the ephemeral nature of the upper section which generally flows from February through to the autumn. This is known as a 'winterbourne'. Any flora or fauna occurring in these stretches must be adapted to wide variations in flow, thus winterbourne sections tend to be less species-rich than the lower reaches which hold water all year round. Species characteristic of these conditions include pond water-crowfoot *Ranunculus peltatus* which is the dominant aquatic plant, as well as fool's-water-cress *Apium nodiflorum* and the moss *Fontinalis antipyretica.* Further down the river where there are perennial flows, the aquatic plants are typical of shallow, gravel-bedded watercourses. Stream water-crowfoot *Ranunculus penicillatus* ssp. *pseudofluitans*, lesser water-parsnip *Berula erecta* and water-cress *Rorippa nasturtiumaquaticum* are abundant; blunt-fruited water-starwort *Callitriche obtusangula* is also characteristic in the channel. The good water quality, coarse sediments and extensive beds of submerged plants provide excellent habitat for bullhead *Cottus gobio* and brook lamprey *Lampetra planeri*.

### B.2.4 Pressures and Threats

The River Lambourn currently suffers from a number of pressures and threats including siltation, water quality, invasive species, hydrological changes, inappropriate cutting and mowing, inland flood defence works.

## B.3 Kennet and Lambourn Floodplain SAC

### B.3.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- The extent and distribution of the habitats of qualifying species;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site.

### B.3.2 Qualifying features

- Desmoulin's whorl snail *Vertigo moulinsiana*

### B.3.3 Site description

The cluster of sites in the Kennet and Lambourn valleys supports an extensive population of Desmoulin's whorl snail *Vertigo moulinsiana* in association with chalk stream habitat. The habitat occupied at this site differs from the sites in East Anglia in that it is predominantly reed sweet-grass *Glyceria maxima* swamp or tall sedges at the river margins, in ditches and in depressions in wet meadows.

### B.3.4 Pressures and threats

The Kennet and Lambourn Floodplain SAC currently suffers from a number of pressures and threats including siltation, water quality, invasive species, hydrological changes, inappropriate cutting and mowing, inland flood defence works, and changes in land management.

## B.4 Kennet Valley Alderwoods SAC

### B.4.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- The extent and distribution of the qualifying natural habitats;
- The structure and function (including typical species) of the qualifying natural habitats; and,
- The supporting processes on which the qualifying natural habitats rely.

### B.4.2 Qualifying features

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

### B.4.3 Site 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. 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).

### B.4.4 Pressures and threats

Inappropriate water levels and game management are considered major threats to this site.

## B.5 Mottisfont Bats SAC

### B.5.1 Conservation objectives

- The extent and distribution of the habitats of qualifying species
- The structure and function of the habitats of qualifying species
- The supporting processes on which the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

### B.5.2 Qualifying features

- Barbastelle *Barbastella barbastellus*

### B.5.3 Site description

The Mottisfont woodland supports an important population of the rare Barbastelle bat *Barbastella barbastellus*. Mottisfont contains a mix of woodland types including hazel *Corylus avellana* coppice with standards, broadleaved plantation and coniferous plantation which the bats use for breeding, roosting, commuting and feeding

### B.5.4 Pressures and threats

The site currently suffers from offsite habitat availability/ management,  forestry and woodland management.

## B.6 Solent Maritime SAC

### B.6.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species

- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

### B.6.2 Qualifying features

- Spartina swards (*Spartinion maritimae*)
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- Sandbanks which are slightly covered by sea water all the time
- Mudflats and sandflats not covered by seawater at low tide
- Coastal lagoons * Priority feature
- Annual vegetation of drift lines
- Perennial vegetation of stony banks
- Salicornia and other annuals colonizing mud and sand
- Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
- Desmoulin's whorl snail *Vertigo moulinsiana*

### B.6.3 Site description

The Solent is a complex site encompassing a major estuarine system on the south coast of England. The Solent and its inlets are unique in Britain and Europe for their hydrographic regime with double tides, as well as for the complexity of the marine and estuarine habitats present within the area. Sediment habitats within the estuaries include extensive areas of intertidal mudflats, often supporting eelgrass *Zostera* spp. and green algae, saltmarshes and natural shoreline transitions, such as drift line vegetation. All four species of cordgrass found within the UK are present within the Solent and it is one of only two UK sites with significant amounts of the native small cordgrass *Spartina maritima*. The rich intertidal mudflats, saltmarsh, shingle beaches and adjacent coastal habitats, including grazing marsh, reedbeds and damp woodland, support nationally and internationally important numbers of migratory and over-wintering waders and waterfowl as well as important breeding gull and tern populations.

### B.6.4 Pressures and threats

This site is currently subject to many types of threats including:

- Public Threat Access/Disturbance
- Coastal squeeze
- Fisheries: Commercial
- Water Pollution
- Changes in species Threat distributions
- Climate change
- Change to site conditions
- Invasive species
- Direct land take from development
- Biological Resource Threat Not yet determined Use
- Change in land management
- Inappropriate pest Threat control
- Air Pollution atmospheric nitrogen deposition

- Hydrological changes
- Extraction: non-living resources

## B.7 Solent and Dorset Coast Potential SPA

On 16 January 2020, the Minister approved proposals to classify the Solent and Dorset Coast SPA. For this Special Protection Area (SPA) site, Natural England is currently in the process of developing a Conservation Advice package.

### B.7.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

### B.7.2 Qualifying features

- Sandwich tern *Sterna sandvicensis* (Breeding)
- Common tern *Sterna hirundo* (Breeding)
- Little tern *Sternula albifrons* (Breeding)

### B.7.3 Site description

Not available

### B.7.4 Pressures and threats

Not available

## B.8 Solent and Southampton Water Ramsar Site

### B.8.1 Qualifying features

Ramsar criterion 1

- The site is one of the few major sheltered channels between a substantial island and mainland in European waters, exhibiting an unusual strong double tidal flow and has long periods of slack water at high and low tide. It includes many wetland habitats characteristic of the biogeographic region: saline lagoons, saltmarshes, estuaries, intertidal flats, shallow coastal waters, grazing marshes, reedbeds, coastal woodland and rocky boulder reefs.

Ramsar criterion 2

- The site supports an important assemblage of rare plants and invertebrates. At least 33 British Red Data Book invertebrates and at least eight British Red Data Book plants are represented on site.

Ramsar criterion 5 - Assemblages of international importance:

- Species with peak counts in winter: 51343 waterfowl (5 year peak mean 1998/99-2002/2003)

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Qualifying Species/populations (as identified at designation):

- Species with peak counts in spring/autumn:
  - Ringed plover *Charadrius hiaticula*, Europe/Northwest Africa 397 individuals, representing an average of 1.2% of the GB population (5 year peak mean 1998/9-2002/3)
- Species with peak counts in winter:
  - Dark-bellied brent goose, *Branta bernicla bernicla*, 6456 individuals, representing an average of 3% of the population (5 year peak mean 1998/9-2002/3)
  - Eurasian teal, *Anas crecca*, NW Europe 5514 individuals, representing an average of 1.3% of the population (5 year peak mean 1998/9-2002/3)
  - Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe 1240 individuals, representing an average of 3.5% of the population (5 year peak mean 1998/9-2002/3).

### B.8.2 Site description

The estuaries and harbours of the Solent are particularly sheltered and form the largest number and tightest cluster of small estuaries anywhere in Great Britain. The Solent and Isle of Wight system is notable for its large range and extent of different habitats. The intertidal area is predominantly sedimentary in nature with extensive intertidal mud and sandflats within the sheltered harbours and areas of gravel and pebble sediments on more exposed beaches. These conditions combine to favour an abundant benthic fauna and green algae which support high densities of migrant and over-wintering wildfowl and waders.

Eelgrass *Zostera* beds occur discontinuously along the north shore of the Isle of Wight and in a few places along the northern shore of The Solent. The Solent system supports a wide range of saltmarsh communities. Upper saltmarshes are dominated by sea purslane *Atriplex portulacoides*, sea plantain *Plantago maritima*, sea meadow grass *Puccinellia maritima* and sea lavender *Limonium vulgare*; locally thrift *Armeria maritima* and the nationally scarce golden samphire *Inula crithmoides* are abundant. Lower saltmarsh vegetation tends to be dominated by sea purslane, cord grass *Spartina* spp., glasswort *Salicornia* spp. and sea-blite *Suaeda maritima*. Cord-grasses dominate much of the saltmarsh in Southampton Water and in parts of the Solent and it was the original location of the introduction of Spartina alterniflora and subsequent hybridisation with the native species.

### B.8.3 Pressures and threats

Erosion is identified as the main pressure at this site.

## B.9 Solent & Southampton Water SPA

### B.9.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

### B.9.2 Qualifying Features

- A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
- A052 *Anas crecca*; Eurasian teal (Non-breeding)
- A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)
- A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
- A176 *Larus melanocephalus*; Mediterranean gull (Breeding)
- A191 *Sterna sandvicensis*; Sandwich tern (Breeding)
- A192 *Sterna dougallii*; Roseate tern (Breeding)
- A193 *Sterna hirundo*; Common tern (Breeding)
- A195 *Sterna albifrons*; Little tern (Breeding)

## B.10 Emer Bog SAC

### B.10.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- The extent and distribution of the qualifying natural habitat;
- The structure and function (including typical species) of the qualifying natural habitat, and, The supporting processes on which the qualifying natural habitat rely

### B.10.2 Qualifying features

- H7140. Transition mires and quaking bogs; Very wet mires often identified by an unstable ‘quaking’ surface

### B.10.3 Site description

The site comprises an extensive valley bog which has been described as unparalled in lowland England as an example of a young oligotrophic / mesotrophic basin mire, together with associated damp acidic grassland, heathland and developing woodland over Bracklesham Beds in the Hampshire Basin. The bog grades downstream into mature alder carr and upstream into heathland. To the south and west of Emer Bog, the site includes remnants of former common land, now acidic grassland. The invertebrate fauna of the bog and heath is of considerable interest and very large numbers of moths have been recorded.

### B.10.4 Pressures and threats

This site is currently subject to many types of threats including:

- Air Pollution: impact of atmospheric nitrogen deposition
- Hydrological changes
- Public Access/Disturbance

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