

# **Thames to Southern Transfer (T2ST)**

Water Framework Directive Assessment

28 June 2021



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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 for 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
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 Water Framework Directive (WFD) Assessment Annex supports the Environmental Assessment Report (EAR) that accompanies the Gate 1 submission to Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the Thames to Southern Transfer (T2ST) Strategic Resource Option (SRO). This annex presents the results of the WFD assessment applied to the six T2ST options.

The Level 1 WFD assessment was completed by Water Resources South East (WRSE) 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 Level 1 WFD assessment indicated that all options had one waterbody which required further assessment; Thames (Evenlode to Thame) – Option 1, 2 and 5; and Thames (Wallingford to Caversham) – Option 3, 4 and 6.

Level 2 WFD assessments were completed for these two waterbodies in line with the All Company Working Group (ACWG) framework for undertaking WFD assessments for SROs, (*ACWG WFD: Consistent framework for undertaking no deterioration assessments, Nov 2020*). The findings indicate that there are potentially precautionary WFD compliance risks associated with the operation of the new abstractions for all options. The potential hydrological effects could conflict with achieving WFD status objectives. This is particularly the case for Options 3, 4 and 6 where hydrology/river flow is an existing limiting factor, recorded in WFD baseline data as a 'reason for not achieving good'. The potential biological effects, particularly on fish, would require further assessment.

For all options it has been assumed that another SRO would be used in combination with this option to support the water to the River Thames. This will help to reduce the impact on hydrological regime and therefore on the biological elements.

Further WFD assessment would be required for all options that progress to Gate 2 and beyond, to improve the certainty of the levels of WFD risk outlined in the Gate 1 WFD Level 2 assessments.

# 1 Introduction

## 1.1 Overview

This Annex supports the Environment Assessment Report (EAR) that accompanies the Gate 1 submission to the Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the Thames to Southern Transfer (T2ST) Strategic Resource Option (SRO). This Annex presents the findings of a Water Framework Directive (WFD) assessment applied to the T2ST options.

## 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.

**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 120MI/d)
2	Raw water transfer from Culham to Otterbourne North WTW (50, 80 and 120MI/d)
3	Raw water transfer from the River Thames at Reading to Otterbourne North WTW (50, 80 and 120MI/d)
4	Potable water transfer from the River Thames at Reading to Otterbourne North WTW (50, 80 and 120MI/d)
5	Raw water transfer from Culham to Testwood
6	Raw water transfer from the River Thames at Reading to Testwood

## 1.3 Methodology

### 1.3.1 Approach to WFD assessment for SROs

The WFD requires all waterbodies (both surface and groundwater) to achieve 'good status or potential'. The Directive also requires that waterbodies experience no deterioration in status or potential. Good status/potential is a function of good ecological status/potential (biological, physico-chemical and hydromorphological elements and specific pollutants) and good chemical status (Priority Substances and Priority Hazardous Substances).

The All Company Working Group (ACWG) has developed a consistent framework for undertaking WFD assessments for SROs to demonstrate that options will not cause deterioration in status/potential of any WFD waterbodies. The assessment considers mitigation that would need to be put in place to protect waterbody status/potential. The assessment also considers WFD future objectives to ensure the option would not preclude them from reaching good status/potential.

Two stages of assessment are completed under the ACWG WFD approach, an initial Level 1 basic screening and a Level 2 detailed impact screening. These are conducted/reported using a spreadsheet assessment tool which is automated based on option information for Level 1 and expert judgment for Level 2. Further information on WFD classification and the approach

adopted can be found in *ACWG, WFD: Consistent framework for undertaking no deterioration assessments, Nov 2020*.

### 1.3.2 Level 1 – basic screening

The first stage of WFD assessment was completed by Water Resources South East (WRSE) in January 2021, and updated in March 2021, following the methodology in the WRSE Regional Plan Environmental Assessment Methodology Guidance, July 2020 for all options. Level 1 assessment follows these steps:

- Identify affected waterbodies;
- Review SRO options;
- Identify possible impacts;
- Apply 'embedded' mitigation measures; and
- Calculate screening score (using a 6-point scale) to 'screen out' waterbodies and options with no or very minor potential impacts from further assessment.

The outcomes for T2ST options are summarised in Section 2.1 and Appendix A. Where waterbodies and option impacts were 'screened in', they have been taken forward to Level 2 assessment.

### 1.3.3 Level 2 – detailed impact screening

The second stage of WFD assessment has been completed for T2ST SRO options that were screened in at Level 1, following the steps:

- Waterbody scale detailed assessment of impacts to each WFD quality element for each activity proposed as part of an SRO option;
- Assessment of data confidence level and design certainty – confidence levels are assigned for each assessment, based on professional judgement of the quality and availability of both physical data and design information about the option at the time of assessment (*note, confidence/certainty expected to be low at initial Gate 1 assessment and increase over time*). Where the confidence levels are medium or low, the requirements for further data or design information in order to raise this confidence level for future gates will be listed;
- Identification of further mitigation needs;
- Assessment of impacts after mitigation (scoring on a 6-point scale); and
- Identification of activities to improve certainty of assessment outcomes.

The outcomes of the Level 2 assessments are summarised in Section 4 and Appendix B.

### 1.3.4 WFD for Gate 2 and beyond

Where waterbodies and option impacts have been identified, recommendations have been made for increasing the confidence in the assessment. This is expected to be through increasing the level of detail available during later stages of option development for subsequent gateways if the relevant options are progressed. In combination assessments where different SRO option delivery is interdependent would also be required.

It is noted that there may be potential changes to WFD-related legislation related to Britain's exit from the European Union (EU). The EU WFD legislation is transposed in England and Wales by *The Water Environment (WFD) (England and Wales) Regulations 2017*<sup>1</sup>. The Cycle 3 River Basin Management Plans (RBMPs) are also due to be published in 2021, which may bring

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<sup>1</sup> <https://www.legislation.gov.uk/uksi/2017/407/made>

about changes in the baseline status and objectives for waterbodies. Where necessary, changes will need to be accounted for in updates to the WFD assessments.

#### **1.4 Assumptions and limitations**

The WRSE outputs discussed in Section 3 do not include an assessment for the additional components described in Section 4.1.

For all options it has been assumed that another SRO would be used in combination with this option to support the water to the River Thames. However, this WFD assessment does not include an in-combination assessment with other SROs, water company capital investments or third-party development plans or projects.

## 2 Scheme Description

### 2.1 Overview

The aim of the T2ST SRO 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 for T2ST, however a summary of the main aspects of the options is included below.

### 2.2 Option descriptions

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

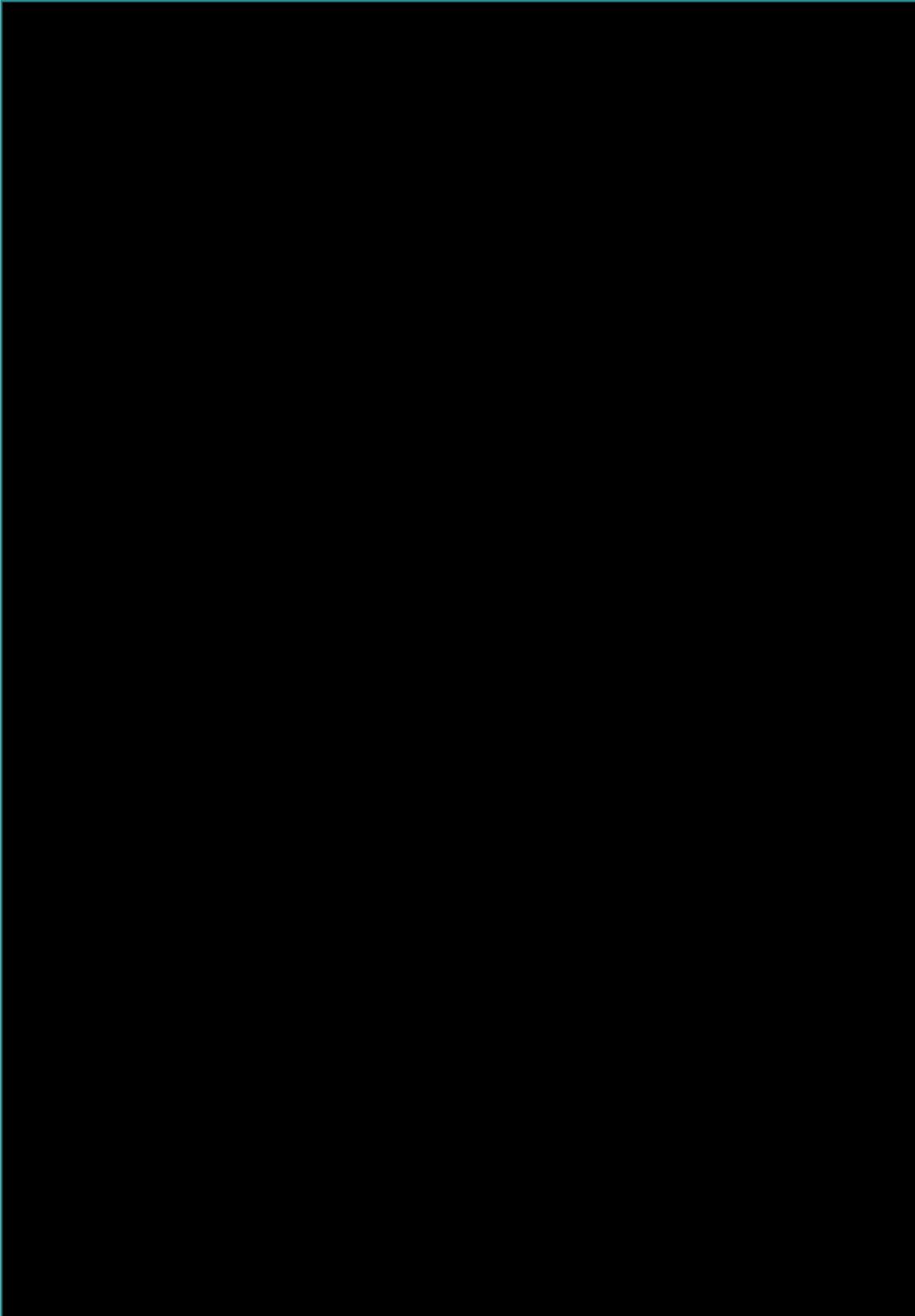
**Table 2.1: T2ST Gate 1 unconstrained options description**

Option ref	Option name	Option description
1	Potable water transfer from Culham to Otterbourne North WTW (50, 80 and 120MI/d)	<p>Transfer of potable water from the River Thames at Culham near Abingdon to Otterbourne. Water provided from either STT or SESRO.</p> <p>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.</p> <p>This option includes offtakes for delivery of potable water as follows:</p> <ul style="list-style-type: none"> <li>• 10MI/d offtake to Kingsclere Water supply reservoir (WSR)</li> <li>• 10MI/d offtake to Micheldever WSR</li> <li>• 10-20MI/d offtake to the South East Water (SEW) Basingstoke supply zone at Northgate WSR</li> <li>• 50 – 120 MI/d to a new WTW at Otterbourne North – treated water will be delivered to a new storage tank for distribution into the supply network.</li> </ul> <p>A new WTW will be required at Culham. A new WTW will be required at Otterbourne North. Service reservoir extensions will be required at Kingsclere WSR and Micheldever WSR. New pumping stations (PS) will be required at:</p> <ul style="list-style-type: none"> <li>• Culham WTW</li> <li>• Newton Common</li> </ul> <p>New break pressure tanks (BPT) will be required at:</p> <p>██████████ ██████████ ████████████████████</p> <p>An alternative option for the Andover connection is being considered where potable water is received at Upper Enham WSR rather than Micheldever WSR.</p>
2	Raw water transfer from Culham to Otterbourne North WTW (50, 80 and 120MI/d)	<p>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.</p> <p>This option includes offtakes for delivery of raw water as follows:</p> <ul style="list-style-type: none"> <li>• 10MI/d offtake to a new WTW at Kingsclere</li> <li>• 10MI/d offtake to a new WTW at Andover</li> <li>• 10-20MI/d offtake to SEW at Northgate WTW</li> <li>• 50 – 120 MI/d to a new WTW at Otterbourne North</li> </ul>

Option ref	Option name	Option description
		<p>New WTW will be required at:</p> <ul style="list-style-type: none"> <li>• Kingsclere</li> <li>• Andover</li> <li>• Otterbourne</li> </ul> <p>North New PS will be required at:</p> <ul style="list-style-type: none"> <li>• Culham WTW</li> </ul> <p>New BPT will be required at:</p> <ul style="list-style-type: none"> <li>• [REDACTED]</li> </ul>
3	Raw water transfer from the River Thames at Reading to Otterbourne North WTW (50, 80 and 120MI/d)	<p>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 .</p> <p>This option includes offtakes for delivery of raw water as follows:</p> <ul style="list-style-type: none"> <li>• 10MI/d offtake to a new WTW at Kingsclere</li> <li>• 10MI/d offtake to a new WTW at Andover</li> <li>• 10-20MI/d offtake to SEW at Northgate WTW</li> <li>• 50 – 120 MI/d to a new WTW at Otterbourne North</li> </ul> <p>A new river abstraction intake and pumping station will be required at Reading at the abstraction point.</p> <p>New WTW will be required at:</p> <ul style="list-style-type: none"> <li>• Kingsclere</li> <li>• Andover</li> <li>• Otterbourne North</li> </ul> <p>A new PS will be required at [REDACTED]</p> <p>A new BPT will be required at:</p> <ul style="list-style-type: none"> <li>• [REDACTED]</li> </ul>
4	Potable water transfer from the River Thames at Reading to Otterbourne North WTW (50, 80 and 120MI/d)	<p>Transfer of potable water from [REDACTED] Reading to Otterbourne. Water provided from either the Severn to Thames Transfer or SESRO.</p> <p>Water treatment will be required [REDACTED] and potable water will be transferred to Otterbourne WTW.</p> <p>This option includes offtakes for delivery of potable water as follows:</p> <ul style="list-style-type: none"> <li>• 10MI/d offtake to Kingsclere WSR</li> <li>• 10MI/d offtake to Micheldever WSR</li> <li>• 10-20MI/d offtake to SEW at Northgate WSR</li> <li>• 50 – 120 MI/d to a new WTW at Otterbourne North –treated water will be delivered to a new storage tank for distribution into the supply network</li> </ul> <p>A new river abstraction intake and pumping station will be required at Reading at the abstraction point.</p> <p>Service reservoir extensions will be required at Kingsclere WSR and Micheldever WSR.</p> <p>New WTW will be required at:</p> <ul style="list-style-type: none"> <li>• Otterbourne North</li> </ul> <p>A new PS will be required at [REDACTED]</p> <p>A new BPT will be required at:</p> <ul style="list-style-type: none"> <li>• [REDACTED]</li> </ul> <p>An alternative option for the Andover connection is being considered where potable water is received at Upper Enham WSR rather than Micheldever WSR.</p>
5	Raw water transfer from Culham to Testwood	<p>As Option 2, except raw water is treated at Testwood not Otterbourne.</p> <p>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.</p>

Option ref	Option name	Option description
		<p>This option includes offtakes for delivery of raw water as follows:</p> <ul style="list-style-type: none"> <li>• 10MI/d offtake to a new WTW at Kingsclere</li> <li>• 10MI/d offtake to a new WTW at Andover</li> <li>• 10-20MI/d offtake to SEW at Northgate WTW</li> <li>• 50 – 120 MI/d to a new WTW as an extension to the existing Testwood WTW.</li> </ul> <p>New WTW will be required at:</p> <ul style="list-style-type: none"> <li>• Kingsclere</li> <li>• Andover</li> <li>• Testwood</li> </ul> <p>New PS will be required at:</p> <ul style="list-style-type: none"> <li>• Culham WTW</li> <li>• [REDACTED]</li> </ul> <p>New BPT will be required at:</p> <ul style="list-style-type: none"> <li>• [REDACTED]</li> </ul>
6	Raw water transfer from the River Thames at Reading to Testwood	<p>As Option 3, except raw water is treated at Testwood not Otterbourne. 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.</p> <p>This option includes offtakes for delivery of raw water as follows:</p> <ul style="list-style-type: none"> <li>• 10MI/d offtake to a WTW works at Kingsclere</li> <li>• 10MI/d offtake to a new WTW at Andover</li> <li>• 10-20MI/d offtake to SEW at Northgate WTW</li> <li>• 50 – 120 MI/d to a new WTW as an extension to the existing Testwood WTW.</li> </ul> <p>A new river abstraction intake and pumping station will be required at Reading at the abstraction point.</p> <p>New WTW will be required at:</p> <ul style="list-style-type: none"> <li>• Kingsclere</li> <li>• Andover</li> <li>• Testwood</li> </ul> <p>A new PS will be required at [REDACTED]</p> <p>A new BPT will be required at [REDACTED]</p>

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



## 3 Level 1 WFD Findings

### 3.1 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 the Level 1 WFD for the options in January 2021, and updated in March 2021, following the methodology in the WRSE Regional Plan Environmental Assessment Methodology Guidance, July 2020. The following sections summarise the results of the Level 1 WFD. Full WRSE output tables are included in Appendix A. Further information on WFD classification and the approach adopted can be found in *ACWG, WFD: Consistent framework for undertaking no deterioration assessments, Nov 2020*.

### 3.2 Option 1 - Potable water transfer from Culham to Otterbourne North WTW

The WRSE Level 1 WFD assessment covered three components of the option. A summary is provided in Table 3.1.

**Table 3.1: WRSE WFD Level 1 assessment outcomes for Option 1**

WRSE Option ID	SWS_HSE_HI-TFR_SWX_ALL_cul/ott pot
<b>Option Description</b>	Transfer of 50, 80 or 120 Ml/d of potable water from Culham to Otterbourne WSR. Thames Water to Southern transfer option 1.
<b>Number of waterbodies passing WFD assessment</b>	22
<b>Waterbodies passing WFD assessment (no further assessment needed)</b>	GB106039023360: Cow Common Brook and Portobello Ditch; GB106039023660: Ginge Brook and Mill Brook; GB106039023600: Mill Brook and Bradfords Brook system, Wallingford; GB106039023300: Pang; GB106039023210: Winterbourne; GB106039023220: Lambourn (Source to Newbury); GB106039023174: Middle Kennet (Hungerford to Newbury); GB106039017280: Enborne (Source to downstream A34); GB106039017310: Enborne (downstream A34 to Burghclere Brook); GB106039017230: Earlstone Stream and Burghclere Brook (source to Enborne); GB106039017250: Ecchinswell Brook (source to Enborne); GB106039017220: Kingsclere Brook (Source to Enborne); GB107042022710: Test (Upper); GB107042022720: Bourne Rivulet; GB107042022700: Test - Bourne Rivulet to conf Dever; GB107042022810: Anton - Upper; GB107042022770: Dever; GB107042022620: Candover Brook; GB107042022730: Nun's Walk Stream; GB107042022740: Sombourne Stream; GB107042016310: Monks Brook; GB107042022580: Itchen;
<b>Number of waterbodies requiring further WFD assessment</b>	1
<b>Waterbodies requiring further WFD assessment</b>	GB106039030334: Thames (Evenlode to Thame)

The outcome from the updated WRSE Level 1 WFD assessment indicated a Level 2 assessment would be required on the Thames (Evenlode to Thame) WFD waterbody (ID GB106039030334), due to the increase in abstraction of water from the river.

### 3.3 Option 2 - Raw water transfer from Culham to Otterbourne North WTW

The WRSE Stage 1 WFD assessment covered three components of the option. A summary is provided in Table 3.2.

**Table 3.2: WRSE WFD Level 1 assessment outcomes for Option 2**

Option ID	SWS_HWZ_HI-TFR_SWX_ALL_ab/otter
<b>Option Description</b>	Transfer of 50, 80 or 120 Ml/d of raw water from Culham to Otterbourne WSR. Thames Water to Southern transfer option 1.
<b>Number of waterbodies passing WFD assessment</b>	22
<b>Waterbodies passing WFD assessment (no further assessment needed)</b>	GB106039023360: Cow Common Brook and Portobello Ditch; GB106039023660: Ginge Brook and Mill Brook; GB106039023600: Mill Brook and Bradfords Brook system, Wallingford; GB106039023300: Pang; GB106039023210: Winterbourne; GB106039023220: Lambourn (Source to Newbury); GB106039023174: Middle Kennet (Hungerford to Newbury); GB106039017280: Enborne (Source to downstream A34); GB106039017310: Enborne (downstream A34 to Burghclere Brook); GB106039017230: Earlstone Stream and Burghclere Brook (source to Enborne); GB106039017250: Ecchinswell Brook (source to Enborne); GB106039017220: Kingsclere Brook (Source to Enborne); GB107042022710: Test (Upper); GB107042022720: Bourne Rivulet; GB107042022700: Test - Bourne Rivulet to conf Dever; GB107042022810: Anton - Upper; GB107042022770: Dever; GB107042022620: Candover Brook; GB107042022730: Nun's Walk Stream; GB107042022740: Sombourne Stream; GB107042016310: Monks Brook; GB107042022580: Itchen;
<b>Number of waterbodies requiring further WFD assessment</b>	1
<b>Waterbodies requiring further WFD assessment</b>	GB106039030334: Thames (Evenlode to Thame)

The outcome from the updated WRSE Level 1 WFD assessment indicated a Level 2 assessment would be required on the Thames (Evenlode to Thame) WFD waterbody (ID GB106039030334), due to the potential for some WFD effects related to new abstraction infrastructure or the operation of abstraction directly from the waterbody.

### 3.4 Option 3 - Raw water transfer from the River Thames at Reading to Otterbourne North WTW

The WRSE Stage 1 WFD assessment covered three components of the option. A summary is provided in Table 3.3

**Table 3.3: WRSE WFD Level 1 assessment outcomes for Option 3**

WRSE Option ID	SWS_HSE_HI-TFR_KVZ_ALL_readottraw
<b>Option Description</b>	Transfer of 50, 80 or 120 Ml/d of raw water from Reading to Otterbourne WSR. Thames to Southern transfer option 3
<b>Number of waterbodies passing WFD assessment</b>	18

WRSE Option ID	SWS_HSE_HI-TFR_KVZ_ALL_readottraw
<b>Waterbodies passing WFD assessment (no further assessment needed)</b>	GB106039023280:Sulham Brook; GB106039023141:Holy Brook; GB106039023140:Lower Kennet (Sheffield Bottom to Reading); GB106039017300:West End Brook (tributary of Foudry Brook); GB106039017190:Silchester Brook; GB106039017160:Bow Brook (Pamber End to Bramley); GB106039017200:Baughurst Brook; GB106039017220:Kingsclere Brook (Source to Enborne); GB107042022710:Test (Upper); GB107042022620:Candover Brook; GB107042022720:Bourne Rivulet; GB107042022700:Test - Bourne Rivulet to conf Dever; GB107042022810:Anton - Upper; GB107042022770:Dever; GB107042022740:Sombourne Stream; GB107042022730:Nun's Walk Stream; GB107042016310:Monks Brook; GB107042022580:Itchen;
<b>Number of waterbodies requiring further WFD assessment</b>	1
<b>Waterbodies requiring further WFD assessment</b>	GB106039030331: Thames (Wallingford to Caversham)

The outcome from the updated WRSE Level 1 WFD assessment indicated a Level 2 assessment would be required on the Thames (Wallingford to Caversham) WFD waterbody (ID GB106039030331), due to the new abstraction from the river.

### 3.5 Option 4 - Potable water transfer from the River Thames at Reading to Otterbourne North WTW

The WRSE Stage 1 WFD assessment covered three components of the option. A summary is provided in Table 3.4.

**Table 3.4: WRSE WFD Level 1 assessment outcomes for Option 4**

WRSE Option ID	SWS_HSE_HI-TFR_KVZ_ALL_readottpot
<b>Option Description</b>	Transfer of 50, 80 or 120 MI/d of potable water from Reading to Otterbourne WSR. Thames to Southern transfer option 4
<b>Number of waterbodies passing WFD assessment</b>	18
<b>Waterbodies passing WFD assessment (no further assessment needed)</b>	GB106039023280:Sulham Brook; GB106039023141:Holy Brook; GB106039023140:Lower Kennet (Sheffield Bottom to Reading); GB106039017300:West End Brook (tributary of Foudry Brook); GB106039017190:Silchester Brook; GB106039017160:Bow Brook (Pamber End to Bramley); GB106039017200:Baughurst Brook; GB106039017220:Kingsclere Brook (Source to Enborne); GB107042022710:Test (Upper); GB107042022620:Candover Brook; GB107042022720:Bourne Rivulet; GB107042022700:Test - Bourne Rivulet to conf Dever; GB107042022810:Anton - Upper; GB107042022770:Dever; GB107042022740:Sombourne Stream; GB107042022730:Nun's Walk Stream; GB107042016310:Monks Brook; GB107042022580:Itchen;
<b>Number of waterbodies requiring further WFD assessment</b>	1
<b>Waterbodies requiring further WFD assessment</b>	GB106039030331: Thames (Wallingford to Caversham)

The outcomes from the updated WRSE Level 1 WFD assessment indicated a Level 2 assessment would be required on the Thames (Wallingford to Caversham) WFD waterbody (ID GB106039030331), due to the new abstraction from the river.

### 3.6 Option 5 - Raw water transfer from Culham to Testwood

The WRSE Stage 1 WFD assessment covered three components of the option. A summary is provided in Table 3.5.

**Table 3.5: WRSE WFD Level 1 assessment outcomes for Option 5**

WRSE Option ID	SWS_HSW_HI-TFR_SWX_ALL_cultestraw
<b>Option Description</b>	Transfer of 50, 80 or 120 Ml/d of raw water from Culham to Testwood WSR. Thames to Southern transfer option 5
<b>Number of waterbodies passing WFD assessment</b>	25
<b>Waterbodies passing WFD assessment (no further assessment needed)</b>	GB106039023360: Cow Common Brook and Portobello Ditch; GB106039023660: Ginge Brook and Mill Brook; GB106039023600: Mill Brook and Bradfords Brook system, Wallingford; GB106039023300: Pang; GB106039023210: Winterbourne; GB106039023174: Middle Kennet (Hungerford to Newbury); GB106039023220: Lambourn (Source to Newbury); GB106039017280: Enborne (Source to downstream A34); GB106039017310: Enborne (downstream A34 to Burghclere Brook); GB106039017230: Earlstone Stream and Burghclere Brook (source to Enborne); GB106039017250: Ecchinswell Brook (source to Enborne); GB106039017220: Kingsclere Brook (Source to Enborne); GB107042022710: Test (Upper); GB107042022720: Bourne Rivulet; GB107042022700: Test - Bourne Rivulet to conf Dever; GB107042022810: Anton - Upper; GB107042022770: Dever; GB107042022730: Nun's Walk Stream; GB107042022740: Sombourne Stream; GB107042016310: Monks Brook; GB107042016490: Tadburn Lake; GB107042016800: Luzborough Lane Stream; GB107042016840: Test (Lower); GB520704202800: Southampton Water* GB107042022620: Candover Brook;
<b>Number of waterbodies requiring further WFD assessment</b>	1
<b>Waterbodies requiring further WFD assessment</b>	GB106039030334: Thames (Evenlode to Thame)

\*GB520704202800: Southampton Water is listed as "58: Not part of a river WB catchment" on the WRSE output table. Note that this is a transitional waterbody but has been included for completeness.

The outcomes from the updated WRSE Level 1 WFD assessment indicated a Level 2 assessment would be required on the Thames (Evenlode to Thame) WFD waterbody (ID GB106039030334), due to the increase in abstraction of water from the river.

### 3.7 Option 6 - Raw water transfer from River Thames at Reading to Testwood

The WRSE Stage 1 WFD assessment covered three components of the option. A summary is provided in Table 3.6.

**Table 3.6: WRSE WFD Level 1 assessment outcomes for Option 6**

WRSE Option ID	SWS_HSW_HI-TFR_KVZ_ALL_readtestraw
<b>Option Description</b>	Transfer of 50, 80 or 120 Ml/d of raw water from Reading to Testwood WSR. Thames to Southern transfer option 6
<b>Number of waterbodies passing WFD assessment</b>	21
<b>Waterbodies passing WFD assessment (no further assessment needed)</b>	GB106039023280:Sulham Brook; GB106039023141:Holy Brook; GB106039023140:Lower Kennet (Sheffield Bottom to Reading); GB106039017300:West End Brook (tributary of Foudry Brook); GB106039017190:Silchester Brook; GB106039017160:Bow Brook (Pamber End to Bramley); GB106039017200:Baughurst Brook; GB106039017220:Kingsclere Brook (Source to Enborne); GB107042022710:Test (Upper); GB107042022620:Candover Brook; GB107042022720:Bourne Rivulet; GB107042022700:Test - Bourne Rivulet to conf Dever; GB107042022810:Anton - Upper; GB107042022770:Dever; GB107042022740:Sombourne Stream; GB107042022730:Nun's Walk Stream; GB107042016310:Monks Brook; GB107042016490:Tadburn Lake; GB107042016800:Luzborough Lane Stream; GB107042016840:Test (Lower) GB520704202800: Southampton Water*
<b>Number of waterbodies requiring further WFD assessment</b>	1
<b>Waterbodies requiring further WFD assessment</b>	GB106039030331: Thames (Wallingford to Caversham)

\*GB520704202800: Southampton Water is listed as "58:Not part of a river WB catchment" on the WRSE output table. Note that this is a transitional waterbody but has been included for completeness.

The outcomes from the updated WRSE Level 1 WFD assessment indicated a Level 2 assessment would be required on the Thames (Evenlode to Thame) WFD waterbody (ID GB106039030334), due to the new abstraction from the river.

## 4 Level 2 WFD Assessments

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

The WRSE review was undertaken in January 2021 and updated in 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 4.1. These components have been included in the Level 2 WFD assessment.

**Table 4.1: Additional areas of work since WRSE assessment**

Option ref	Changes since WRSE assessment
1	<ul style="list-style-type: none"> <li>• New start point and section of pipeline route at Culham</li> <li>• Possible alternative offtake to Upper Enham</li> <li>• Slight modification of the pipeline route to Andover WTW</li> <li>• Modification of offtake to Otterbourne North (not Otterbourne WTW)</li> <li>• Additional areas for works at:                             <ul style="list-style-type: none"> <li>○ Culham WTW</li> <li>○ [REDACTED]</li> <li>○ Upper Enham Reservoir</li> <li>○ Andover WTW</li> <li>○ [REDACTED]</li> <li>○ Otterbourne North WTW</li> </ul> </li> </ul>
2	<ul style="list-style-type: none"> <li>• New start point and section of pipeline route at Culham</li> <li>• Slight modification of the pipeline route to Kingsclere WTW</li> <li>• Slight modification of the pipeline route to Andover WTW</li> <li>• Modification of offtake to Otterbourne North (not Otterbourne WTW)</li> <li>• Additional areas for works at:                             <ul style="list-style-type: none"> <li>○ Culham WTW</li> <li>○ [REDACTED]</li> <li>○ Kingsclere WTW</li> <li>○ Andover WTW</li> <li>○ [REDACTED]</li> <li>○ Otterbourne North WTW</li> </ul> </li> </ul>
3	<ul style="list-style-type: none"> <li>• Modification of the pipeline route to Kingsclere WTW</li> <li>• Slight modification of the pipeline route to Northgate WSR</li> <li>• Modification of offtake to Otterbourne North (not Otterbourne WTW)</li> <li>• Additional areas for works at:                             <ul style="list-style-type: none"> <li>○ [REDACTED]</li> <li>○ Kingsclere WTW</li> <li>○ Andover WTW</li> <li>○ [REDACTED]</li> <li>○ Otterbourne North WTW</li> </ul> </li> </ul>
4	<ul style="list-style-type: none"> <li>• Possible alternative offtake to Upper Enham</li> <li>• Modification of the pipeline route to Kingsclere WTW</li> <li>• Slight modification of the pipeline route to Northgate WSR</li> <li>• Modification of offtake to Otterbourne North (not Otterbourne WTW)</li> <li>• Additional areas for works at:                             <ul style="list-style-type: none"> <li>○ [REDACTED]</li> <li>○ Kingsclere WTW</li> </ul> </li> </ul>

Option ref	Changes since WRSE assessment
5	<ul style="list-style-type: none"> <li>○ Andover WTW</li> <li>○ Otterbourne North WTW</li> </ul> <hr/> <ul style="list-style-type: none"> <li>• New start point and section of pipeline route at Culham</li> <li>• Slight modification of the pipeline route to Kingsclere WTW</li> <li>• Slight modification of the pipeline route to Andover WTW</li> <li>• Slight modification of the pipeline route to Testwood</li> <li>• Additional areas for works at:                             <ul style="list-style-type: none"> <li>○ Culham WTW</li> <li>○ Andover WTW</li> <li>○ Testwood</li> </ul> </li> </ul>
6	<ul style="list-style-type: none"> <li>• Modification of the pipeline route to Kingsclere WTW</li> <li>• Slight modification of the pipeline route to Northgate WSR</li> <li>• Additional areas for works at:                             <ul style="list-style-type: none"> <li>○ Kingsclere WTW</li> <li>○ Andover WTW</li> <li>○ Testwood</li> </ul> </li> </ul>

The second stage of WFD assessment has been completed for T2ST SRO options that were screened in at Level 1. Further information on WFD classification and the approach adopted can be found in ACWG, *WFD: Consistent framework for undertaking no deterioration assessments*, Nov 2020.

Sections 4.2 to 4.7 provide an overview of the Level 2 WFD assessments undertaken for the 6 options. Section 4.8 provides a summary table for each option assessed. Detailed outputs are presented in Appendix B.

#### 4.2 Option 1 - Potable water transfer from Culham to Otterbourne North WTW

The Level 2 WFD assessment identified possible deterioration risks to fish, invertebrates and hydrological regime. These are primarily due to a potential risk of reduced flow due to increased abstraction, and the additional intake structure required. It also identified potential impediments to meeting Good Ecological Status. A summary of the Level 2 WFD assessment is included in Table 4.2.

#### 4.3 Option 2 - Raw water transfer from Culham to Otterbourne North WTW

The Level 2 WFD assessment identified possible deterioration risks to fish, invertebrates and hydrological regime. These are primarily due to a potential risk of reduced flow due to increased abstraction, and the additional intake structure required. It also identified potential impediments to meeting Good Ecological Status. A summary of the Level 2 WFD assessment is included in Table 4.3.

#### 4.4 Option 3 - Raw water transfer from the River Thames at Reading to Otterbourne North WTW

The Level 2 WFD assessment identified possible deterioration risks to fish, macrophytes and phytobentos and hydrological regime. These are primarily due to a potential risk of reduced flow due to increased abstraction, and the additional intake structure required. It also identified

potential impediments to meeting Good Ecological Status. A summary of the Level 2 WFD assessment is included in Table 4.4.

#### **4.5 Option 4 - Potable water transfer from the River Thames at Reading to Otterbourne North WTW**

The Level 2 WFD assessment identified possible deterioration risks to fish, macrophytes and phytobentos and hydrological regime. These are primarily due to a potential risk of reduced flow due to increased abstraction, and the additional intake structure required. It also identified potential impediments to meeting Good Ecological Status. A summary of the Level 2 WFD assessment is included in Table 4.5.

#### **4.6 Option 5 - Raw water transfer from Culham to Testwood**

The Level 2 WFD assessment identified possible deterioration risks to fish, invertebrates and hydrological regime. These are primarily due to a potential risk of reduced flow due to increased abstraction, and the additional intake structure required. It also identified potential impediments to meeting Good Ecological Status. A summary of the Level 2 WFD assessment is included in Table 4.6.

#### **4.7 Option 6 - Raw water transfer from River Thames at Reading to Testwood**

The Level 2 WFD assessment identified possible deterioration risks to fish, macrophytes and phytobentos and hydrological regime. These are primarily due to a potential risk of reduced flow due to increased abstraction, and the additional intake structure required. It also identified potential impediments to meeting Good Ecological Status. A summary of the Level 2 WFD assessment is included in Table 4.7.

#### **4.8 Summary tables**

Summary tables of the Level 2 WFD outcomes are below and detailed outputs are presented in Appendix B.

**Table 4.2: Option 1: Potable transfer Culham to Otterbourne North (50, 80 and 120 MI/d options) Level 2 WFD summary**

Waterbody ID	Waterbody Name	Confidence in WFD data	Confidence in option design	Requirements to improve confidence	Mitigation measures	Deterioration between status classes	Compromises water body objectives	Assists attainment of water body objectives	Further comments
GB106039030334	Thames (Evenlode to Thame)	Low	Low	<p>Detailed review of all baseline ecological WFD data, including results of any surveys already undertaken for T2ST (e.g. macrophyte and fish surveys).</p> <p>Detailed hydrological assessment of the impacts of abstractions on water quality / concentration of key physicochemical parameters in combination with the appropriate SRO option (STT or SESRO).</p> <p>Further information about option.</p>	<p>Water will be transferred to the River Thames upstream of the abstraction point (from SRO such as STT or SESRO) and there will be no net loss in flow at this location and negligible impact on hydrological regime.</p> <p>Fish and eel screening at new intake.</p> <p>Abstraction conditions to be set to minimise changes to hydrological regime that could cause deterioration of biological and physicochemical WFD elements.</p> <p>Provision for de-chlorination of pipeline water when draining down pipeline before discharge to watercourse.</p>	Possible	No	No	Assumption that the impacts of transfers from STT or SESRO (such as water quality and INNS) will be covered under the corresponding SRO WFD assessments and therefore are not included in this assessment.

**Table 4.3: Option 2: Raw transfer Culham to Otterbourne North (50, 80 and 120 MI/d options) Level 2 WFD summary**

Waterbody ID	Waterbody Name	Confidence in WFD data	Confidence in option design	Requirements to improve confidence	Mitigation measures	Deterioration between status classes	Compromises water body objectives	Assists attainment of water body objectives	Further comments
GB106039030334	Thames (Evenlode to Thame)	Low	Low	<p>Detailed review of all baseline ecological WFD data, including results of any surveys already undertaken for T2ST (e.g. macrophyte and fish surveys).</p> <p>Detailed hydrological assessment of the impacts of abstractions on water quality / concentration of key physicochemical parameters in combination with the appropriate SRO option (STT or SESRO).</p> <p>Further information about option.</p>	<p>Water will be transferred to the River Thames upstream of the abstraction point (from SRO such as STT or SESRO) and there will be no net loss in flow at this location and negligible impact on hydrological regime.</p> <p>Fish and eel screening at new intake.</p> <p>Abstraction conditions to be set to minimise changes to hydrological regime that could cause deterioration of biological and physicochemical WFD elements.</p>	Possible	No	No	Assumption that the impacts of transfers from STT or SESRO (such as water quality and INNS) will be covered under the corresponding SRO WFD assessments and therefore are not included in this assessment.

**Table 4.4: Option 3: Raw transfer River Thames at Reading to Otterbourne North (50, 80 and 120 MI/d options) Level 2 WFD summary**

Waterbody ID	Waterbody Name	Confidence in WFD data	Confidence in option design	Requirements to improve confidence	Mitigation measures	Deterioration between status classes	Compromises water body objectives	Assists attainment of water body objectives	Further comments
GB106039030331	Thames (Wallingford to Caversham)	Low	Low	<p>Detailed review of all baseline ecological WFD data, including results of any surveys already undertaken for T2ST (e.g. macrophyte and fish surveys).</p> <p>Use of net loss/gain tool to understand impact of new in river structures on mitigation measures assessment and RNAG</p> <p>Detailed hydrological assessment of the impacts of abstractions on water quality / concentration of key physicochemical parameters in combination with the appropriate SRO option (STT or SESRO).</p> <p>Further information about option.</p>	<p>Water will be transferred to the River Thames upstream of the abstraction point (from SRO such as STT or SESRO) and there will be no net loss in flow at this location and negligible impact on hydrological regime.</p> <p>Fish and eel screening at new intake.</p> <p>Abstraction conditions to be set to minimise changes to hydrological regime that could cause deterioration of biological and physicochemical WFD elements.</p>	Possible	Possible	No	Assumption that the impacts of transfers from STT or SESRO (such as water quality and INNS) will be covered under the corresponding SRO WFD assessments and therefore are not included in this assessment.

**Table 4.5: Option 4: Potable transfer River Thames at Reading to Otterbourne North (50, 80 and 120 MI/d options) Level 2 WFD summary**

Waterbody ID	Waterbody Name	Confidence in WFD data	Confidence in option design	Requirements to improve confidence	Mitigation measures	Deterioration between status classes	Compromises water body objectives	Assists attainment of water body objectives	Further comments
GB106039030331	Thames (Wallingford to Caversham)	Low	Low	<p>Detailed review of all baseline ecological WFD data, including results of any surveys already undertaken for T2ST (e.g. macrophyte and fish surveys).</p> <p>Use of net loss/gain tool to understand impact of new in river structures on mitigation measures assessment and RNAG</p> <p>Detailed hydrological assessment of the impacts of abstractions on water quality / concentration of key physicochemical parameters in combination with the appropriate SRO option (STT or SESRO).</p> <p>Further information about option.</p>	<p>Water will be transferred to the River Thames upstream of the abstraction point (from SRO such as STT or SESRO) and there will be no net loss in flow at this location and negligible impact on hydrological regime.</p> <p>Fish and eel screening at new intake.</p> <p>Abstraction conditions to be set to minimise changes to hydrological regime that could cause deterioration of biological and physicochemical WFD elements.</p> <p>Provision for de-chlorination of pipeline water when draining down pipeline before discharge to watercourse.</p>	Possible	Possible	No	Assumption that the impacts of transfers from STT or SESRO (such as water quality and INNS) will be covered under the corresponding SRO WFD assessments and therefore are not included in this assessment.

**Table 4.6: Option 5: Raw transfer Culham to Testwood Level 2 WFD summary**

Waterbody ID	Waterbody Name	Confidence in WFD data	Confidence in option design	Requirements to improve confidence	Mitigation measures	Deterioration between status classes	Compromises water body objectives	Assists attainment of water body objectives	Further comments
GB106039030334	Thames (Evenlode to Thame)	Low	Low	<p>Detailed review of all baseline ecological WFD data, including results of any surveys already undertaken for T2ST (e.g. macrophyte and fish surveys).</p> <p>Use of net loss/gain tool to understand impact of new in river structures on mitigation measures assessment and RNAG</p> <p>Detailed hydrological assessment of the impacts of abstractions on water quality / concentration of key physicochemical parameters in combination with the appropriate SRO option (STT or SESRO).</p>	<p>Water will be transferred to the River Thames upstream of the abstraction point (from SRO such as STT or SESRO) and there will be no net loss in flow at this location and negligible impact on hydrological regime.</p> <p>Fish and eel screening at new intake.</p> <p>Abstraction conditions to be set to minimise changes to hydrological regime that could cause deterioration of biological and physicochemical WFD elements.</p>	Possible	No	No	Assumption that the impacts of transfers from STT or SESRO (such as water quality and INNS) will be covered under the corresponding SRO WFD assessments and therefore are not included in this assessment.

Waterbody ID	Waterbody Name	Confidence in WFD data	Confidence in option design	Requirements to improve confidence	Mitigation measures	Deterioration between status classes	Compromises water body objectives	Assists attainment of water body objectives	Further comments
				Further information about option.					

**Table 4.7: Option 6: Raw transfer River Thames at Reading to Testwood Level 2 WFD summary**

Waterbody ID	Waterbody Name	Confidence in WFD data	Confidence in option design	Requirements to improve confidence	Mitigation measures	Deterioration between status classes	Compromises water body objectives	Assists attainment of water body objectives	Further comments
GB106039030331	Thames (Wallingford to Caversham)	Low	Low	<p>Detailed review of all baseline ecological WFD data, including results of any surveys already undertaken for T2ST (e.g. macrophyte and fish surveys).</p> <p>Use of net loss/gain tool to understand impact of new in river structures on mitigation measures assessment and RNAG</p> <p>Detailed hydrological assessment of the impacts of abstractions on water quality / concentration of key physicochemical parameters in combination with the appropriate SRO option (STT or SESRO).</p> <p>Further information about option.</p>	<p>Water will be transferred to the River Thames upstream of the abstraction point (from SRO such as STT or SESRO) and there will be no net loss in flow at this location and negligible impact on hydrological regime.</p> <p>Fish and eel screening at new intake.</p> <p>Abstraction conditions to be set to minimise changes to hydrological regime that could cause deterioration of biological and physicochemical WFD elements.</p>	Possible	Possible	No	Assumption that the impacts of transfers from STT or SESRO (such as water quality and INNS) will be covered under the corresponding SRO WFD assessments and therefore are not included in this assessment.

## 5 Conclusion and Recommendations

### 5.1 Conclusion

For the T2ST SRO, six options have been subject to a WFD assessment.

The Level 1 WFD assessment completed for Gate 1 by WRSE indicated that all options had one waterbody which required further assessment as follows:

- Thames (Evenlode to Thame) – Option 1, 2 and 5
- Thames (Wallingford to Caversham) – Option 3, 4 and 6

Level 2 WFD assessments were completed for these waterbodies and the findings indicate that there are potentially precautionary WFD compliance risks associated with the operation of the new abstractions (see summary provided in Section 4.8). The potential hydrological effects could conflict with achieving WFD status objectives. This is particularly the case for Options 3, 4 and 6 where hydrology/river flow is an existing limiting factor, recorded in WFD baseline data as a 'reason for not achieving good'. The potential biological effects, particularly on fish, would require further assessment as outlined in Section 5.2.

For all options it has been assumed that another SRO would be used in combination with this option to support the water to the River Thames. This will help to reduce the impact on hydrological regime and therefore on the biological elements.

For new or modified intakes, it is recognised that appropriate fish and eel screening would be required to prevent entrainment. At Gate 1, this has been considered as likely mitigation, but moderate/amber risks have been maintained until option designs and assessments are further progressed.

### 5.2 Recommendations

Further WFD assessment would be required for all options that progress to Gate 2 and beyond, to improve the certainty of the levels of WFD risk outlined in the Gate 1 WFD Level 2 assessments.

Areas for future focus include:

- Consultation with the Environment Agency to present and discuss key WFD risks and proposed approach to improving certainty of assessments;
- Collation and review of Heavily Modified Waterbody (HMWB) measures information from the Environment Agency for inclusion into the assessment of potential impediment to obtaining Good Ecological Potential (GEP);
- Collation and review of detailed baseline data concerning WFD biological, physicochemical and hydromorphological elements identified as being at yellow, amber, or red risk in the Level 2 assessments. This may include existing Environment Agency long term WFD and water quality monitoring data within the relevant waterbodies, and targeted baseline surveys being undertaken specifically for the SRO assessments;
- Assessment of the combined potential WFD effects/risks of inter-reliant multiple options (as the T2ST options are reliant on other SROs being delivered) and the potential combined effects;
- Development of a conceptual model linking together how potential hydrological changes could influence water quality and the sensitivity of aquatic communities to those changes. This will include a diagrammatic / visual presentation of linkages between abstraction

impacts and the direct and indirect effects on physico-chemical and biological WFD status elements, indicating thresholds of WFD classes or tolerance to change. This step would aid consultation and discussion with stakeholders and the requirement for/scoping of any detailed modelling;

- Further information on the design and operation of the options;
- Update to Level 2 WFD assessments to incorporate additional information;
- Outlining further work or modelling required to demonstrate compliance into Gate 3.

It is noted that there may be potential changes to WFD-related legislation related to Britain's exit from the EU. The EU WFD legislation is transposed in England and Wales by *The Water Environment (WFD) (England and Wales) Regulations 2017*<sup>2</sup>. The Cycle 3 RBMPs are also due to be published in 2021, which may bring about changes in the baseline status and objectives for waterbodies. Where necessary, changes will need to be accounted for in updates to the WFD assessments at each Gate stage.

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

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<sup>2</sup> <https://www.legislation.gov.uk/uksi/2017/407/made>

## A. WRSE Level 1 Output Tables

This data has been redacted

## **B. Further assessment Level 2 output tables**

This data has been redacted

