

## Environmental Assessment Reports

- SEA (incl BNG & NC)
- HRA
- WFD

The content of this document is draft and relates to material [or data] which is still in the course of completion in travel to Gate 2 and should not be relied upon at this early stage of development. We continue to develop our thinking and our approach to the issues raised in the document in preparation for Gate 2.

## Grand Union Canal Transfer SRO

Affinity Water, Severn Trent Water, Canal & River Trust



## Grand Union Canal Strategic Resource Option

**Environmental Assessment Summary Report** 

May 2021

The content of this document is draft and relates to material [or data] which is still in the course of completion in travel to Gate 2 and should not be relied upon at this early stage of development. We continue to develop our thinking and our approach to the issues raised in the document in preparation for Gate 2. Mott MacDonald East Wing 69-75 Thorpe Road Norwich NR1 1UA United Kingdom

T +44 (0)1603 767530 mottmac.com

Affinity Water, Tamblin Way, Hatfield, Hertfordshire, AL10 9EZ.

## **Grand Union Canal Strategic Resource Option**

**Environmental Assessment Summary Report** 

May 2021

## **Issue and Revision Record**



## Document reference:

#### Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the abovecaptioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

## Contents

1	Intro	duction	1
	1.1	Overview	1
	1.2	GUC Options	1
	13	Methodology Overview	1
2	Sche	me Description	3
	2.1	Overview	3
	22	Option descriptions	3
3	WRS	E Environmental Assessment Findings	6
	3.1	Comparison of WRSE SEA outputs	6
	3.2	Comparison of WRSE NCA and BNG findings	26
4	Gate	2 Requirements and Next Steps	34
	4 1	Gate 2: detailed feasibility, concept design and multi-solution decision making	34
5	Conc	lusion	37
A.	WRS	E output tables	39
Tabl	es		
Table	e 1 1: G	UC Options	1
Table	e 2 1: T2	2AT Gate 1 options	3
Table	93.1: S	ummary WRSE SEA outputs Effects with no mitigation (pre-mitigation)	7
Table	9 3.2: S	ummary WRSE SEA outputs – Residual effects (post mitigation)	12
Table	9 3 3: P	redicted impacts on natural capital stocks	27
Table	9.4: S	ummary of the WRSE unmitigated BNG Metric outputs	29
Table	9 3 5: Q	uantitative detailed assessment of the predicted impacts on the provision of	
ecosy	stem s	ervices	29
Table	e 3.6: Q	ualitative assessment of the predicted impacts on the provision of water	21
Table	e 5.1: S	ummary of the potential benefits and adverse effects of the scheme at Gate 1	38
Figu	res		
Figur	e 2 1: N	lap of the GUC options	5
5		• •	

## 1 Introduction

#### 1.1 Overview

This report accompanies the Gate 1 submission report to RAPID for the Grand Union Canal (GUC) Strategic Resource Option (SRO). This Annex presents the findings of the Strategic Environmental Assessments (SEA), Biodiversity Net Gain Assessments (BNG) and Natural Capital Assessments (NCA) applied to the GUC options.

#### 1.2 GUC Options

The outputs of the initial route options appraisal identified nine options for transferring water from the Severn Trent Water (STW) region to the Affinity Water (AfW) region. These options are shown in Table 1.1. Further details on the options are set out in Section 2: Scheme Description.

#### Table 1.1: GUC Options

Options Taken Forward	Sub-Route
1A. Minworth WwTW to Grove	Route 1 (Minworth to Atherstone - Canal)
1B. Minworth WwTW to Grove	Route 3 (Minworth to Atherstone - Pipeline)
1C. Minworth WwTW to Grove	Route 6 (Minworth to Leamington - Pipeline)
2A. Minworth WwTW to Hemel Hempstead	Route 1 (Minworth to Atherstone - Canal)
2B. Minworth WwTW to Hemel Hempstead	Route 3 (Minworth to Atherstone - Pipeline)
2C. Minworth WwTW to Hemel Hempstead	Route 6 (Minworth to Leamington - Pipeline)
3A. Minworth WwTW to Tring	Route 1 (Minworth to Atherstone - Canal)
3B. Minworth WwTW to Tring	Route 3 (Minworth to Atherstone - Pipeline)
3C. Minworth WwTW to Tring	Route 6 (Minworth to Leamington - Pipeline)

## 1.3 Methodology Overview

#### Overview assessment methodology: SEA

The All Company Working Group (ACWG) water companies involved in developing SROs have been working together to increase consistency in approach to SRO development across the country. To confirm the list of SEA criteria to be used in the SEA assessment for the SROs, a review of the SEA objectives of the water companies was undertaken to determine if a core set of scheme objectives could be developed. The draft WRMP 2019 guidance and its application to the SRO schemes was also considered. The recommended objectives were then reviewed against the Water Resources Planning Guidelines: Working Version for WRMP 2024. Further information on the process undertaken to develop the SEA objectives is available in the Strategic Environmental Assessment: Core Objective Identification document<sup>1</sup>.

An option-level assessment has been undertaken to assess concept design options against the SEA objectives. The SEA assessment was undertaken on 14 SEA objectives based on nine topics (biodiversity, flora and fauna; soil; water; air; climatic factors; landscape; historic environment; population and human health; material assets). For each option, an assessment of the potential impact of construction and operation of the option on each SEA criteria was undertaken. The SEA assessment also considered the assessment of residual effects from construction and operation of potential mitigation.

<sup>&</sup>lt;sup>1</sup> Mott MacDonald (2020). All Companies Working Group: Core Objective Identification. Revision 01C. October 2020. 29 pages.

For the options previously assessed as part of the WRMP19, the assessment information was used as a basis for the SEA assessment work for the Gate 1 submission.

#### Overview assessment methodology: BNG

The BNG requirement as outlined in the WRPG stipulates that each option should look to maximise biodiversity net gain. Therefore, BNG has been assessed at the options-level by the WRSE Environmental Team. BNG calculations have been undertaken for Gate 1 and these are to be further refined throughout the gateway process to inform planning requirements.

The methodology for the BNG calculations is as follows. For each of the GUC Options, a biodiversity baseline has been developed from spatial data sets of habitats inventories and assessed in line with the DEFRA BNG metric 2.0 which has been used to calculate BNG change through land use of each option. The Priority Habitat Inventory and sites with Site of Special Scientific Interest and Ramsar designations were used to identify areas with high biodiversity importance. Units have been assigned to the pre-construction land use according to the habitats present in the project boundary. Post construction land use including any mitigation described in the option description has be used to calculate the post construction score.

#### Overview assessment methodology: NCA

A natural capital assessment has been undertaken on the GUC Options by the WRSE Environmental Team for RAPID Gate 1, to meet the WRPG and Enabling a Natural Capital Approach (ENCA) requirements. The five ecosystem services assessed are:

- Biodiversity and Habitat
- Climate Regulation (carbon storage)
- Natural Hazard (flood and drought) Regulation
- Water Purification
- Water Regulation

Both natural capital assessment strategies, as outlined in the Environment Agency's Water Resource Planning Guidelines (2020) and the Defra: Enabling a Natural Capital Approach (2020), discuss taking a proportionate approach to the assessment. It is therefore important to accommodate this when integrating a natural capital approach within the SRO gated process. A natural capital approach has the potential to inform concept design and aid decision making, by quantifying the relative cost benefits and disbenefits of scheme options to aid the initial assessment of the identified strategic solutions.

## Structure of this Report

This document presents the SEA, BNG and NCA of the GUC options. There are two parts to this report.

a) **The WRSE Environmental Assessment Findings**. The SEA, BNG and NCA have been undertaken in line with the methodology found in the *WRSE Regional Plan Environmental Assessment Methodology Guidance, July 2020*. The outputs of these assessment are described in Section 3.

b) **Gate 2 Requirements and Next Steps.** As deemed necessary by the SEA, BNG and NCA and/or the *WRMP environmental assessment guidance and applicability with SROs* document (Mott MacDonald, 2020). Section 4.

The environmental assessment summaries do not include an in-combination assessment with other SROs, water company capital investments or third-party development plans or projects. The environmental assessments at Gate 2 stage are intended to include potential in-combination effects.

## 2 Scheme Description

## 2.1 Overview

The aim of the GUC SRO is to investigate options for transferring available water from Severn Trent Water's Minworth wastewater treatment works (WwTW) into the GUC, to supplement AfW's supply. From the GUC, it is proposed to transfer the additional resource southwards towards AfW's supply area using Canal and River Trust assets.

There are nine proposed options to assess under the WFD, comprising a combination of three separate routes and three separate Affinity abstraction locations. A summary of the options is provided below. Table 2.1 provides a summary of each option whilst Figure 2.1 displays a map of the three potential route options and three Affinity Water abstraction locations.

Information regarding the proposed route options and abstraction locations has been obtained from the 'Route Development' and 'Site Appraisal' reports by WSP. It should be noted that the scheme is at the early stages of design development and therefore detail of each option is currently limited.

## 2.2 **Option descriptions**

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

Option ref	Option name	Option description						
1A	Treated wastewater transfer from Minworth WwTW to The Grove via Route 1 (50 and	Treated wastewater transfer from Minworth WwTW to The Grove via Route 1 (Birmingham to Fazeley, Coventry, Oxford (upper section) and Grand Union Canals).						
	100Ml/d)	The Grove abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.						
1B	Treated wastewater transfer from Minworth WwTW to The Grove via Route 3 (50 and	Treated wastewater transfer from Minworth WwTW to The Grove via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford (upper section) and Grand Union Canals).						
	100MI/d)	The Grove abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100MId of additional water resources supplied from the GUC.						
1C	Treated wastewater transfer from Minworth WwTW to The Grove via Route 6 (50 and	Treated wastewater transfer from Minworth WwTW to The Grove via Route 6 (Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal).						
	100Ml/d)	The Grove abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100MId of additional water resources supplied from the GUC.						
2A	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 1 (Birmingham to Fazeley, Coventry, Oxford (upper section) and Grand Union Canals).						
	1 (50 and 100MI/d)	The Hemel Hempstead abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.						

#### Table 2.1: GUC Gate 1 options

Option ref	Option name	Option description
2B	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford (upper section) and Grand Union Canals).
	3 (50 and 100MI/d)	The Hemel Hempstead abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
2C	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 6 (Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal).
	6 (50 and 100MI/d)	The Hemel Hempstead abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
3A	Treated wastewater transfer from Minworth WwTW to Tring via Route 1 (50 and	Treated wastewater transfer from Minworth WwTW to Tring via Route 1 (Birmingham to Fazeley, Coventry, Oxford (upper section) and Grand Union Canals).
	100Ml/d)	The Tring abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
3B	Treated wastewater transfer from Minworth WwTW to Tring via Route 3 (50 and	Treated wastewater transfer from Minworth WwTW to Tring via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford (upper section) and Grand Union Canals).
	100MI/d)	The Tring abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
3C	Treated wastewater transfer from Minworth WwTW to Tring via Route 6 (50 and	Treated wastewater transfer from Minworth WwTW to Tring via Route 6 (Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal).
	100MI/d)	The Tring abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.

Figure 2.1: Map of the GUC options



## 3 WRSE Environmental Assessment Findings

## 3.1 Comparison of WRSE SEA outputs

## 3.1.1 Overview

The WRSE SEA outputs for each option are summarised in Table 3.1 and Table 3.2 and discussed in the following sections. For each option, the tables show ratings for Construction and Operation phases against each of the SEA objectives. Table 3.1 shows the ratings before any mitigation is applied and Table 3.2 shows the ratings after mitigation is applied. The applicable mitigation for each SEA objective is described in the following sections.

Based on the WRSE SEA outputs for residual effects (post mitigation), all options rated the same across the SEA objectives. They are summarised below:

- Biodiversity: Minor negative effects in construction and moderate negative effects in operation.
- Soil: Minor negative effects in construction.
- Water: Minor negative effects in construction (for flood risk), moderate negative effects in operation (for water quality) and moderate positive effects in operation (for resilient water supply).
- Air: Minor negative effects in construction.
- Climatic factors: Minor negative effects in construction and operation (reducing carbon) and minor positive effects in operation (for reducing vulnerability to climate change).
- Landscape: Minor negative effects in construction and minor positive effects in operation.
- Historic Environment: Minor negative effects in construction.
- Population and Human Health: Minor negative effects in construction and minor positive effects in operation (for both health and wellbeing of the local community and tourism).
- Material Assets: Minor negative effects in construction (for resource use and waste, and effects of built assets) and minor positive effects in operation (for effects of built assets).

The performance of each option against the SEA objectives are reported in Section 3.1.2 Section 3.1.3, and Section 3.1.4. The SEA findings are grouped by their sub-routes, due to the similarities between them, to avoid repetition.

## Table 3.1: Summary WRSE SEA outputs – Effects with no mitigation (pre-mitigation)

		1A. Minwort	th WwTW to	Grove		1B. Minwor	th WwTW to	Grove	
SEA Topic	SEA Objective	Construct	ion Effects	Operation	nal Effects	Construction Effects		<b>Operational Effects</b>	
Biodiversity, flora and fauna	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	o	-	o	-	0		o	
Soil	Protect and enhance the functionality, quantity and quality of soils	0	÷	0	0	0		0	0
	Increase resilience and reduce flood risk	0	-	0	0	0	-	0	0
Water	Protect and enhance the quality of the water environment and water resources	0	-	0		0	-	0	
	Deliver reliable and resilient water supplies	0	0	+++	0	0	0		0
Air	Reduce and minimise air emissions	0		0	0	0		0	0
Climatia Eastern	Reduce embodied and operational carbon emissions	0	÷ .	0	- <del>1</del>	0		0	-
Climatic Factors	Reduce vulnerability to climate change risks and hazards	0	0	+	0	0	0	+	0
Landscape	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0		+	0	o		+	0
Historic Environment	Conserve, protect and enhance the historic environment, including archaeology	0	-	0	0	0	-	0	0
Population and	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	0		+	0	0		+	0
numun neutin	Maintain and enhance tourism and recreation	0	÷	+	0	0		+	0
	Minimise resource use and waste production	0		0	0	0		0	0
iviaterial Assets	Avoid negative effects on built assets and infrastructure	0	-	+	0	0		+	0

		1C. Minwor	th WwTW to	Grove		2A. Minworth WwTW to Hemel Hempstead				
SEA Topic	SFA Objective	Construct	Construction Effects		<b>Operational Effects</b>		Construction Effects		<b>Operational Effects</b>	
Biodiversity, flora and fauna	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	o	-	o		0		o		
Soil	Protect and enhance the functionality, quantity and quality of soils	0		0	0	0	.+	0	0	
	Increase resilience and reduce flood risk	0	-	0	0	0	- 14	0	0	
Water	Protect and enhance the quality of the water environment and water resources	0	-	0	-	0	-	0		
	Deliver reliable and resilient water supplies	0	0	+++	0	0	0	••••	0	
Air	Reduce and minimise air emissions	0	-	0	0	0		0	0	
Climatic Fasters	Reduce embodied and operational carbon emissions	0		0	-	0	-	0	-	
Climatic Factors	Reduce vulnerability to climate change risks and hazards	0	0	+	0	0	0	+	0	
Landscape	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0	-	+	0	0		+	0	
Historic Environment	Conserve, protect and enhance the historic environment, including archaeology	0	-	0	0	0		0	0	
Population and	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	0		+	0	0		+	0	
numan neath	Maintain and enhance tourism and recreation	0	•	+	0	0	+	+	0	
Managial Assess	Minimise resource use and waste production	0	•	0	0	0	-	0	0	
iviaterial Assets	Avoid negative effects on built assets and infrastructure	0		+	0	0		+	0	

		2B. Minwor	th WwTW to	Hemel Hem	pstead	2C. Minworth WwTW to Hemel Hempstead				
SEA Topic	SFA Objective	Construct	Construction Effects		<b>Operational Effects</b>		Construction Effects		<b>Operational Effects</b>	
Biodiversity, flora and fauna	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	o	-	o	-	0		o		
Soil	Protect and enhance the functionality, quantity and quality of soils	0		0	0	0	- 18	0	0	
	Increase resilience and reduce flood risk	0	-	0	0	0	1. Sec. 1.	0	0	
Water	Protect and enhance the quality of the water environment and water resources	0	-	0		0	-	0	-	
	Deliver reliable and resilient water supplies	0	0	+++	0	0	0	+++	0	
Air	Reduce and minimise air emissions	0	-	0	0	0		0	0	
Climatic Fasters	Reduce embodied and operational carbon emissions	0		0		0	-	0		
Climatic Factors	Reduce vulnerability to climate change risks and hazards	0	0	+	0	0	0	+	0	
Landscape	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0	-	+	0	0	-	+	0	
Historic Environment	Conserve, protect and enhance the historic environment, including archaeology	0	-	0	0	0	÷	0	0	
Population and	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	0		+	0	0		+	0	
numan neath	Maintain and enhance tourism and recreation	0	-	+	0	0	-	+	0	
Manual Assess	Minimise resource use and waste production	0		0	0	0	-	0	0	
iviaterial Assets	Avoid negative effects on built assets and infrastructure	0		+	0	0	-	+	0	

		3A. Minworth WwTW to Tring				3B. Minworth WwTW to Tring			
SEA Topic	SEA Objective	Construction Effects		<b>Operational Effects</b>		Construction Effects		Operational Effects	
Biodiversity, flora and fauna	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	o	-	o		o		o	-
Soil	Protect and enhance the functionality, quantity and quality of soils	0	÷	0	0	0	.+	0	0
	Increase resilience and reduce flood risk	0	-	0	0	0		0	0
Water	Protect and enhance the quality of the water environment and water resources	0	-	0	-	0	-	0	
	Deliver reliable and resilient water supplies	0	0	+++	0	0	0	+++	0
Air	Reduce and minimise air emissions	0	-	0	0	0		0	0
Climatia Fastara	Reduce embodied and operational carbon emissions	0	•	0	-	0		0	
Climatic Factors	Reduce vulnerability to climate change risks and hazards	0	0	+	0	0	0	+	0
Landscape	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0		+	0	0	-	+	0
Historic Environment	Conserve, protect and enhance the historic environment, including archaeology	0	-	0	0	0	( <del>-</del> )	0	0
Population and	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	0		+	0	0		+	0
numan neath	Maintain and enhance tourism and recreation	0	-	+	0	0	-	+	0
Managial Assess	Minimise resource use and waste production	0		0	0	0	7	0	0
iviaterial Assets	Avoid negative effects on built assets and infrastructure	0	-	+	0	0		+	0

#### 3C. Minworth WwTW to Tring

SEA Topic SEA Objective	SFA Objective	Constructi	ion Effects	<b>Operational Effects</b>		
SEA TOPIC					<u>.</u>	
Biodiversity, flora and fauna	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	0	-	0		
Soil	Protect and enhance the functionality, quantity and quality of soils		•	0	0	
	Increase resilience and reduce flood risk	0	-	0	0	
Water	Protect and enhance the quality of the water environment and water resources	0	-	0	-	
	Deliver reliable and resilient water supplies	0	0	••••	0	
Air	Reduce and minimise air emissions	0	-	0	0	
Climatic Fasters	Reduce embodied and operational carbon emissions	0	•	0		
Climatic Factors	Reduce vulnerability to climate change risks and hazards	0	0	+	0	
Landscape	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0	-	+	0	
Historic Environment	Conserve, protect and enhance the historic environment, including archaeology	0	-	0	0	
Population and Human Health	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	0	•	+	0	
	Maintain and enhance tourism and recreation	0	•	+	0	
Matarial Accests	Minimise resource use and waste production	0	-	0	0	
waterial ASSEtS	Avoid negative effects on built assets and infrastructure	0	-	+	0	

## Table 3.2: Summary WRSE SEA outputs – Residual effects (post mitigation)

		1A. Minwor	th WwTW to	Grove		1B. Minwor	th WwTW to	Grove		
SEA Topic	SEA Objective	Construct	ion Effects	Operatio	<b>Operational Effects</b>		Construction Effects		<b>Operational Effects</b>	
Biodiversity, flora and fauna	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	o		O	-	o		o		
Soil	Protect and enhance the functionality, quantity and quality of soils	0	- A	0	0	0		0	0	
	Increase resilience and reduce flood risk	0		0	0	0	-	0	0	
Water	Protect and enhance the quality of the water environment and water resources	0	0	0	-	0	0	0	-	
	Deliver reliable and resilient water supplies	0	0	+++	0	0	0	••••	0	
Air	Reduce and minimise air emissions	0		0	0	0		0	0	
Climatic Factors	Reduce embodied and operational carbon emissions	0		0		0		0		
Climatic Factors	Reduce vulnerability to climate change risks and hazards	0	0	+	0	0	0	+	0	
Landscape	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0		+	0	o		+	0	
Historic Environment	Conserve, protect and enhance the historic environment, including archaeology	0		0	0	0	-	0	0	
Population and	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	0		+	0	о		+	0	
human neutin	Maintain and enhance tourism and recreation	0		+	0	0	.+	+	0	
Managial Assess	Minimise resource use and waste production	0		0	0	0	÷	0	0	
ivialerial Assets	Avoid negative effects on built assets and infrastructure	0	-	+	0	0		+	0	

		1C. Minwor	th WwTW to	Grove		2A. Minworth WwTW to Hemel Hempstead			
SEA Topic	SEA Objective	Construct	ion Effects	Operation	nal Effects	Construction Effects		<b>Operational Effects</b>	
Biodiversity, flora and fauna	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	O		o	-	O		o	
Soil	Protect and enhance the functionality, quantity and quality of soils	0	-	0	0	0		0	0
	Increase resilience and reduce flood risk	0		0	0	0	14 A.	0	0
Water	Protect and enhance the quality of the water environment and water resources	0	0	0	-	0	0	0	-
	Deliver reliable and resilient water supplies	0	0	+++	0	0	0		0
Air	Reduce and minimise air emissions	0	-	0	0	0		0	0
Climatic Fastan	Reduce embodied and operational carbon emissions	0		0	1.1	0		0	-
Climatic Factors	Reduce vulnerability to climate change risks and hazards	0	0	+	0	0	0	+	0
Landscape	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0		+	0	0		( <b>+</b> )	0
Historic Environment	Conserve, protect and enhance the historic environment, including archaeology	0	-	0	0	0	-	0	0
Population and Human Health	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	0		+	0	0		+	0
numan neatth	Maintain and enhance tourism and recreation	0		+	0	0		(+)	0
Managial Association	Minimise resource use and waste production	0		0	0	0		0	0
iviaterial Assets	Avoid negative effects on built assets and infrastructure	0	-	+	0	0		+	0

		2B. Minwor	th WwTW to	Hemel Hem	pstead	2C. Minworth WwTW to Hemel Hempstead				
SEA Topic	SEA Objective	Construct	Construction Effects		<b>Operational Effects</b>		Construction Effects		<b>Operational Effects</b>	
Biodiversity, flora and fauna	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	o		0	-	0		o		
Soil	Protect and enhance the functionality, quantity and quality of soils	0	÷	0	0	0	÷	0	0	
	Increase resilience and reduce flood risk	0	-	0	0	0	•	0	0	
Water	Protect and enhance the quality of the water environment and water resources	0	0	0	-	0	0	0		
	Deliver reliable and resilient water supplies	0	0	+++	0	0	0	+++	0	
Air	Reduce and minimise air emissions	0	-	0	0	0	-	0	0	
Climatia Frantsur	Reduce embodied and operational carbon emissions	0		0		0	-	0		
Climatic Factors	Reduce vulnerability to climate change risks and hazards	0	0	+	0	0	0	+	0	
Landscape	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0		+	0	o		+	0	
Historic Environment	Conserve, protect and enhance the historic environment, including archaeology	0	-	0	0	0	+	0	0	
Population and	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	O	•	+	o	o		+	0	
in an inclusion	Maintain and enhance tourism and recreation	0	-	+	0	0	-	+	0	
	Minimise resource use and waste production	0		0	0	0	-	0	0	
iviaterial Assets	Avoid negative effects on built assets and infrastructure	0	-	+	0	0		+	0	

	3A. Minworth WwTW to Tring				3B. Minworth WwTW to Tring				
SFA Topic	SEA Objective	Construction Effects Operational Eff		nal Effects	Construction Effects Oper		Operatio	perational Effects	
Biodiversity, flora and fauna	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	o		o		0		0	
Soil	Protect and enhance the functionality, quantity and quality of soils	0	÷	0	0	0		0	0
	Increase resilience and reduce flood risk	0	-	0	0	0	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	0	0
Water	Protect and enhance the quality of the water environment and water resources	0	0	0	-	0	0	0	
	Deliver reliable and resilient water supplies	0	0	+++	0	0	0	+++	0
Air	Reduce and minimise air emissions	0	-	0	0	0	-	0	0
Climatic Factors	Reduce embodied and operational carbon emissions	0		0	-	0		0	
	Reduce vulnerability to climate change risks and hazards	0	0	+	0	0	0	+	0
Landscape	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0	•	+	0	0		+	0
Historic Environment	Conserve, protect and enhance the historic environment, including archaeology	0	-	0	0	0	+	0	0
Population and Human Health	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	o	•	+	0	o		+	0
	Maintain and enhance tourism and recreation	0		+	0	0	-	+	0
	Minimise resource use and waste production	0		0	0	0	-	0	0
Material Assets	Avoid negative effects on built assets and infrastructure	0		+	0	0	•	+	0

#### 3C. Minworth WwTW to Tring

SEA Topic	SEA Objective	Construct	ion Effects	<b>Operational Effects</b>		
					12	
Biodiversity, flora and fauna	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	0	•	0	-	
Soil	Protect and enhance the functionality, quantity and quality of soils	0	•	0	0	
	Increase resilience and reduce flood risk	0	-	0	0	
Water	Protect and enhance the quality of the water environment and water resources	0	0	0	-	
	Deliver reliable and resilient water supplies	0	0	+++	0	
Air	Reduce and minimise air emissions	0	-	0	0	
Climatic Frankrus	Reduce embodied and operational carbon emissions	0		0		
Climatic Factors	Reduce vulnerability to climate change risks and hazards	0	0	+	0	
Landscape	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0	•	+	0	
Historic Environment	Conserve, protect and enhance the historic environment, including archaeology	0	•	0	0	
Population and Human Health	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	0	•	+	0	
	Maintain and enhance tourism and recreation	0	•	+	0	
Material Access	Minimise resource use and waste production	0		0	0	
material Assets	Avoid negative effects on built assets and infrastructure	0	•	+	0	

## 3.1.2 Sub-Route 1 Summary

The three options for Sub-Route 1 are largely similar, transferring treated water from Minworth WwTW across a network of canals, including; Minworth to Birmingham canal, Coventry canal, Oxford Canal, and GUC. They differ through their abstraction points, either at Grove, Hemel Hempstead, or Tring. Due to their similarities, option performances have been reviewed together.

## 1A Minworth WwTW to Grove, 2A Minworth WwTW to Hemel Hempstead and 3A Minworth WwTW to Tring

## Biodiversity, flora and fauna

All three route options directly intersect Ashridge Commons and Woods SSSI, Bugbrooke Meadows SSSI Groundwater Dependent Terrestrial Ecosystem (GWDTE), and Bentley Park Wood SSSI (GWDTE). The Upper Nene Valley Gravel Pits Special Protection Area (SPA) and Ramsar site is located 7.8km north east of the options and could be susceptible from changes in flow and water levels between the hydrologically connected GUC downstream and Wilton Brook/River Nene. The construction and operation phase could result in moderate negative effects, with particular concern for GWDTE, especially in areas in close proximity to abstraction location. There is also the risk of spread of invasive non-native species (INNS) from open water transfer. No ancient woodland or priority habitat are intersected by the three options; however, all are located in close proximity, notably deciduous woodland and good quality semi-improved grasslands, therefore there is potential for indirect effects.

#### Mitigation

The implementation of best practice mitigation measures is recommended to minimise the impact of construction activities and to compensate the loss of habitats. Following the implementation of which, the effect on biodiversity, flora and fauna during construction would be minimised (minor negative) for all three options. Residual moderate negative effects are likely to remain for operation of all three options. Where directly impacted, habitat should be reinstated on completion, or compensatory habitat should be considered to replace damaged or lost habitat. It is recommended that ecology surveys are undertaken prior to construction. It is also recommended that any mitigation stipulated in the HRA AA is followed.

#### Soil

All three route options intersect with Grade 3 agricultural land, therefore causing disturbance to soils during construction. All route options pass through numerous authorised and historic landfill sites, and therefore may intersect areas with localised contamination of soils. As such, the construction activities would likely result in minor negative effects. Operational activities would not result in negative effects on soil.

#### Mitigation

To minimise the potential minor negative effects on soil, construction best practices should be implemented, including pollution control practices to reduce potential contamination risk. Best practice methods for working in landfill sites would likely be implemented. Following the implementation of mitigation measures, the residual effects on soil would be remain as minor negative.

#### Water

All three route options intersect sections of Flood Zones 2 and 3. The construction works of each option could result in a minor negative effect on flooding, associated with increasing volumes in the existing canals, and works on the existing canals being susceptible to flood risk.

The construction of all route options could result in a minor negative effect on the water quality of nearby waterbodies, intersecting several Water Framework Directive (WFD) waterbodies and Source Protection Zones.

Surface water abstraction for all options are likely to have an ecological impact in the water environment surrounding the abstraction location. Option 1A may result in ecological impacts at Gade (from confluence with Bulbourne to Chess) causing deterioration of WFD classification. Option 2A may have ecological impacts at Bulbourne, where transfer of water may have moderate ecological effects on connected waterbodies. Option 3A may have severe ecological impacts upstream of Aylesbury, where transfer of water may have moderate ecological effects on connected waterbodies. As best practice construction measures such as pollution prevention would be implemented, the options are unlikely to result in residual construction effects on water resources (reduced from minor negative effects).

As these options would present a large-scale transfer, potentially improving water availability and resilience across regions, they are likely to result in a major positive effect during operation on the resilience of water supplies.

## Mitigation

It is recommended that best practise mitigation measures should be implemented to reduce the impact of flooding during the construction phase, however minor residual flood risk is likely to remain for all options during construction. As best practice construction measures such as pollution prevention would be implemented, the options are unlikely to result in residual construction effects on water resources. Although the options use existing canals, increased abstraction could affect sensitive groundwater bodies, and result in moderate negative effects on water flows, levels and quality during the operational phase. It is recommended that water quality and water levels should be monitored, and further WFD assessment is be required to investigate effects. Inclusive of such mitigation measures, moderate residual negative effects on water quality is likely to remain for all options.

## Air

All three options pass through three Air Quality Management Areas (AQMA). Due to use of existing canals, with little new infrastructure, minimal increases in air emissions are likely during the construction phase. It would be confined to areas of new infrastructure such as outfalls and canal modifications. As such, minor negative effects are expected for all options. No operational impacts on local air quality are expected.

#### Mitigation

While best practice mitigation measures would likely be implemented during construction, such as damping to reduce dust emissions, temporary minor negative effects on local air quality remain likely for all options.

#### **Climatic factors**

All three options would likely increase carbon emissions through embodied carbon in construction materials, and abstraction pumps in operation. The WRSE relative carbon scale identified that, the options would result in minor construction and operational carbon emissions.

As these options would likely increase capacity in the transfer of water across water companies, these options would have a beneficial effect on the resilience of water supplies.

#### Mitigation

Recommended measures include investigating the use of renewables during construction and operation for energy supply, and the use of materials with lower embodied carbon. After

mitigation, the minor negative effects on climatic factors remain likely. As the electricity grid is decarbonised, greener energy will be available.

#### Landscape

All three options intersect the Chilterns Area of Outstanding Natural Beauty (AONB), and several national landscape character areas will be affected by construction. As such, minor negative effects during construction are likely.

#### Mitigation

While construction management plans and temporary screens are recommended, temporary residual minor negative effects remain likely.

As these options presents opportunities for improvements to canal, including that of visual amenity and character, operation of the options is likely to have a minor positive effect on landscape. It is recommended that permanent screening and restoration to original landscape character should be considered once construction is complete, in addition to landscaping to restore visual amenity.

#### **Historic Environment**

All three options are located in close proximity to numerous conservation areas, Grade II listed parks and gardens, and Grade II listed buildings. Potential disruption to these features is anticipated from construction access and is expected to result in minor negative effects. Operational activities would not result in negative effects on the historic environment.

#### Mitigation

The implementation of construction management plans and temporary screening during construction is recommended. Residual negative effects are likely to remain for construction.

#### **Population and Human Health**

All three options intersect or are located in close proximity to; National Trails, national cycle networks, as well as sports facilities and golf courses. Modification of existing canal infrastructure and construction of new structures is likely to generate dust, noise and vibration, potentially causing temporary disruption to local community assets, and to affect tourism and recreational activities.

Once operational, the options will likely benefit the local community, tourism and recreational activities due to improved canal provision.

#### Mitigation

The implementation of a phased construction, best construction practices and traffic control measures are recommended, residual minor negative effects are likely to remain.

#### **Material Assets**

All three route options are likely to require minimal resources, due to the use of existing infrastructure. Although use of local materials and the reinstatement of dug materials is recommended, residual minor negative effects are likely to remain.

The route options intersect several major roads and railways, of which could lead to negative effects on built assets. The use of existing canals suggests minimal disruption, as there are likely to be alternative bridges and structures in place by way of diversion. A minor negative effect is expected to remain after mitigation measures.

These options present an opportunity to improve existing canal infrastructure, and therefore operational activities are expected to result in minor positive on built assets and infrastructure.

## 3.1.3 Sub-Route 3 Summary

The three options for Sub-Route 3 are largely similar, transferring treated water from Minworth WwTW via the Minworth to Atherstone pipeline, followed by Coventry canal, Oxford Canal, and GUC. They differ through their abstraction points, either at Grove, Hemel Hempstead, or Tring. Due to their similarities, option performances have been reviewed together.

## 1B Minworth WwTW to Grove, 2B Minworth WwTW to Hemel Hempstead and 3B Minworth WwTW to Tring

## Biodiversity, flora and fauna

All three route options directly intersect Ashridge Commons and Woods SSSI, Bugbrooke Meadows SSSI (GWDTE), Bentley Park Wood SSSI (GWDTE) and Hoar Park Wood (SSSI). The Upper Nene Valley Gravel Pits SPA and Ramsar site is located 7.8km north east of the options and is susceptible from changes in flow and water levels between the hydrologically connected GUC downstream and Wilton Brook/River Nene. Construction of pipeline may cause significant disruption to Bentley Park Wood and Hoar Park Wood SSSIs. The construction and operation phase could result in moderate negative effects, with particular concern for GWDTE, especially in areas in close proximity to abstraction location. There is also the risk of spread of INNS from open water transfer. No ancient woodland or priority habitat are intersected by the three options; however, these are located in close proximity, notably deciduous woodland and good quality semi-improved grasslands, therefore there is potential for indirect effects.

### Mitigation

The implementation of best practice mitigation measures is recommended to minimise the impact of construction activities and to compensate the loss of habitats. Following the implementation of which, the effect on biodiversity, flora and fauna during construction would be minimised (minor negative) for all three options. Residual moderate negative effects are likely to remain for operation of all three options. Where directly impacted, habitat should be reinstated on completion, or compensatory habitat should be considered to replace damaged or lost habitat. It is recommended that ecology surveys are undertaken prior to construction. It is also recommended that any mitigation stipulated in the HRA AA is followed.

#### Soil

All three route options intersect Grades 1-3 agricultural land, causing disturbance to soils during construction. All route options pass through numerous authorised and historic landfill sites, which may result in localised contamination of the soils during construction of the pipeline between Minworth and Atherstone. Operational activities would not result in negative effects on soil.

#### Mitigation

To minimise the potential minor negative effects on soil, best construction practices should be implemented, including pollution prevention and control practices to reduce potential contamination risk. Best practice methods for working in landfill sites would likely be implemented. Following the implementation of mitigation measures, the residual effects on soil would be remain as minor negative.

#### Water

All three route options intersect sections of Flood Zones 2 and 3. The construction works of each could result in a minor negative effect of flooding, due to the transfer of water increasing volumes in the existing canals.

The construction of all route options could result in a minor negative effect on the water quality of nearby waterbodies, intersecting several WFD waterbodies, watercourses and Source Protection Zones. Pipeline construction and increased abstraction could affect sensitive groundwater bodies. Changes to canal levels and flow could also affect water chemistry and aquatic communities.

Surface water abstraction for all options are likely to have an ecological impact in the water environment surrounding the abstraction location. Option 1B may result in ecological impacts at Gade (from confluence with Bulbourne to Chess) causing deterioration of WFD classification. Option 2B may have ecological impacts at Bulbourne, where transfer of water may have moderate ecological effects on connected waterbodies. Option 3B may have severe ecological impacts upstream of Aylesbury, where transfer of water may have moderate ecological effects on connected waterbodies. As best practice construction measures such as pollution prevention would be implemented, the options are unlikely to result in residual construction effects on water resources (reduced from minor negative effects).

As these options would present a large-scale transfer, potentially improving water availability and resilience across regions, they are likely to result in a major positive effect during operation on the resilience of water supplies.

#### Mitigation

It is recommended that best practise mitigation measures should be implemented to reduce the impact of flooding during the construction phase, minor residual flood risk is likely to remain for all options during construction. As best practice construction measures such as pollution prevention would be implemented, the options are unlikely to result in residual construction effects on water resources. It is recommended that water quality and water levels should be monitored, and further WFD assessment is required to investigate effects. Inclusive of such mitigation measures, moderate residual negative effects on water quality is likely to remain for operation.

#### Air

All three route options intersect with three AQMAs. The construction phase could result in minor negative effects, through increases in air emissions during construction of the pipeline and other built assets.

#### Mitigation

While the implementation of best construction practises, such as damping to reduce dust emissions, would be implemented, residual minor negative effects are likely to remain.

#### **Climatic factors**

All three options will likely increase carbon emissions through embodied carbon in construction materials. Emissions will be generated in the construction of the pipeline and pumps, in addition to abstraction pumps when in operation. The WRSE relative carbon scale identified that the options would result in minor negative construction and operation effects on carbon emissions. As these options would likely increase capacity in the transfer of water across water companies, these options would have a beneficial effect on the resilience of water supplies.

#### Mitigation

Recommended measures include investigating the use of renewables during construction and operation for energy supply, and the use of materials with lower embodied carbon. After mitigation, the minor negative effects on climatic factors remain likely. As the electricity grid is decarbonised, greener energy will be available.

#### Landscape

All three options intersect with the Chilterns AONB and several national landscape character areas including Dunmore and Feldon and the Northamptonshire Uplands. Areas of the scheme also lie within Green Belt land. The construction phase could result in moderate negative effects, in particular where the pipeline is being constructed. Some permanent above ground structures will also be present such as pumping station and outfalls and small adjustments to existing canal infrastructure may be required.

However, as it is expected the land would be reinstated following the construction works, no operational impacts on landscape are anticipated.

#### Mitigation

Construction management plans and temporary screening during construction are expected to reduce negative effects to residual minor effects.

Once construction is complete, permanent screening and restoration to original landscape character where possible may result in minor positive impacts.

#### **Historic Environment**

All three options intersect with a number of conservation areas and Grade II listed parks and gardens. The options are found within close proximity to a number of Grade II listed buildings. Of particular interest is Merevale Abbey Scheduled Monument and Merevale Park Registered Park, which are infringed upon in Atherstone where pipeline and canal meet. Construction of the options are likely to result in moderate negative effects.

Operational activities would not result in negative effects on the historic environment.

## Mitigation

Mitigation measures of construction management plans, temporary screening during construction and reinstatement of dug material are expected to reduce negative effects to residual minor effects. Permanent disruption to archaeology is likely.

## **Population and Human Health**

All three options intersect or are located in close proximity to; National Trails, national cycle networks, as well as sports facilities and golf courses. Due to the options using existing stretches of canals, effect on tourism and recreational activities are likely to be minimal, confined to areas of canals that require changes to existing infrastructure and areas of construction such as the pipeline, abstraction points and outfalls. Community assets are expected to face minimal disruption along the majority of the route, due to only small changes to existing canal infrastructure required. Disturbance will likely be in areas surrounding above ground structures and pipeline that require construction. As such, construction is likely to result in minor negative effects on local community and tourism.

Once operational, modifications to the existing river and canal on all may benefit tourism and recreational due to improved ecosystem services, and as such results in minor positive effects.

## Mitigation

Following the implementation of mitigation measures, such as traffic management plans, best use construction practises and construction management plans the residual effects on population and health would be remain as minor negative. The use of directional drilling is recommended for the pipelines to minimise disturbance to existing infrastructure.

#### **Material Assets**

All three route options are likely to require resources for pipeline construction, abstraction points and outfalls, and amendments to existing canal infrastructure.

Numerous major roads and railway tracks are intersected by the options, however as only small changes to existing canal infrastructure are required minimal disruption is expected along the majority of the route. Disturbance most likely in areas surrounding above ground structures and pipeline that require construction. As such, construction is likely to result in minor negative effects and is expected to remain after mitigation measures are implemented.

These options present an opportunity to improve existing canal infrastructure, and therefore operational activities are expected to result in minor positive on built assets and infrastructure.

#### Mitigation

The use of local materials, and practise of reinstatement of dug materials is recommended, however, residual minor negative effects are likely to remain.

## 3.1.4 Sub Route 6 Summary

The three options for Sub-Route 6 are largely similar, transferring treated water from Minworth WwTW to Learnington pipeline, followed by GUC. They differ through their abstraction points, either at Grove, Hemel Hempstead, or Tring. Due to their similarities, option performances have been reviewed together.

## 1C Minworth WwTW to Grove, 2C Minworth WwTW to Hemel Hempstead and 3C Minworth WwTW to Tring

#### Biodiversity, flora and fauna

The proposed pipeline of all three route options directly intersect River Blyth SSSI (92.72% unfavourable no change, 7.28% unfavourable recovering) and Cole Bank LNR. This is likely to result in loss of habitat, and possible loss of important species. Within 2000m of the proposed pipeline there are several SSSIs including: Coten End Quarry; Bickenhill Meadows; Guy's Cliffe; Berkswell Marsh; River Blythe; Coleshill and Bannerly Pools, and several LNRs including: Smiths Wood; Cole End; Marston Green Park; Kingfisher; Babbs Mill; Alcott Wood; Yorks Wood; Lavender Hall Park; Oakwood and Blacklow Spinney; Marston Green Millennium Wood; Chelmsley Wood; Cole Bank. No direct effects are anticipated to these features however there may be disturbance effects during construction. The Upper Nene Valley Gravel Pits SPA and Ramsar site is located 7.8km north east of the options, and is susceptible from changes in flow and water levels between the hydrologically connected GUC downstream and Wilton Brook/River Nene - effects are uncertain. Chiltern Beechwoods SAC is located 0.6km east of the GUC at the closest point, however it is unlikely to have any significant effects. Transfer of untreated water poses potential risk of INNS to connected water bodies. Options 1C and 3C have parcels of ancient woodland within 2000m of abstraction site which could be affected. Whippendell Wood SSSI is within 1km of the Grove abstraction point (Option 1C), which may have effects on woodland habitat.

## Mitigation

The implementation of best practice mitigation measures are recommended to minimise the impact of construction activities and to compensate the loss of habitats. Following the implementation of which, the effect on biodiversity, flora and fauna during construction would be minimised (minor negative) for all three options. Residual moderate negative effects are likely to remain for operation of all three options. Where directly impacted, habitat should be reinstated on completion, or compensatory habitat should be considered to replace damaged or lost habitat. It is recommended that ecology surveys are undertaken prior to construction. It is also recommended that any mitigation stipulated in the HRA AA is followed.

#### Soil

All three route options intersect Grades 3 agricultural land, and numerous authorised and historic landfill sites, which may result in localised contamination of the soils. Construction of the pipeline will require excavation and therefore there may be a temporary impact on soil quality, resulting in a minor negative impact. Operational activities would not result in negative effects on soil.

#### Mitigation

To minimise the potential minor negative effects on soil, construction best practices should be implemented, including pollution control practices to reduce potential contamination risk. Best practice methods for working in landfill sites would likely be implemented. Following the implementation of mitigation measures, in particular where pipeline intersects directly or is nearby a landfill site, the residual effects on soil would be remain as minor negative.

#### Water

All three route options intersect sections of Flood Zones 2 and 3. The construction works of each could result in a minor negative effect of flooding, from the transfer of water increasing volumes in canals. The proposed pipeline passes through flood defences, which is likely to cause temporary increased risk of flooding during construction.

Surface water abstraction for all options are likely to have an ecological impact in the water environment surrounding the abstraction location. Option 1C may result in ecological impacts at Gade (from confluence with Bulbourne to Chess) causing deterioration of WFD classification. Option 2C may have ecological impacts at Bulbourne, where transfer of water may have moderate ecological effects on connected waterbodies. Option 3C may have severe ecological impacts upstream of Aylesbury, where transfer of water may have moderate ecological effects on connected waterbodies. As best practice construction measures such as pollution prevention would be implemented, the options are unlikely to result in residual construction effects on water resources (reduced from minor negative effects).

As this option would likely increase capacity in the transfer of water across water companies, improve water efficiency and reduce demand, this option is likely to result in a major positive effect on the resilience of water supplies.

## Mitigation

It is recommended that best practise mitigation measures should be implemented to reduce the impact of flooding during the construction phase, however minor residual flood risk is likely to remain for all options during construction.

It is recommended that water quality and water levels should be monitored, and further WFD assessment is be required to investigate effects. Inclusive of such mitigation measures, moderate residual negative effects on water quality is likely to remain for operation.

## Air

All three route options intersect with three AQMAs. Construction of the pipeline on all three route options are expected to cause a temporary increase in air emissions. As such, the construction phase is likely to result in minor negative effects.

#### Mitigation

While the implementation of best construction practises, such as damping to reduce dust emissions, would be implemented, residual minor negative effects are likely to remain.

#### **Climatic factors**

All three options will likely increase carbon emissions through embodied carbon in construction materials. Emissions will be generated in the construction of the pipeline and pumps, in addition to abstraction pumps when in operation. The WRSE relative carbon scale identified that the options would result in minor negative construction and operation effects on carbon emissions. As these options would likely increase capacity in the transfer of water across water companies, these options would have a beneficial effect on the resilience of water supplies.

#### Mitigation

Recommended measures include investigating the use of renewables during construction and operation for energy supply, and the use of materials with lower embodied carbon. After mitigation, the minor negative effects on climatic factors remain likely. As the electricity grid is decarbonised, greener energy will be available.

#### Landscape

All three options intersect with the Chilterns AONB and several national landscape character areas. Parts of the options are located within greenbelt land; however, pipeline infrastructure will be below ground so effects only temporary during construction. The proposed pipeline passes through areas of woodland, where removal of trees may be required. As such, a moderate negative impact to landscape is expected during construction.

Improvements to canal will increase visual amenity and enhance character around the canal once operating.

#### Mitigation

Following the implementation of construction management plans and temporary screening during construction, impacts are anticipated to be reduced to minor negative.

Once construction is complete, permanent screening and restoration to original landscape character where possible may result in minor positive effects.

#### **Historic Environment**

All three options are within close proximity to a number of; conservation areas, Grade II listed parks and gardens and Grade II listed buildings. There will be no direct impact on such features, and permanent disruption will be unlikely. As such, construction of the options are likely to result in minor negative effects.

Operational activities would not result in negative effects on the historic environment.

#### Mitigation

Best practise mitigation measures will likely be implemented to minimise effects during construction. However, minor and temporary effects are likely to still occur (minor negative).

## **Population and Human Health**

The construction of three options is likely to cause temporary disturbance to important facilities located within 500m of the proposed pipeline, including numerous schools and two medical facilities (Myton Hospice and Warwick hospital) and numerous places of worship. Construction of pipeline from Minworth to Learnington also intersects with two golf courses, recreational ground and playing spaces. This will result in temporary effects on tourism and recreation. As such, minor negative effects are expected during construction of the options.

Improvements to the canal will provide increased opportunity for use for local communities and may benefit tourism. As the pipeline infrastructure will be buried and ground reinstated, minor positive effects are expected once the scheme is operational.

#### Mitigation

Following the implementation of mitigation measures, such as traffic management plans, best use construction practises and construction management plans the residual minor negative impacts are expected to remain.

#### **Material Assets**

All three route options will require resources for pipeline construction, abstraction points and outfalls, and amendments to existing canal infrastructure. Excavation will produce waste material. There will be temporary impacts from construction as the proposed pipeline intersects with major roads including the M6, M42, A46, A452 and the A445, in addition to two round abouts. There will be temporary effects of road/railway closures and diversions. As such, minor negative effects are expected for resource use and on built assets.

These options present an opportunity to improve existing canal infrastructure, and therefore operational activities are expected to result in minor positive on built assets and infrastructure.

#### Mitigation

There are opportunities to implement sustainable design measures, such as reducing the schemes footprint, select more sustainable materials and reuse excavated material, to reduce the impact, however it is likely that minor negative effects will remain.

## 3.2 Comparison of WRSE NCA and BNG findings

## 3.2.1 Overview

The WRSE NCA and BNG outputs for the 9 options (1A-C, 2A-C, 3A-C) are summarised in Table 3.3, Table 3.4, Table 3.5, and Table 3.6. Mitigation has only been considered when outlined in the option description, or where standard mitigation must be applied.

A summary of what is included within each table is as follows:

- Table 3.3 shows the predicted impacts on natural capital during and post construction.
   Note: For each option, only those stocks with predicted impacts are listed.
- Table 3.4 shows the unmitigated BNG outputs for each option which have been informed using the predicted impacts on natural capital in Table 3.3
   Note: At this stage the BNG only takes account reinstatement, not reprovision or additional habitat creation unless outlined in the option description.
- Table 3.5 summarises the predicted impacts to the provision of ecosystem services screened in for detailed assessment.

 Table 3.6 summarises the predicted impacts to the provision of water purification for each option, where screened in for qualitative assessment.

At this stage of design development and for RAPID Gate 1 it is assumed that for most GUC components/options, further assessment will take place as design evolves. For RAPID Gate 2 this will include surveys to ground truth the BNG assessment in the form of Phase 1 habitat surveys. It is likely that these could result in a net increase/decrease in the biodiversity units lost. At this point the BNG assessment can be revisited and mitigation or enhancement opportunities developed further to achieve the 10% BNG required within the project.

Additionally, as a core principle, where possible, GUC should aim to not only reinstate lost habitat, but also provide a greater or more diverse habitat than is lost, to achieve overall Biodiversity Net Gain. The latter could be achieved during the RAPID Gate 2 assessments by identifying local sites of ecological interest and proposing measures which enhance these features.

#### Table 3.3: Predicted impacts on natural capital stocks

Natural capital stock	Area within option boundary pre- construction (Ha)	Stocks present during construction (Ha)	Stocks present post construction (Ha)	Change (Ha)						
1A. Minworth WwTV	1A. Minworth WwTW to Grove									
Coastal floodplain grazing marsh	6.05	0.00	0.00	-6.05						
Pastures	20.46	0.00	0.00	-20.46						
Broadleaved, mixed and yew woodland	0.09	0.00	0.00	-0.09						
Active flood plain	0.44	0.00	0.00	-0.44						
Ponds & linear features	0.06	0.00	0.00	-0.06						
1B. Minworth WwTV	V to Grove									
Coastal floodplain grazing marsh	6.05	0.00	0.00	-6.05						
Arable	20.89	0.00	20.89	0.00						
Pastures	27.75	0.00	7.29	-20.46						
Broadleaved, mixed and yew woodland	0.43	0.00	0.34	-0.09						
Greenspace	0.72	0.72	0.72	0.00						
Active flood plain	0.44	0.00	0.00	-0.44						
Lakes & standing waters	0.23	0.23	0.23	0.00						
Ponds & linear features	0.06	0.00	0.00	-0.06						
1C. Minworth WwTV	V to Grove									
Coastal floodplain grazing marsh	6.55	0.00	0.50	-6.05						
Arable	28.57	0.00	28.47	0.00						
Pastures	31.27	0.00	10.81	-20.46						
Orchards & top fruit	0.10	0.00	0.00	-0.10						
Broadleaved, mixed and yew woodland	2.92	0.00	2.83	-0.09						
Coniferous woodland	1.58	0.00	1.58	0.00						
Greenspace	3.32	0.00	3.32	0.00						

Natural capital stock	Area within option boundary pre- construction (Ha)	Stocks present during construction (Ha)	Stocks present post construction (Ha)	Change (Ha)
Active floodplain	2.47	2.03	2.03	-0.44
Ponds & linear features	0.06	0.00	0.00	-0.06
2A. Minworth WwTV	N to Hemel Hempstead	d		
Arable	35.62	0.00	0.00	-35.62
2B. Minworth WwTV	N to Hemel Hempstead	d		
Arable	56.51	0.00	20.89	-35.62
Pastures	7.29	0.00	7.29	0.00
Broadleaved, mixed and yew woodland	0.34	0.00	0.34	0.00
Greenspace	0.72	0.72	0.72	0.00
Active flood plain	1.33	1.33	1.33	0.00
Lakes & standing waters	0.23	0.23	0.23	0.00
2C. Minworth WwT	<i>N</i> to Hemel Hempstead	d		
Coastal floodplain grazing marsh	0.50	0.00	0.50	0.00
Arable	64.09	0.00	28.47	-35.62
Pastures	10.81	0.00	10.81	0.00
Broadleaved, mixed and yew woodland	2.83	0.00	2.83	0.00
Coniferous woodland	1.58	0.00	1.58	0.00
Greenspace	3.32	3.32	3.32	0.00
Active flood plain	2.03	0.00	2.03	0.00
Lakes & standing waters	0.96	0.96	0.96	0.00
3A. Minworth WwT	N to Tring			
Arable	7.49	0.00	0.00	-7.49
Pastures	2.54	0.00	0.00	-2.54
3B. Minworth WwT	N to Tring			
Arable	28.38	0.00	20.89	-7.49
Pastures	9.83	0.00	7.29	-2.54
Broadleaved, mixed and yew woodland	0.34	0.00	0.34	0.00
Greenspace	0.72	0.00	0.72	0.00
Active flood plain	1.34	1.34	1.34	0.00
Lakes & standing waters	0.23	0.23	0.23	0.00
3C. Minworth WwT	N to Tring			
Coastal floodplain grazing marsh	0.50	0.00	0.50	0.00
Arable	35.96	0.00	28.47	-7.49
Pastures	1083.54	0.00	10.81	-2.54
Orchards & top fruit	0.10	0.10	0.00	-0.10
Broadleaved, mixed and yew woodland	2.83	0.00	2.83	0.00

Natural capital stock	Area within option boundary pre- construction (Ha)	Stocks present during construction (Ha)	Stocks present post construction (Ha)	Change (Ha)
Coniferous woodland	1.58	0.00	1.58	0.00
Greenspace	3.32	3.32	3.32	0.00
Active flood plain	2.03	2.03	2.03	0.00
Lakes & standing waters	0.96	0.96	0.96	0.00

Table 5.4. Outliniary of the Wrock unmitigated bito methe output	Table	3.4: Su	immary o	of the	WRSE	unmitigated	BNG	Metric	outputs
--	-------	---------	----------	--------	------	-------------	-----	--------	---------

Option	On-site Baseline (Ha)	On-Site Post Intervention (Ha)	Total Net Unit change (Ha)	Total Percentage Change
1A. Minworth WwTW to Grove	171.86	0	-171.86	-100.00%
1B. Minworth WwTW to Grove	260.59	73.49	-187.1	-71.80%
1C. Minworth WwTW to Grove	378.19	145.57	-232.62	-61.51%
2A. Minworth WwTW to Hemel Hempstead	78.36	0	-78.36	-100.00%
2B. Minworth WwTW to Hemel Hempstead	167.09	73.17	-93.92	-56.21%
2C. Minworth WwTW to Hemel Hempstead	266.75	128.89	-137.86	-51.68%
3A. Minworth WwTW to Tring	27.65	0	-27.65	-100.00%
3B. Minworth WwTW to Tring	116.38	73.17	-43.21	-37.13%
3C. Minworth WwTW to Tring	217.36	128.89	-88.47	-40.70%

The unmitigated BNG outputs have been informed using the predicted impacts on natural capital stocks listed in Table 3.3. Options 1A, 1B and 3A have a -100% total change in BNG units due to the presumed permanent loss of all natural capital during construction (see Table 3.3.).

## Table 3.5: Quantitative detailed assessment of the predicted impacts on the provision of ecosystem services

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)		
1A. Minworth WwTW	to Grove						
Carbon storage	£561.97	£0.00	-£561.97	£0.00	-£561.97		
Natural hazard management	£7.96	£0.00	-£7.96	£0.00	-£7.96		
Air Pollutant Removal <sup>2</sup>	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out		
Recreation and Amenity Value <sup>3</sup>	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out		
Food production	£6,400.00	£0.00	-£6,400.00	£0.00	-£6,400.00		
Total	£6,969.93	£0.00	-£6,969.93	£0.00	-£6,969.93		
1B. Minworth WwTW to Grove							
Carbon storage	£1,034.21	£0.00	-£1,034.21	£460.54	-£573.67		
Natural hazard management	£38.08	£0.00	-£38.08	£22.59	-£15.49		
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out		

<sup>2</sup> Scoped out when the option does not cause the temporary and/or permanent loss of associated stocks within an AQMA or urban area.

<sup>&</sup>lt;sup>3</sup> Scoped out when the option does not cause the permanent loss of greenspace.

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Recreation and Amenity Value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£6,400.00	£0.00	-£6,400.00	£0.00	-£6,400.00
Total	£7,472.29	£0.00	-£7,472.29	£483.13	-£6,989.16
1C. Minworth WwTW	to Grove				
Carbon storage	£2,108.63	£0.00	-£2,108.63	£1,310.82	-£797.81
Natural hazard management	£398.69	£0.00	-£398.69	£293.04	-£105.64
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation and Amenity Value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£6,400.00	£0.00	-£6,400.00	£0.00	-£6,400.00
Total	£8,907.32	£0.00	-£8,907.32	£1,603.87	-£7,303.45
2A. Minworth WwTW	to Hemel Hem	ipstead			
Carbon storage	£391.58	£0.00	-£391.58	£0.00	-£391.58
Natural hazard management <sup>4</sup>	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation and Amenity Value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£11,000.00	£0.00	-£11,000.00	£0.00	-£11,000.00
Total	£11,391.58	£0.00	-£11,391.58	£0.00	-£11,391.58
2B. Minworth WwTW	to Hemel Hem	ipstead			
Carbon storage	£863.82	£0.00	-£863.82	£460.54	-£403.28
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation and Amenity Value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£11,000.00	£0.00	-£11,000.00	£0.00	-£11,000.00
Total	£11,863.82	£0.00	-£11,863.82	£460.54	-£11,403.28
2C. Minworth WwTW	to Hemel Hem	ipstead			
Carbon storage	£1,938.16	£0.00	-£1,938.16	£1,310.74	-£627.42
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation and Amenity Value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£11,000.00	£0.00	-£11,000.00	£0.00	-£11,000.00
Total	£12,938.16	£0.00	-£12,938.16	£1,702.33	-£11,627.42
3A. Minworth WwTW	to Tring				
Carbon storage	£150.47	£0.00	-£150.47	£0.00	-£150.47
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out

<sup>4</sup> Scoped out when the option does not cause the temporary and/or permanent loss of associated stock within an active floodplain.

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation and Amenity Value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£3,000.00	£0.00	-£3,000.00	£0.00	-£3,000.00
Total	£3,150.47	£0.00	-£3,150.47	£0.00	-£3,150.47
3B. Minworth WwTW	to Tring				
Carbon storage	£622.71	£0.00	-£622.71	£460.54	-£162.17
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation and Amenity Value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£3,000.00	£0.00	-£3,000.00	£0.00	-£3,000.00
Total	£3,622.71	£0.00	-£3,622.71	£460.54	-£3,162.17
3C. Minworth WwTW	to Tring				
Carbon storage	£1,697.13	£0.00	-£1697.13	£1,310.82	-£386.31
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation and Amenity Value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	£3,000.00	£0.00	-£3,000.00	£0.00	-£3,000.00
Total	£33,441.68	£0.00	-£33,441.68	£1,310.82	-£3,386.31

# Table 3.6: Qualitative assessment of the predicted impacts on the provision of water purification

Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision				
1A-C. Minworth WwTW to Grove							
The stock likely provides a high provision of the ecosystem service due to the natural capital assets high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced.	The provision of water purification provided by the stock will likely be reduced due to the option.				
2C. Minworth WwTW to Hemel Hempstead							
The stock likely provides a high provision of the ecosystem service due to the natural capital assets high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced.	The provision of water purification provided by the stock will likely be reduced due to the option.				
3C. Minworth WwTW to Tring							
The stock likely provides a high provision of the ecosystem service due to the natural capital assets high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced.	The provision of water purification provided by the stock will likely be reduced due to the option.				
Note that options not listed in Table 3.6 are presumed to not impact on the provision of water purification due to:

- Options 2A and 3A area of proposed works containing no natural capital stocks contributing to this ecosystem service (see Table 3.3)
- Options 2B and 3B area of proposed works containing a small area of broadleaved mixed woodland (0.34Ha) which is presumed to not impact on the provision of this ecosystem service when temporarily lost during construction.

## 3.2.2 Sub-Route 1 Summary

1A Minworth WwTW to Grove, 2A Minworth WwTW to Hemel Hempstead and 3A Minworth WwTW to Tring

#### Natural capital

All three options are likely to cause the permanent loss of multiple natural capital stocks during construction.

### BNG

Applying the methodology, all options are likely to result in a loss of BNG habitat units due to the removal of habitats during construction.

### **Ecosystem Services**

All three options are likely to generate the temporary and permanent loss of natural capital stock associated with the provision of several ecosystem services. Construction impacts include the release of CO<sub>2</sub>, loss of flood regulation, loss of water purification and loss of provision of food production due to habitat clearance.

All the options present opportunities to improve the existing habitats along the route through post construction remediation and replacement of low value habitats with higher value habitats. The options cross several Natural England habitat, Network Enhancement Zones and are therefore suitable for the planting.

## 3.2.3 Sub-Route 3 Summary

# 1B Minworth WwTW to Grove, 2B Minworth WwTW to Hemel Hempstead and 3B Minworth WwTW to Tring

#### **Natural capital**

All three options are likely to cause the temporary and permanent loss of multiple natural capital stocks during construction. However, compensation/reinstatement of natural capital stock expected to be temporarily lost means that post construction, these stocks are likely to have little to no change.

#### BNG

Applying the methodology, all options are likely to result in a loss of BNG habitat units due to the removal of habitats during construction.

#### **Ecosystem Services**

All three options are likely to generate the temporary and permanent loss of natural capital stock associated with the provision of several ecosystem services. Major construction impacts include the release of CO2 and loss of provision of food production due to habitat clearance. Option 1B will also likely cause the loss of flood regulation.

All the options present opportunities to improve the existing habitats along the route through post construction remediation and replacement of low value habitats with higher value habitats. The option crosses several Natural England habitat, Network Enhancement Zones and is therefore suitable for the planting.

### 3.2.4 Sub-Route 6 Summary

# 1C Minworth WwTW to Grove, 2C Minworth WwTW to Hemel Hempstead and 3C Minworth WwTW to Tring

#### **Natural capital**

All three options are likely to cause the temporary loss of multiple natural capital stocks during construction. Options 1C and 3C are also likely to cause the permanent loss of stocks. However, compensation/reinstatement of natural capital stock expected to be temporarily lost means that post construction, these stocks are likely to have little to no change.

#### BNG

Applying the methodology, all options are likely to result in a loss of BNG habitat units due to the removal of habitats during construction.

#### **Ecosystem Services**

All three options are likely to generate the temporary and permanent loss of natural capital stock associated with the provision of several ecosystem services. Major construction impacts include the release of CO2 and loss of provision of food production due to habitat clearance. Option 1C will also likely cause the loss of flood regulation.

All the options present opportunities to improve the existing habitats along the pipeline route through post construction remediation and replacement of low value habitats with higher value habitats. The option crosses several Natural England habitat, Network Enhancement Zones and is therefore suitable for the planting.

# 4 Gate 2 Requirements and Next Steps

# 4.1 Gate 2: detailed feasibility, concept design and multi-solution decision making

Gate 2 builds on gate one activities to improve the detail and breadth of studies for a key decision point for strategic solutions. This will include concept solution designs with reduced uncertainty in costs and benefits and re-testing in revised regional and company models (to support updated decision making and filtering on outputs including those that are mutually exclusive). The solution should be developed to a standard suitable for submitting into final regional plans or final water resources management plans. This stage of the programme aims to further enhance the funding portfolio, based on refined and consistent costs and benefits, with suboptimal solutions eliminated and viable solutions carried forward to the pre-planning stage. Figure 4.1 outlines the envisaged steps in the SRO Environment Assessment.

#### 4.1.1 SEA

In Gate 2, the SEA compliant option level-environmental assessments will be updated as more detailed design and mitigation information may be available, enabling the assessment to be updated. Any HRA Appropriate Assessment or full WFD assessments undertaken can feed into the Gate 2 refined assessment.

#### 4.1.2 Natural capital assessment

At Gate 2, additional ecosystem services may merit assessment. To both accommodate the WRPG approach, as well as that outlined in ENCA the natural capital assessment at this stage could also consider:

- Urban natural capital
- Enclosed farmland
- Mountain
- Moor and heathland
- Freshwater
- Woodland
- Coastal margins
- Marine environment
- Semi-natural grassland

The addition of these additional ecosystem services (in line with ENCA approach) would provide the required greater detail and breadth of study required by later gates. At these stages the Ecosystem Services or Natural Capital metrics (as they are referred to in the Environment Agency guidance) will be assessed both qualitatively and quantitatively so that they can be considered within option assessments if confidence in monetisation is not appropriate or reliable.

Where possible monetisation of the natural capital metrics should occur and be incorporated into the cost benefit ratio as a discreet input. This monetised value will be a single figure defined by the maximum natural capital benefit. The cost of the option will not be considered within this assessment as it is captured elsewhere within the investment model. Monetised values for the key ecosystem services are provided within ENCA and supplementary valuation databases that would provide a suitable source for the information required. It is proposed that the database of

suitable values for the provision of each service is developed during SEA Scoping phase and presented for stakeholders to consult on.

The majority of data required for the above assessments is open source and available at no cost, as outlined in Section 4.2 of the 'All Companies Working Group – WRMP environmental assessment guidance and applicability with SROs'.

### 4.1.3 BNG

The BNG assessment would be refined through the inclusion of concept designs into the assessment. Measures to promote net gain would also be incorporated into the design.

#### Figure 4.1: Environment Assessment Integration with SRO Gates

#### **Environmental Assessment Required**



Source: Mott MacDonald, 2020

# 5 Conclusion

SEA, Natural Capital and BNG Assessments was undertaken by Water Resources South East in Q1 2021 on the GUC options.

Based on the SEA outputs for residual effects (post mitigation), no major negative effects are expected. The options are predicted to result in major positive, moderate positive, minor positive, neutral, minor negative or moderate negative effects across all the SEA objectives. All nine options produced the same outputs in the SEA tables. They differ in features by:

- Biodiversity: Pipelines associated with Options 1B, 2B, 3B (Sub-route 3) and Options, 1C, 2C, 3C (Sub-route 6), are likely to cause significant disruption to a multiple SSSIs. Sub-route 6 options are within 2000m of multiple SSSIs, LNRs, and parcels of ancient woodland. Whippendell Wood SSSI is within 1km of the abstraction point for Option 1C.
- Soil: Options 1B, 2B, 3B (Sub-route 3) intersects with Grades 1, 2 and 3 land, whereas Options 1A, 2A, 3A (Sub-route 1) and Options, 1C, 2C, 3C (Sub-route 6) intersect with Grade 3 land.
- Air: Options 1A, 2A, 3A, (Sub-route 1) and Options 1B, 2B, 3B (Sub-route 3) intersect three AQMAs.
- Historic environment: Options 1B, 2B, 3B (Sub-routes3) options intersect with a number of conservation areas and Grade II listed parks and gardens, and in close proximity to Grade II listed buildings. Options 1A, 2A, 3A (Sub-route 1) and Options, 1C, 2C, 3C (Sub-route 6) are located in close proximity to numerous conservation areas, Grade II listed parks and gardens and Grade II listed buildings.
- Material Assets: All options intersect major roads, and Options 1A, 2A, 3A, (Sub-route 1) and Options 1B, 2B, 3B (Sub-route 3) intersect railways. Options, 1C, 2C, 3C (Sub-route 6), however intersects several major roads including the M6, M42, A46, A452 and the A445.

When comparing the outputs above, Sub-route 1 appears to be the most preferred group of options. Sub-routes 3 and 6 are less preferred, due to Sub-route 3 options impact on higher grades of agricultural land and impact to the historic environment, and Sub-Route 6 options impact to biodiversity and material assets. Note: Design development during Gate 2 may alter these conclusions and the SEA assessment would be revisited and updated at this stage.

The Natural capital, BNG, and Ecosystem Services outputs identified the following:

- NC: All options, except option 2C (Sub-route 6), are likely to generate a permanent loss of natural stocks. Option 3C (Sub-route 6) has the greatest change in natural capital stocks, notably in loss of pastures.
- BNG: All options are likely to result in a loss of BNG habitat units. Option 3C (Sub-route 6) has the greatest total net change in terms of hectares lost, whereas option 3A (Sub-route 1) has the lowest.
- Ecosystem services: All the options present opportunities to improve the existing habitats along the pipeline route through post construction remediation and replacement of low value habitats with higher value habitats. Option 3C (Sub-route 6) had the greatest overall change in value per year, whereas option 3A (Sub-route 1) had the least overall change.

When reviewing the assessments outputs, although very similar, Option 3A (Sub-route 1) performed slightly better, and Option 3C (Sub-route 6) performed slightly worse.

The opportunities identified in the BNG/NC assessment have the potential to contribute to Government ambitions for environmental net gain. This could take the form of habitat

compensation, creation and/or species relocation schemes. Any schemes would need to be taken forward based on a comprehensive understanding on the interaction between natural systems and between natural systems and social uses of land.

A summary of the key potential benefits and adverse effects of the scheme is presented in Table 5.1.

Торіс	Benefits	Adverse effects
Biodiversity, flora and fauna	None identified – however all options have an opportunity to protect and enhance biodiversity during operation.	All options intersect SSSIs and are hydrologically connected to a SPA and Ramsar site. Pipelines associated with Options 1B, 2B, 3B (Sub-route 3) and Options, 1C, 2C, 3C (Sub-route 6), are likely to cause significant disruption to a multiple SSSIs. Sub-route 6 options are within 2000m of multiple SSSIs, LNRs, and parcels of ancient woodland. Whippendell Wood SSSI is within 1km of the abstraction point for Option 1C.
Soil	None identified	All sub-routes intersect with authorised and historic landfill sites. Options 1B, 2B, 3B (Sub-route 3) intersects with Grades 1, 2 and 3 land, whereas Options 1A, 2A, 3A (Sub-route 1) and Options, 1C, 2C, 3C (Sub-route 6) intersect with Grade 3 land.
Water	All options deliver reliable and resilient water supplies.	All options pass through sections of flood zones 2 and 3. Potential adverse effects on the water quality of nearby waterbodies.
Air	None identified	All options are likely to generate short-term vehicle emissions and dust from construction activities. Options 1A, 2A, 3A, (Sub-route 1) and Options 1B, 2B, 3B (Sub-route 3) intersect three AQMAs.
Climatic factors	All options reduce vulnerability to climate change risks and hazards.	All options will likely result in greater energy use during operation.
Landscape	All options present an opportunity for landscaping and to restore visual amenity and character once operational.	All three options intersect with the Chilterns AONB and several national landscape character areas.
Historic environment	None identified	Options 1B, 2B, 3B (Sub-route 3) intersect with a number of conservation areas and Grade II listed parks and gardens, and in close proximity to Grade II listed buildings. Options 1B, 2B, 3B (Sub-route 3) also infringes upon Merevale Abbey Scheduled Monument and Merevale Park Registered Park. Options 1A, 2A, 3A (Sub-route 1) and Options, 1C, 2C, 3C (Sub-route 6) are located in close proximity to numerous conservation areas, Grade II listed parks and gardens and Grade II listed buildings.
Population and human health	All options present an opportunity to enhance the health and wellbeing of the local community and enhance tourism and recreation.	All options intersect or are in close proximity to a number of community facilities.
Material assets	All options present an opportunity to improve existing canal infrastructure.	Material Assets: All options intersect major roads, and Options 1A, 2A, 3A, (Sub-route 1) and Options 1B, 2B, 3B (Sub-route 3) intersect railways. Options, 1C, 2C, 3C (Sub-route 6), however intersects several major roads including the M6, M42, A46, A452 and the A445.

# A. WRSE output tables

The WRSE GUC outputs are available upon request.



# Grand Union Canal Strategic Resource Option

Habitats Regulations Assessment Report

May 2021

The content of this document is draft and relates to material [or data] which is still in the course of completion in travel to Gate 2 and should not be relied upon at this early stage of development. We continue to develop our thinking and our approach to the issues raised in the document in preparation for Gate 2. Mott MacDonald 22 Station Road Cambridge CB1 2JD United Kingdom

T +44 (0)1223 463500 mottmac.com

Affinity Water, Tamblin Way, Hatfield, Hertfordshire, AL10 9EZ.

# **Grand Union Canal Strategic Resource Option**

Habitats Regulations Assessment Report

May 2021

## **Issue and Revision Record**

Revision	Date	Originator	Checker	Approver	Description
P01	Apr 2021				First draft for client comment
P02	May 2021				Final following client comments

#### Document reference:

#### Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the abovecaptioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

# Contents

Exe	cutive	Summary	2
1	Intro	duction	3
	11	Overview	3
	1.2	Severn Trent to Affinity Transfer Grand Union Canal Options	3
	13	The Purpose of the Habitats Regulation Assessment	4
	1.4	Limitations to the Assessment	5
2	GUC	Scheme Description	6
	21	Overview	6
	22	Route Sub Options	6
	23	Affinity Water Abstraction Location Options	6
3	HRA	Stage 1: Screening	9
	31	HRA Stage 1 Screening Principles	9
	3.2	The WRSE Review	9
4	HRA	Stage 2: Appropriate Assessment Approach and Methodology	11
	4 1	Approach to the Appropriate Assessment	11
	4.2	Potential impacts considered as part of the HRA	12
	43	Assumptions and standard best-practice mitigation measures	14
5	Аррі	opriate Assessment of the GUC Options	17
	5 1	Likely Impact Pathways	17
	5.2	Potential Effects on Habitats Sites	19
	53	GUC scheme Appropriate Assessment	20
	5.4	Summary of the GUC Scheme Appropriate Assessment	21
6	Con	clusions	22
Α	Мар	S	23
B.	WRS	SE Screening Results for GUC Scheme	25
C.	Desi	gnated Site Information	38
	C.1	Chiltern Beechwood SAC	38

## Tables

Table 1.1: GUC Options	3
Table 2 1: Option descriptions for Severn Trent to Affinity Water GUC transfer	7
Table 3 1: Summary of WRSE HRA Stage 1 Screening Output         Likely Significant Effects	
and Uncertain Effects	9
Table 4.1: Potential Impacts Considered in the Appropriate Assessment	13
Table 5.1: GUC Option 3 Minworth – Tring (3A, 3B, and 3C): Potential effects on	
designated sites and qualifying features	20

# Glossary

Acronym	Definition
ACWG	All Company Working Group
AWB	Artificial Waterbody
EAR	Environmental Assessment Report
EU	European Union
GEP	Good Ecological Potential
GES	Good Ecological Status
GUC	Grand Union Canal
HMWB	Heavily Modified Waterbody
INNS	Invasive Non Native Species
MI/d	Megalitres per day
POM	Programme of Measures [WFD measures required to improve waterbody status]
PS	Pumping station
RAPID	Regulators' Alliance for Progressing Infrastructure Development
RBMP	River Basin Management Plan
RNAG	Reason for Not Achieving Good [WFD status]
SRO	Strategic Resource Option
WFD	Water Framework Directive
WRSE	Water Resources South East
WSR	Water supply reservoir
WSW	Water Supply Works
WwTW	Water Treatment Works

# **Executive Summary**

This report presents the results of the Habitats Regulations Assessment (HRA) undertaken of the options considered for the Severn Trent to Affinity Transfer via the Grand Union Canal (GUC) Strategic Resource Option. The HRA assesses the potential impact of the options on designated sites in the UK's National Site Network, called Habitats Sites. This report supports the *Environment Assessment Report* that accompanies the Gate 1 submission report to the Regulators' Alliance for Progressing Infrastructure Development for the GUC Scheme.

The aim of the GUC SRO is to investigate options for transferring available water from Severn Trent Water's Minworth Wastewater Treatment Works (WwTW) into the GUC, to supplement Affinity Water's supply. From the GUC, it is proposed to transfer the additional resource southwards towards Affinity Water's supply area using Canal and River Trust assets. There are nine proposed option combinations to consider under the HRA, comprising a combination of three separate routes to Braunston junction, and one single route downstream of the junction to three separate Affinity abstraction locations The ultimate solution will be a single route and abstraction location

The options have been subject to a HRA Stage 1 assessment, which was completed by WRSE. Subsequently, a HRA Stage 2 Appropriate Assessment (plan stage) has been undertaken The HRA Stage 2 Appropriate Assessment did not identify any options that, if implemented (alone) would result in any residual significant impacts on the National Site Network of designated sites, or Habitat Sites.

The Appropriate Assessment undertaken for Options 1 (Minworth – The Grove) and Option 2 (Minworth – Hemel Hempstead) and their associated A, B, and C sub-routes did not identify any transmission pathways by which a Likely Significant Effect could reasonably occur. No key risks to Habitats Sites were identified during construction or operation of these options.

The Appropriate Assessment undertaken for Option 3 (Minworth Tring) and its associated A, B, and C sub routes identified a transmission pathway to the Chiltern Beechwood SAC from construction works at the proposed intake location, but concluded that no significant effects are foreseeable on the integrity of the Habitats Sites if the suggested mitigation measures to reduce disturbance and air emissions during construction are observed.

It should be noted that at this stage an in-combination assessment to identify potential cumulative effects of the GUC Scheme with other non related plans or projects has not been conducted An in-combination assessment would not be considered proportionate at this stage (at WRSE regional plan level), due to the early stages of the regional plan, and the preliminary nature of design details of the GUC options and other SROs An updated HRA will be conducted at Gate 2 to include an in-combination assessment of the options within the GUC Scheme, between different SROs and between any other external plans or projects that may put pressure on the same water resources As the GUC Scheme develops, it is assumed that any potential significant effects on Habitats Sites due to individual options, or in-combination effects will be avoided as far as reasonably practicable.

# 1 Introduction

#### 1.1 Overview

This Annex supports the Environment Assessment Summary Report (EAR) that accompanies the Gate 1 submission to the Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the Severn Trent to Affinity Transfer via the Grand Union Canal (GUC) Strategic Resource Option (SRO) The scheme looks to transfer water from Minworth Wastewater Treatment Works (WwTW) in the Midlands, to Affinity Water in the South East using the existing canal network.

This Annex presents the findings of the Habitats Regulations Assessment (HRA) Appropriate Assessment applied to the transfer route options, to assess the potential impact of the options on European designated sites in the UK's National Site Network. The route options were shortlisted by GUC PMB in 2020 (WP1a) and shortlisted options reviewed in more detail in 2021. Details of the options and wider assessment are reported in *WP1B – Engineering Route Development report (March 2021)*.

### 1.2 Severn Trent to Affinity Transfer Grand Union Canal Options

The outputs of options appraisal WP1a and WP1b identified three viable transfer routes and WP2 reviewed and short-listed three potential abstraction locations for the GUC transfer as shown in **Error! Reference source not found.**. The transfer would be reliant on operation of the Minworth SRO as the source of additional water The Minworth SRO is not part of the GUC WFD assessment at this stage. . Further details on the scheme description are included in Chapter 2

HRA Option	GUC route	Abstraction location	Option description
1A	1	Grove	Treated wastewater transfer from Minworth WwTW to The Grove via Route 1 (Birmingham to Fazeley, Coventry, Oxford and Grand Union Canals)
1B	3	Grove	Treated wastewater transfer from Minworth WwTW to The Grove via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford and Grand Union Canals)
1C	6	Grove	Treated wastewater transfer from Minworth WwTW to The Grove via Route 6 (Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal)
2A	1	Hemel Hempstead	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 1 (Birmingham to Fazeley, Coventry, Oxford and Grand Union Canals)
2B	3	Hemel Hempstead	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford and Grand Union Canals)
2C	6	Hemel Hempstead	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 6 (Pipeline from Minworth to Leamington Spa then transfer via Grand Union Canal)
3A	1	Tring	Treated wastewater transfer from Minworth WwTW to Tring via Route 1 (Birmingham to Fazeley, Coventry, Oxford and Grand Union Canals)
3B	3	Tring	Treated wastewater transfer from Minworth WwTW to Tring via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford and Grand Union Canals)

#### Table 1 1: GUC Options

HRA Option	GUC route	Abstraction location	Option description
3C	6	Tring	Treated wastewater transfer from Minworth WwTW to Tring via Route 6 (Pipeline from Minworth to Leamington Spa then transfer via Grand Union Canal)

### 1.3 The Purpose of the Habitats Regulation Assessment

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

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 on 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 referred to as the National Site Network in the Habitats Regulations and refer to Special Areas of Conservation (SAC) and Special Protection Areas (SPA) (i e European sites in the UK). 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 National Planning Policy Framework (NPPF). In accordance with the terminology used in government guidance for England on Appropriate Assessment and the NPPF, sites subjected to the HRA process can be collectively referred to as 'Habitats Sites'

For any plan or project that could affect one or more Habitats Sites, the provisions of Part 6 of the Conservation of Habitats and Species Regulations 2017 (as amended) 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<sup>1</sup>:

- Stage 1 Screening to check if the proposal is likely to have a significant effect on the site's conservation objectives. If so, the proposal needs to go through the appropriate assessment or derogation stages.
- Stage 2 Appropriate Assessment to assess the likely significant effects of the proposal in more detail and identify ways to avoid or minimise any effects.
- Stage 3 Derogation to consider if proposals that would have an adverse effect on a European site qualify for an exemption

<sup>&</sup>lt;sup>1</sup> As defined by national guidance 'Appropriate Assessment - Guidance on the use of Habitats Regulations Assessment. Published 22 July 2019' (GOV UK (2019)

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

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 Conservation of Habitats and Species Regulations 2017 (as amended) 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.

#### 1.4 Limitations to the Assessment

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

As the project is still in the early stages of design development, it is acknowledged that there is limited design certainty, and that further infrastructure (such as pumping stations, water reservoirs etc.) may be required that have not been considered in the Gate 1 assessment. Such components will need to be added to the assessment at Gate 2. It is considered unlikely that these components will substantially change the HRA assessment, given the proximity and pathways to Habitats Sites identified in this Gate 1 report.

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

It should be noted that at this stage an in-combination assessment to identify potential cumulative effects of the GUC scheme with other non-related plans or projects has not been conducted An in-combination assessment would not be considered proportionate at this stage, due to the early stages of the plan, and the consequential lack of further design details on the GUC options and other SROs that is available. The WRSE process will involve an in-combination assessment following the output of their modelling work which coincides with RAPID Gate 2, therefore the updated HRA that is a requirement of Gate 2 will include this incombination assessment of the options within the GUC scheme, between different SROs and between any other external plans or projects that may put pressure on the same water resources. As the GUC scheme develops, it is assumed that any potential significant effects on Habitats Sites due to individual options, or in-combination effects will be avoided as far as reasonably possible

# **2 GUC Scheme Description**

#### 2.1 Overview

The aim of the GUC SRO is to investigate options for transferring available water from Severn Trent Water's Minworth WwTW into the GUC, to supplement Affinity Water's supply From the GUC, it is proposed to transfer the additional resource southwards towards Affinity Water's supply area using Canal and River Trust assets

There are nine proposed options combinations to assess under the HRA at this stage, comprising three separate routes and three separate Affinity Water abstraction locations, however it is important to note that downstream of the Braunston junction, each of the three sub-routes converge and follow the same route. Each route option is being considered for a transfer volume of either 50MI/d or 100MI/d. Table 2-1 provides a summary of each option. A map of the three potential route options and three Affinity Water abstraction locations is given in Appendix A. The ultimate solution will be a single route and abstraction location. i.e. the routes and abstraction locations are mutually exclusive with one another.

Information regarding the proposed route options and abstraction locations has been obtained from the 'Route Development' and 'Site Appraisal' reports by WSP<sup>2</sup>,<sup>3</sup>. It should be noted that the scheme is at the early stages of design development and therefore detail of each option is currently limited

#### 2.2 Route Sub-Options

Each of the proposed transfer options utilises one of three proposed routes:

- Route 1 (all 'A' options): Birmingham to Fazeley, Coventry, Oxford (upper section) and Grand Union Canals
- Route 3 (all 'B' options): Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford and Grand Union Canals
- Route 6 (all 'C' options): Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal

### 2.3 Affinity Water Abstraction Location Options

There are three potential abstraction locations that could be applied to any transfer route option:

- The Grove (options 1A, 1B, 1C): The proposed Grove abstraction site is located near the town of Abbots Langley and Hunton Bridge, downstream of GUC interactions with the River Gade and Bulbourne and upstream of the River Colne
- Hemel Hempstead (options 2A, 2B, 2C): The proposed Hemel Hempstead abstraction site is in the GUC stretch adjacent to the village of Bourne End in Hertfordshire, between Berkhamsted and Hemel Hempstead, within the reach of GUC interactions with the River Bulbourne and upstream of the River Gade.
- Tring (options 3A, 3B, 3C): The proposed Tring abstraction site is located between the towns of Tring and Berkhamsted, downstream of Tring WwTW (Thames Water) and upstream of GUC interactions with the River Bulbourne or Gade.

<sup>&</sup>lt;sup>2</sup> WSP March 2021 Grand Union canal – WP1B Engineering Route Development Project No 70076064

<sup>&</sup>lt;sup>3</sup> WSP March 2021 Grand Union Canal – WP2 Company Assets Site Appraisal Project No 70075218.

Option Ref	Option Name	Option Description
1A	Treated wastewater transfer from Minworth WwTW to The Grove via Route 1 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to The Grove via Route 1 (Birmingham to Fazeley, Coventry, Oxford (upper section) and Grand Union Canals) The Grove abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
1B	Treated wastewater transfer from Minworth WwTW to The Grove via Route 3 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to The Grove via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford (upper section) and Grand Union Canals). The Grove abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
1C	Treated wastewater transfer from Minworth WwTW to The Grove via Route 6 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to The Grove via Route 6 (Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal) The Grove abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC
2A	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 1 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 1 (Birmingham to Fazeley, Coventry, Oxford (upper section) and Grand Union Canals) The Hemel Hempstead abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC
2B	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 3 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford (upper section) and Grand Union Canals). The Hemel Hempstead abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
2C	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 6 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 6 (Pipeline from Minworth to Leamington Spa then transfer via Grand Union Canal) The Hemel Hempstead abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
3A	Treated wastewater transfer from Minworth WwTW to Tring via Route 1 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to Tring via Route 1 (Birmingham to Fazeley, Coventry, Oxford (upper section) and Grand Union Canals). The Tring abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC
3B	Treated wastewater transfer from Minworth WwTW to Tring via Route 3 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to Tring via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford (upper section) and Grand Union Canals). The Tring abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC

Option Ref	Option Name	Option Description
3C	Treated wastewater transfer from Minworth WwTW to Tring via Route 6 (50 or 100Ml/d)	Treated wastewater transfer from Minworth WwTW to Tring via Route 6 (Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal) The Tring abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.

# 3 HRA Stage 1: Screening

### 3.1 HRA Stage 1 Screening Principles

The purpose of the Screening Stage (Stage 1) of the HRA is to identify the Likely Significant Effects that arise from the interaction between actions of the GUC options and sensitive receptors of a Habitats Site through impact pathways.

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

#### 3.2 The WRSE Review

A screening exercise was undertaken by WRSE in February 2021 in-line with the methodology found in the WRSE Regional Plan Environmental Assessment Methodology Guidance, July 2020

The WRSE Stage 1 assessment included screening of the long-list of options considered for the GUC scheme The outputs of this assessment relevant to the sub options currently considered for the GUC SRO are summarised in Table 3 1, and the output tables received from WRSE are contained in Appendix B. The results of this assessment were used to identify the GUC options that were carried forward to HRA Stage 2: Appropriate Assessment.

Options Taken Forward	Sub-Route	Likely Significant Effects or Uncertain Effects
1A. Minworth WwTW to	Route 1 (Minworth to	Upper Nene Valley Gravel Pits SPA
Grove	Atherstone Canal)	Upper Nene Valley Gravel Pits Ramsar site
1B Minworth WwTW to	Route 3 (Minworth to	Upper Nene Valley Gravel Pits SPA
Grove	Atherstone - Pipeline)	Upper Nene Valley Gravel Pits Ramsar site
1C. Minworth WwTW to	Route 6 (Minworth to	Upper Nene Valley Gravel Pits SPA
Grove	Leamington Pipeline)	Upper Nene Valley Gravel Pits Ramsar site
2A Minworth WwTW to	Route 1 (Minworth to	Upper Nene Valley Gravel Pits SPA
Hemel Hempstead	Atherstone - Canal)	Upper Nene Valley Gravel Pits Ramsar site
2B. Minworth WwTW to	Route 3 (Minworth to	Upper Nene Valley Gravel Pits SPA
Hemel Hempstead	Atherstone Pipeline)	Upper Nene Valley Gravel Pits Ramsar site
2C. Minworth WwTW to	Route 6 (Minworth to	Upper Nene Valley Gravel Pits SPA
Hemel Hempstead	Leamington - Pipeline)	Upper Nene Valley Gravel Pits Ramsar site
3A. Minworth WwTW to Tring	Route 1 (Minworth to Atherstone - Canal)	Chiltern Beechwood SAC Upper Nene Valley Gravel Pits SPA Upper Nene Valley Gravel Pits Ramsar site
3B. Minworth WwTW to Tring	Route 3 (Minworth to Atherstone - Pipeline)	Chiltern Beechwood SAC Upper Nene Valley Gravel Pits SPA Upper Nene Valley Gravel Pits Ramsar site
3C. Minworth WwTW to Tring	Route 6 (Minworth to Leamington - Pipeline)	Chiltern Beechwood SAC Upper Nene Valley Gravel Pits SPA Upper Nene Valley Gravel Pits Ramsar site

# Table 3.1: Summary of WRSE HRA Stage 1 Screening Output Likely Significant Effects and Uncertain Effects Image: Comparison of Compari

For the Upper Nene Valley SPA/Ramsar site, the justification for requirement of a Stage 2 HRA assessment is the identification of a hydrological connection from the GUC to the Habitats Site from the Wilton Brook/River Nene. The pathway has the potential to result in alterations to flow and water quality entering the Habitats Site

For the Chiltern Beechwood SAC, although no hydrological connection has been identified, justification for the requirement of a Stage 2 assessment is given due to the close proximity of the Tring intake, located approximately 0 6km from the Habitats Site The potential for disturbance-related effects from construction through noise, vibration and air emissions have been identified and there is uncertainty whether associated intake infrastructure will be required in close proximity to the SAC

May 2021

# 4 HRA Stage 2: Appropriate Assessment Approach and Methodology

## 4.1 Approach to the Appropriate Assessment

For options where potential 'Likely Significant Effects' or 'Uncertain Effects' were identified in the Stage 1 screening assessment, an Appropriate Assessment is required The Appropriate Assessment needs 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 effects 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 this plan stage it is not always possible to determine the exact scale and extent of the impact, when this is the case a precautionary approach is taken when evaluating the significance of the impact

The 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.

The relevant content of 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 the light of further details on the proposed options.

It should be noted that at this stage an in combination assessment to identify potential cumulative effects of GUC scheme with other non related plans or projects has not been conducted. An in-combination assessment would not be considered proportionate at this stage, due to the early stages of the plan, and the consequential lack of further design details on the GUC options and other SROs that is available An updated HRA will be conducted at Gate 2, and will include an in-combination assessment of the options within the GUC scheme, between different SROs and between any other external plans or projects that may put pressure on the same water resources; as required by the WRSE process As the GUC scheme develops, it is assumed that any potential significant effects on Habitats Sites due to individual options, or in-combination effects will be avoided as far as reasonably possible.

#### 4.1 1 HRA Methodology

This HRA Stage 2: Appropriate Assessment has been formulated using the following approach:

- Review the sites identified at Stage 1 and confirm any additions or exclusions<sup>4</sup>
- Assessment of the construction and operation impacts of the GUC options<sup>5</sup>
- Assessment of the Habitats Sites' characteristics and identification of their conservation objectives<sup>6</sup>, and
- Identification of the aspects of the proposed GUC options that will significantly impact the conservation objectives of the Habitats Sites<sup>7</sup>.

This assessment has been undertaken in accordance with the following guidance:

- GOV UK (2019) Appropriate Assessment Guidance on the use of Habitats Regulations Assessment. Published 22 July 2019<sup>8</sup>.
- UK Water Industry Research (UKWIR, 2012) Strategic Environmental Assessment and Habitats Regulations Assessment Guidance for Water Resources Management Plans and Drought Plans (12/WR/02/7)<sup>9</sup>; and
- European Commission (EU, 2018) Managing Natura 2000 sites The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC<sup>10</sup>

#### 4.1.2 Consultation

It is a statutory requirement of the HRA process that as the competent authority, Natural England be consulted at the Appropriate Assessment stage. Natural England have been engaged in the consultation phase during scoping works for the SRO and the RAPID deliverables will be available to them after the Gate 1 submission. As there is residual uncertainty due to the lack of detailed design of the GUC option, it is recommended that further formal consultation will be more appropriate at Gate 2 after the HRA is updated in line with design progress.

#### 4.2 Potential impacts considered as part of the HRA

Following UKWIR (2012) guidance and given the nature of the proposed options the potential impacts considered in this assessment are summarised 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 new pipeline crosses a watercourse that runs into a Habitats Site, and where changes in water quality and quantity could affect habitats that are hydrologically connected

<sup>&</sup>lt;sup>4</sup> The Stage 1 Screening results for the preferred GUC options are given in Appendix B; confirmation of any additions or exclusions are given in Section 5.1.

<sup>&</sup>lt;sup>5</sup> Given in Section 5.1

<sup>&</sup>lt;sup>6</sup> Habitats Sites characteristics and conservation objectives are given in Appendix C.

<sup>&</sup>lt;sup>7</sup> This is the Appropriate Assessment given in Chapter 5 and tabulated in Section 5.3.

<sup>&</sup>lt;sup>8</sup> Available at: <u>Appropriate assessment - GOV.UK (www.gov.uk)</u>

<sup>&</sup>lt;sup>9</sup> UKWIR (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)

<sup>&</sup>lt;sup>10</sup> Available at: https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/Provisions\_Art\_\_nov\_2018\_endocx.pdf

## Table 4.1: Potential Impacts Considered in the Appropriate Assessment

Broad categories of potential impacts on European sites (with examples)	Examples of operations resulting in impacts and proposed Zol
<b>Physical loss</b> Destruction (including offsite effects) e.g. foraging habitat, smothering	Development of built infrastructure associated with the pipelines, access routes. 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 Habitat degradation Erosion Trampling Fragmentation Severance/barrier effects Edge effects	Development of built infrastructure associated with the option, e.g. reservoir embankments, water treatment plants, pipelines, pumping stations. 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 Noise Visual presence Light pollution	Noise from vehicular traffic during construction of the option Plant and personnel involved in construction and operation of the option e.g. for maintenance. 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. 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 Drying Flooding/storm water Changes to surface water levels and flows Changes to groundwater level and flows	Change to water levels and flows due to water abstraction, storage and drainage interception associated with inland options. 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 Water pollution Soil contamination Air pollution	Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems. These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the option and the Habitats Site, and whether the option is up or down stream from the Habitats Site Contamination of soil due to leaching of contaminated waters
	ingress of dust/air emissions or pollution events. 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 or where the boundary of the option extends within the same ground or surface water catchment as the Habitats Site
	Air emissions associated with vehicular traffic during construction and operation 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.

Proad estagories of potential

impacts on European sites (with examples)	proposed Zol
Non-toxic contamination Nutrient enrichment (e.g. of soils and water) Algal blooms Changes in turbidity Changes in sedimentation/silting Air pollution (dust)	Changes to nutrient levels, turbidity, storage, or inter-catchment transfers. 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. Emissions of dust during the earthworks, construction of plant and tunnel/pipeline construction associated with options.
Biological Disturbances Direct mortality Changes to habitat availability Out-competition by non-native species Introduction of disease 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 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.
Physical loss Destruction (including offsite effects) e.g. foraging habitat, smothering	Development of built infrastructure associated with the pipelines, access routes. 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).

Examples of operations resulting in impacts and

Source: Adapted from: UK Water Industry Research (2012)<sup>11</sup>.

#### 4.3 Assumptions and standard best-practice mitigation measures

#### 4.3.1 Overview

The high-level nature of this assessment undertaken at the plan stage means that there is lack of detailed design for all options considered. By law any option being taken forward to be implemented will be subject to an Appropriate Assessment at the project stage, when, in the light of more information relating to the construction and design of the project, a more refined HRA assessment can be undertaken.

Based on the current level of detail available for the GUC options, a number of assumed and established mitigation measures are proposed with the assumption that they will be followed at the project stage to avoid or mitigate the effects identified in this HRA. 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. These measures should be applied unless the project stage HRAs or option-specific environmental studies demonstrate that they are not required (i.e. the anticipated effect will not occur), not appropriate, or that alternative or additional measures are necessary or more appropriate. Note that these mitigation measures must be reviewed at the project stage, taking into account any changes in best practice as well as option specific survey information or baseline studies

It is recommended that Severn Trent and Affinity Water work closely with Natural England and the Habitats Site managers to agree the specific mitigation measures to be included at the project stage HRA The agreed mitigation measures will be expected to form part of planning conditions and/or conditions of relevant environmental permits, and their implementation managed through contractual obligations with supervision from an Environmental Clerk of Works

<sup>&</sup>lt;sup>11</sup> 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

#### 4.3 2 Assumptions during construction

The assumptions made on the mitigation measures for the scheme design, pollution control, biosecurity, disturbance, and the Construction and Environmental Management Plan (CEMP) are:

#### Scheme design

- Should design be altered, every opportunity for avoiding potential effects on Habitats Sites (e g through alternative pipeline routes, micro siting, etc) should be taken
- Construction of new pipeline at watercourse crossings, where the watercourse is in hydrological continuity with a Habitats Site will be carried out using directional drilling to avoid direct impacts on riverbed and permanent habitat loss
- 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 construction-related pollution is identified as one key pathway through which designated sites may be affected. There is numerous guidance on environment good practice measures during construction which can be relied on (at this level) to prevent significant adverse effects on a designated site occurring The best-practice procedures detailed in the following documents should be followed for all construction works derived from this option, as a minimum standard:

CIRIA C741 Environmental Good Practice on Site Guide (Charles and Edwards, 2015)<sup>12</sup>

- Environment Agency's Pollution Prevention Guidance Notes<sup>13</sup> 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).
- The installation of sediment traps near or in watercourses or the use of cofferdams should be specified at the project stage.

#### **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:
  - 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 Fallopia japonica), a specific INNS management plan will be developed
- The best practice procedures detailed in the following documents should be followed to reduce the spread of INNS for all construction works derived from these options, as a minimum standard:

<sup>&</sup>lt;sup>12</sup> Charles P. and Edwards P (2015) Environmental good practice on site guide. CIRIA C741, 260p.

<sup>&</sup>lt;sup>13</sup> Note, the Environment Agency Pollution Prevention Guidance Notes have been withdrawn by the Government, although the principles within them are robust and still form a reasonable basis for pollution prevention measures.

 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 to breeding birds outside of the bird breeding season, in the period April to mid-September inclusive.
- Programme activities likely to result in disturbance to wintering birds outside of the period October to March inclusive.
- Construction related noise disturbance can be further minimised by implementing best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008)<sup>14</sup>.

#### **Disturbance - light**

- Lighting will be kept to a minimum to reduce disturbance. Should the works be undertaken at night and flood lighting required, lighting should be kept to a minimum, and hooded spotlights directed away from potential suitable habitat, to reduce disturbance while ensuring standards for health and safety.
- The potential impact of artificial light may be minimised through the implementation of best practice such as '*Guidance Notes for the Reduction of Obtrusive Light*' (Institute of Lighting Professionals, 2011)<sup>15</sup>.

#### **Construction and Environmental Management Plan**

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

#### 4.3.3 Assumptions during operation

New raw water intakes are assumed to be undertaken under licenced limits.

The water treatment level will need to be appropriate to avoid the risk of spreading Invasive Non-Native Species (INNS) and pathogens, this will be identified at the project stage informed by a baseline study. Refer to lead **Example**, section 4 "*Invasive Non-Native Species Risk Assessment*"

<sup>&</sup>lt;sup>14</sup> 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.

<sup>&</sup>lt;sup>15</sup> Institution of Lighting Professionals (2020) Guidance note for the reduction of obtrusive light. Guidance Note1/20.

# 5 Appropriate Assessment of the GUC Options

## 5.1 Likely Impact Pathways

Considering the type, size and scale of the GUC preferred options, the Stage 1 Screening assessment has been reviewed and the Habitats Sites identified with potential for Likely Significant Effects or Uncertain Effects is given in Appendix B The potential impacts (of construction and operational phases) on these sites are described below. A map of the GUC in relation to these Habitats Sites is given in Appendix A 2

### 5.1 1 Construction Effects

All the GUC options propose taking water from the existing Minworth WwTW for conveyance to the Grand Union Canal Sub-route 1 (all A options) use the existing canal network Sub-route 3 (all B options) will require construction of the Minworth – Atherstone pipeline and sub-option 6 (all C options) require construction of the Minworth Learnington pipeline. Based on the current design information, there are no Habitats Sites in hydrological continuity with the new pipeline corridors and no Habitats Sites located in the range for any construction-related disturbance or pollution effects to be considered.

Below Braunston, all three sub-routes follow the same pathway, using the existing Grand Union Canal to convey the water to their proposed abstraction locations. The canal runs southwards from Braunston for approximately 100km until it meets its proposed abstraction locations at Tring (Option 3), Hemel Hempstead (Option 2) or The Grove (Option 1) Construction of new intakes will be required at the abstraction locations and it is assumed that some new pipework will be required to connect to the Affinity Water network supply The new intakes are likely to require in-channel construction works on the Grand Union Canal In-channel works can result in temporary habitat degradation through, for example, runoff from accidental pollution events or dust emissions from construction-related activities. There is also potential for increased sedimentation and silting as a result of construction activities. These impacts are only considered relevant to a HRA if the impacted watercourse is in hydrological continuity with a Habitats Site In the case of the Grand Union Canal, there are no Habitats Sites in hydrological continuity downstream of the proposed intake locations before it feeds into the River Thames. Therefore, any impacts through in-channel construction at the proposed new intakes are not considered further in this assessment

Chiltern Beechwood SAC is located approximately 600m from the Tring intake on the western side of the Grand Union Canal. Given the close proximity of this site, on-site activities associated with the construction of the intake for Option 3A, 3B and 3C and any associated transfer pipeline have the potential to result in disturbance of sensitive species due to noise, lighting, visual impact, air emissions and vibration. Such disturbance works are typically only considered relevant to a HRA within approximately 500m of localised works. Air emissions and dust associated with construction works and vehicular traffic is only likely to be significant where the transport route to and from the scheme is within 200m of the boundary of the designated site. Given the requirement for any new infrastructure to transfer water from the new intake to the Affinity Water network is not fully understood at this stage, construction in the vicinity of the Tring intake must be considered as a material concern to the HRA assessment for the Chiltern Beechwood SAC. For the purpose of the Gate 1 submission however, construction of the intakes is assumed to be a relatively small/local structure (with headwall into canal and fish screens across abstraction points). Given the localised nature of such works and the fact that

the trainline bisects the canal from the designated site, it is unlikely that construction within the impact disturbance zone of the intake would be required. The SAC is a woodland and dry grassland site which supports the Annex II species stag beetle (*Lucanus cervus*) and therefore most sensitive to disturbance in the early summer when they are most active The vegetative qualifying features of the Chiltern Beechwood SAC are not considered sensitive to disturbance effects. It is suggested that most disturbance risks can almost certainly be avoided or controlled through the application of standard best-practice measures and typical mitigation considered adequate to reduce disturbance effects from increased lighting, noise, vibration and dust and air emissions given in Section 4.3 These measures are considered adequate to ensure no adverse effects on qualifying species occurs

As a precautionary approach, Natural England should be consulted in relation to the location of the Chiltern Beechwood SAC in the vicinity of the intake if Option 3A, 3B or 3C progresses at Gate 2, and the project stage HRA should include a specific mitigation plan to ensure that disturbance factors do not breach agreed thresholds at the boundary of the designated site.

The locations of any pipelines associated with the new intakes at Hemel Hempstead and The Grove are not yet designed, therefore are not considered further in this HRA assessment The construction impacts of the GUC options will be revised at Gate 2 when detailed design has progressed to improve the confidence in ruling out potential impacts on Habitat Sites at this stage.

### 5.1.2 Operational Effects

The operation of the GUC options will see 50 or 100Ml/d of treated effluent being conveyed from Minworth WwTW to the Grand Union Canal for abstraction at Tring, Hemel Hempstead or The Grove. The new water input has the potential to result in temporary increases in surface water levels and flows resulting in water quality changes and alterations to hydrologic/hydraulic processes. Thus there is potential that changes caused by the transfer will cause deterioration of the GUC and other waterbodies in hydraulic continuity with the GUC, although it is acknowledged that a permit level for key substances or parameters would need to be agreed and that work within the Environmental Water Quality workstream and subsequent process design work will progress this

Water transfers always introduce a risk of spreading invasive species, for example by introducing pathogens and fish disease if present at the source. It is assumed that the water will be treated at Minworth WwTW to ensure removal of any INNS before it is discharged into the Grand Union Canal and the WFD assessment indicates that most INNS will have already colonised canals and rivers in the study area by virtue of existing interconnection and navigational use The transfer could however result in an increase of this colonisation

These operational impacts are only considered relevant to the HRA if the impacted watercourse is in hydrological continuity with a Habitats Site. Based on the current WFD Level 1 assessments<sup>16</sup>, only one Habitats Site has been identified with potential hydrologic connectivity to the GUC scheme that might be affected by water quality changes, namely the Upper Nene Valley Gravel Pits SPA/Ramsar site. This potential impact is therefore relevant to all nine options of the GUC scheme

The GUC meets the River Nene at Northampton (from the Northampton Arm of the GUC) and the SPA/Ramsar site is located approximately 10km downstream on the Nene from the junction with the GUC A simple GIS-based review and discussion with Affinity Water and the Canal and Rivers Trust have indicated that there are no feeders to the River Nene along the Northampton

<sup>&</sup>lt;sup>16</sup> Please note that the limitations section of the WFD Gate 1 report indicates that a more complete dataset on existing connectivity between canals and river waterbodies through the whole system is needed to confirm hydrological connections from the GUC at future gate stages

Arm of the GUC and a sluice lockage and bypass flow system is in place Any changes in water quality will not be extreme due to the required treatment of water at Minworth WwTW to acceptable water standards, and as is the nature of the water transfer, it is assumed that there will be mechanism put in place to ensure the increased flow will not be utilised by the Northampton Arm, rather southwards towards the proposed new intakes. The presence of the lockage system where the GUC feeds the River Nene also reduces the likelihood that any changes in water quality as a result of the inputted water will result in any adverse effects on the Habitats Site identified on the River Nene. This assessment is comparable to the WFD assessment which has scoped out any impacts on the River Nene Any such associated impacts relating to the introduction of INNS to lengths of canal/ river channel not previously colonised are similarly unlikely on the Upper Nene Valley Gravel Pits SPA/Ramsar site.

There are no further Habitats Sites likely to be affected by the operation of the GUC options.

## 5.2 Potential Effects on Habitats Sites

The following Habitats Site has been screened in as having the potential to result in Likely Significant Effects or Uncertain Effects as a result of the GUC Option 3A, 3B and 3C, and is therefore subject to a HRA Stage 2: Appropriate Assessment:

Chiltern Beechwood SAC.

For the Appropriate Assessment, a review of the sensitivity of the qualifying features of this Habitats Site in relation to the potential impacts from the options and the conservation objectives of the designated site is required. Table 5.1 lists the features for which this site is designated and identifies the Likely Significant Effects before and after mitigation measures are assumed An assessment of each potential impact on the integrity of the site in view of the sites' structure, function and conservation objectives is given. Where adverse impacts are deemed significant, standard mitigation measures addressing some of these impacts are described in Section 4.3.

A description of the Habitats Site including its conservation objectives and any current pressures or threats is given in Appendix C

#### 5.3 **GUC** scheme Appropriate Assessment

Considering the type, size and scale of Option 3A, 3B and 3C, the potential impacts (of construction and operational phases) are described in Table 5.1 below.

Designated Site	Qualifying features	Potential Adverse Significant Effects	Proposed Mitigation Measures <sup>17</sup>	Residual Effects
(Habitats Site)		(before mitigation)		(after mitigation)
Chiltern Beechwood SAC	<ul> <li>Annex I habitats that are a primary reason for selection of this site</li> <li>9130 Asperulo-Fagetum beech forests</li> <li>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</li> <li>6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)</li> <li>Annex II species present as a qualifying feature, but not a primary reason for selection</li> <li>1083 Stag beetle Lucanus cervus"</li> </ul>	<ul> <li>The proposed intake at Tring is located ~6km from the Chiltern Beechwood SAC.</li> <li>There is potential for the construction of the new intake to result in: <ul> <li>Non-physical disturbance – increased noise/vibration may result in disturbance to qualifying stag beetle</li> <li>Non-toxic contamination – air pollution due to dust deposition may affect qualifying habitats in the SAC</li> </ul> </li> <li>The impacts are considered to be temporary and localised and affecting only a small proportion of the designated site.</li> <li>The identified effects have the potential to reduce the extent and distribution of the qualifying species as well as affecting the structure and function of their supporting habitats, compromising the integrity of the Chiltern Beechwood SAC.</li> <li>No pathways have been identified during operation that could lead to significant effects to the integrity of this SPA/Ramsar site.</li> </ul>	<ol> <li>Standard best practice procedures should be followed during construction to limit construction- related disturbance and contamination including (but not limited to) the following         <ul> <li>CIRIA C741 Environmental good practice on site guide</li> <li>Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites).</li> <li>Best practice such as BS 5228- 1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise.</li> <li>Best practice such as 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night).</li> <li>Industry best practice mitigation measures for dust suppression.</li> <li>Biosecurity measures to ensure appropriate removal of INNS at source.</li> </ul> </li> <li>Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at the project stage.</li> </ol>	Assuming all proposed mitigation is implemented it is considered there will not be a significant change in: • The extent and distribution of qualifying bird species; • The structure and function of the habitats of qualifying species; and • The supporting processes on which habitats of qualifying species rely. No residual effects after mitigation are expected

#### Table 5.1: GUC Option 3 Minworth – Tring (3A, 3B, and 3C): Potential effects on designated sites and qualifying features

<sup>&</sup>lt;sup>17</sup> Full references of guidance documents are given in Section 4.3. where they are first listed

### 5.4 Summary of the GUC Scheme Appropriate Assessment

No significant adverse effects resulting from the implementation of this option are reasonably foreseeable on the integrity of the following Habitats Sites if the suggested mitigation measures are observed:

• Chiltern Beechwood SAC

In conclusion, provided that the proposed mitigation measures are taken forward at the project stage, no residual impacts on the Habitats Sites are likely to occur and therefore no further stages in the HRA process will be necessary for the GUC Scheme.

# 6 Conclusions

The options for the GUC Scheme have been subject to a HRA Stage 1 assessment, which was completed by WRSE. Subsequently, a HRA Stage 2 Appropriate Assessment (plan stage) has been undertaken. The HRA Stage 2 Appropriate Assessment did not identify any options that, if implemented (alone), would result in any residual significant impacts on the National Site Network of designated sites (Habitats Sites).

The Appropriate Assessment undertaken for Options 1 (Minworth – The Grove) and Option 2 (Minworth – Hemel Hempstead) and their associated A, B, and C sub-routes did not identify any transmission pathways by which a Likely Significant Effect could reasonably occur. No key risks to Habitats Sites were identified during construction or operation of these options.

The Appropriate Assessment undertaken for Option 3 (Minworth – Tring) and its associated A, B, and C sub-routes identified a transmission pathway to the Chiltern Beechwood SAC, but concluded that no significant effects are foreseeable on the integrity of the Habitats Sites if the suggested mitigation measures are observed.

It should be noted that at this stage an in-combination assessment to identify potential cumulative effects of GUC options with other related or non-related plans or projects has not been conducted. An in-combination assessment would not be considered proportionate at this stage (at WRSE regional plan level), due to the early stages of the regional plan, and the preliminary nature of design details on the GUC scheme and other SROs. It is recommended that an updated HRA be conducted at Gate 2 to include an in-combination assessment of the options within the GUC that are brought forward, between different SROs and between any other external plans or projects that may put pressure on the same water resources.

# A. Maps



#### Figure A.1: Overview of the GUC Scheme




| May 2021

# **B. WRSE Screening Results for GUC Scheme**

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
1A	GUC SRO transfer - Grove Construction & Operation	GUC SRO transfer – <b>Grove</b> <b>Construction &amp; Operation – via</b> <b>Route 1</b> (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Ensor's Pool SAC 1km east	<ul> <li>Annex I habitats that are a primary reason for selection of this site</li> <li>Not Applicable</li> <li>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</li> <li>Not Applicable</li> <li>Annex II species that are a primary reason for selection of this site</li> <li>1092 White-clawed (or Atlantic stream) crayfish</li> <li>Austropotamobius pallipes</li> <li>Annex II species present as a qualifying feature, but not a primary reason for site selection</li> </ul>	Ensor's Pool SSSI: Favourable - 0.00% Unfavourable - Recovering - 0.00% Unfavourable - No change - 0.00% Unfavourable - Declining - 100.00%	No Likely Significant Effects	No apparent hydrological connection to N2k site. Largely separated from the GUC by urban areas. No construction in this area.
		GUC SRO transfer <b>– Grove</b> Construction & Operation – via Route 1 (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits Ramsar 7.8km north east of GUC	Ramsar criterion 5Regularly supports 20,000 or more waterbirds.In the non-breeding season, the site regularly supports23,821 individual waterbirds (5 year peakmean 1999/2000 – 2003/04).Ramsar criterion 6Regularly supports 1% of the individuals in the populationsof the following species or subspecies of waterbird in anyseason.Mute swan Cygnus olor 629 individuals – wintering. 5 yearpeak mean 1999/2000 – 2003/04 – 1.7% BritainGadwall Anas strepera 773 individuals – wintering. 5 yearpeak mean 1999/2000 – 2003/04 – 2.0% strepera NWEurope (breeding)	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
		GUC SRO transfer – <b>Grove</b> <b>Construction &amp; Operation – via</b> <b>Route 1</b> (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits SPA 7.8km north east	Article 4.1 Qualification Used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season: Bittern <i>Botaurus stellaris</i> 2 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of GB population. Golden plover <i>Pluvialis apricaria</i> 5790 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2.3% of GB population. Article 4.2 Qualification Used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season: Gadwall <i>Anas strepera</i> (migratory species) 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of strepera subspecies/population in NW Europe (breeding).	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.
		GUC SRO transfer – <b>Grove</b> <b>Construction &amp; Operation – via</b> <b>Route 1</b> (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Chiltern Beechwoods SAC 0.6km east of the closest point of to the GUC. ~15km north of the proposed Grove abstraction point	Annex I habitats that are a primary reason for selection of this site 9130 Asperulo-Fagetum beech forests Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites) Annex II species that are a primary reason for selection of this site Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection 1083 Stag beetle Lucanus cervus	Ashridge Commons and Woods SSSI: Favourable - 86.33% Unfavourable - Recovering - 13.67% Unfavourable - No change - 0.00% Unfavourable - Declining - 0.00%	No Likely Significant Effects	No hydrological connection apparent. Separated from N2k site by railway line . No construction here to cause dust, pollution etc.
2A	GUC SRO transfer - HemelH Construction & Operation	GUC SRO transfer – <b>HemelH</b> Construction & Operation – via Route 1 (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Chiltern Beechwoods SAC 0.6km east of closest point to GUC. ~6km north of the proposed Hemel Hempstead abstraction point	Annex I habitats that are a primary reason for selection of this site 9130 Asperulo-Fagetum beech forests Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites) Annex II species that are a primary reason for selection of this site Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection 1083 Stag beetle Lucanus cervus	Ashridge Commons and Woods SSSI: Favourable - 86.33% Unfavourable - Recovering - 13.67% Unfavourable - No change - 0.00% Unfavourable - Declining - 0.00%	No Likely Significant Effects	No hydrological connection, no anticipated increase in water levels to the dry grassland. No losses of important sites to stag beetles, i.e. rotten mature trees or habitat loss. No land take from beech forests or cause for enrichment. At this point in the scheme's transfer the water is in the GUC.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
		GUC SRO transfer – <b>HemelH</b> Construction & Operation – via Route 1 (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Ensor's Pool SAC 1km east	Annex I habitats that are a primary reason for selection of this site Not Applicable Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site Not Applicable Annex II species that are a primary reason for selection of this site 1092 White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes Annex II species present as a qualifying feature, but not a primary reason for site selection Not Applicable	Ensor's Pool SSSI: Favourable - 0.00% Unfavourable - Recovering - 0.00% Unfavourable - No change - 0.00% Unfavourable - Declining - 100.00%	No Likely Significant Effects	Ensor's pool is a small SAC designated for white claw crayfish, transferring water via the canal systems in this option is not likely to cause the transfer of either, signal crayfish or the fungus which kills white-clawed crayfish into Ensor's pool. Therefore no LSE are anticipated. This designation is too far from the construction to be considered for LSE.
		GUC SRO transfer – <b>HemelH</b> Construction & Operation – via Route 1 (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits SPA 7.8km north east	Article 4.1 Qualification Used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season: Bittern <i>Botaurus stellaris</i> 2 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of GB population. Golden plover <i>Pluvialis apricaria</i> 5790 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2.3% of GB population. Article 4.2 Qualification Used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season: Gadwall <i>Anas strepera</i> (migratory species) 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of strepera subspecies/population in NW Europe (breeding).	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.
		GUC SRO transfer – HemelH Construction & Operation – via Route 1 (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits Ramsar 7.8km north east of GUC 60km north of abstraction location.	<ul> <li>Ramsar criterion 5</li> <li>Regularly supports 20,000 or more waterbirds. In the non-breeding season, the site regularly supports 23,821 individual waterbirds (5 year peak mean 1999/2000 – 2003/04).</li> <li>Ramsar criterion 6</li> <li>Regularly supports 1% of the individuals in the populations of the following species or subspecies of waterbird in any season.</li> <li>Mute swan <i>Cygnus olor</i> 629 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04 – 1.7% Britain Gadwall <i>Anas strepera</i> 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04 – 2.0% strepera NW Europe (breeding)</li> </ul>	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
ЗА	GUC SRO transfer - Tring Construction & Operation	GUC SRO transfer – <b>Tring</b> <b>Construction &amp; Operation – via</b> <b>Route 1</b> (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Chiltern Beechwoods SAC 0.6km east of the Grand Union Canal at the closest point and proposed Tring abstraction point	Annex I habitats that are a primary reason for selection of this site 9130 Asperulo-Fagetum beech forests Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites) Annex II species that are a primary reason for selection of this site Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection 1083 Stag beetle <i>Lucanus cervus</i>	Ashridge Commons and Woods SSSI: Favourable - 86.33% Unfavourable - Recovering - 13.67% Unfavourable - No change - 0.00% Unfavourable - Declining - 0.00%	Uncertain Effects	No hydrological connection, no cause of increase in water levels to the dry grassland. Construction is 0.6km from designated site and uncertainty whether associated intake infrastructure will be required in close proximity to the SAC. No direct cause to losses of important sites to stag beetles, i.e. rotten mature trees or habitat loss and no land take from beech forests or cause for enrichment. There may be potential for disturbance-related effects from construction through noise, vibration and air emissions given the close proximity of the site
		GUC SRO transfer – <b>Tring</b> <b>Construction &amp; Operation – via</b> <b>Route 1</b> (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Ensor's Pool SAC 1km east	<ul> <li>Annex I habitats that are a primary reason for selection of this site</li> <li>Not Applicable</li> <li>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</li> <li>Not Applicable</li> <li>Annex II species that are a primary reason for selection of this site</li> <li>1092 White-clawed (or Atlantic stream) crayfish</li> <li>Austropotamobius pallipes</li> <li>Annex II species present as a qualifying feature, but not a primary reason for site selection</li> <li>Not Applicable</li> </ul>	Ensor's Pool SSSI: Favourable - 0.00% Unfavourable - Recovering - 0.00% Unfavourable - No change - 0.00% Unfavourable - Declining - 100.00%	No Likely Significant Effects	Ensor's pool is a small SAC designated for white claw crayfish, transferring water via the canal systems in this option is not likely to cause the transfer of either, signal crayfish or the fungus which kills white-clawed crayfish into Ensor's pool. Therefore no LSE are anticipated. N2K is too far from Iver construction to be considered for any LSE
		GUC SRO transfer – <b>Tring</b> <b>Construction &amp; Operation – via</b> <b>Route 1</b> (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits Ramsar 7.8km north east of GUC 48.3km north of abstraction location	<ul> <li>Ramsar criterion 5</li> <li>Regularly supports 20,000 or more waterbirds.</li> <li>In the non-breeding season, the site regularly supports 23,821 individual waterbirds (5 year peak mean 1999/2000 – 2003/04).</li> <li>Ramsar criterion 6</li> <li>Regularly supports 1% of the individuals in the populations of the following species or subspecies of waterbird in any season.</li> <li>Mute swan <i>Cygnus olor</i> 629 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04 – 1.7% Britain Gadwall <i>Anas strepera</i> 773 individuals – wintering. 5 year</li> </ul>	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. Construction at Tring may cause some input (dust/contaminates or other) into the GCU without mitigation. Without a method statement this cannot be fully determined. This, in combination with the weak hydrological link means LSE cannot be ruled out entirely.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
				peak mean 1999/2000 – 2003/04 – 2.0% strepera NW Europe (breeding)			
		GUC SRO transfer – <b>Tring</b> <b>Construction &amp; Operation – via</b> <b>Route 1</b> (Minworth to Birmingham canal, Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits SPA 7.8km north east	Article 4.1 Qualification Used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season: Bittern <i>Botaurus stellaris</i> 2 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of GB population. Golden plover <i>Pluvialis apricaria</i> 5790 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2.3% of GB population. Article 4.2 Qualification Used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season: Gadwall <i>Anas strepera</i> (migratory species) 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of strepera subspecies/population in NW Europe (breeding).	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.
1B	GUC SRO transfer - Grove Construction & Operation	GUC SRO transfer – <b>Grove</b> <b>Construction &amp; Operation – via</b> <b>Route 3</b> (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Ensor's Pool SAC 1km east of the nearest section of the transfer (canal) 97.2km from the abstraction point	Annex I habitats that are a primary reason for selection of this site Not ApplicableAnnex I habitats present as a qualifying feature, but not a primary reason for selection of this site Not ApplicableAnnex II species that are a primary reason for selection of this site 1092 White-clawed (or Atlantic stream) crayfish Austropotamobius pallipesAnnex II species present as a qualifying feature, but not a primary reason for selection Not Applicable	Ensor's Pool SSSI: Favourable - 0.00% Unfavourable - Recovering - 0.00% Unfavourable - No change - 0.00% Unfavourable - Declining - 100.00%	No Likely Significant Effects	No apparent hydrological connection from map. Largely separated from the GUC by urban area.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
		GUC SRO transfer – <b>Grove</b> <b>Construction &amp; Operation – via</b> <b>Route 3</b> (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits Ramsar 7.8km north east of the GUC 50.9km from the abstraction point	Ramsar criterion 5Regularly supports 20,000 or more waterbirds.In the non-breeding season, the site regularly supports23,821 individual waterbirds (5 year peakmean 1999/2000 – 2003/04).Ramsar criterion 6Regularly supports 1% of the individuals in the populationsof the following species or subspecies of waterbird in anyseason.Mute swan Cygnus olor 629 individuals – wintering. 5 yearpeak mean 1999/2000 – 2003/04 – 1.7% BritainGadwall Anas strepera 773 individuals – wintering. 5 yearpeak mean 1999/2000 – 2003/04 – 2.0% strepera NWEurope (breeding)	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene so effects need further assessment. Abstraction at Grove is not likely have LSE on the Upper Nene valley.
		GUC SRO transfer – Grove Construction & Operation – via Route 3 (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits SPA 7.8km north east of the GUC 50.9km from the abstraction point	Article 4.1 Qualification Used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season: Bittern Botaurus stellaris 2 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of GB population. Golden plover Pluvialis apricaria 5790 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2.3% of GB population. Article 4.2 Qualification Used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season: Gadwall Anas strepera (migratory species) 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of strepera subspecies/population in NW Europe (breeding).	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene.
		GUC SRO transfer – Grove Construction & Operation – via Route 3 (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Chiltern Beechwoods SAC 0.6km east of the closest point of to the GUC. ~15km north of the proposed Grove abstraction point	Annex I habitats that are a primary reason for selection of this site 9130 Asperulo-Fagetum beech forests Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites) Annex II species that are a primary reason for selection of this site Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection 1083 Stag beetle Lucanus cervus	Ashridge Commons and Woods SSSI: Favourable - 86.33% Unfavourable - Recovering - 13.67% Unfavourable - No change - 0.00% Unfavourable - Declining - 0.00%	No Likely Significant Effects	No hydrological connection apparent. Separated by railway line. Construction at Tring for abstraction is 0.7km from this N2K site and is therefore considered to be far enough away that no LSE will occur, even without detailed construction methodologies.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
2В	GUC SRO transfer - HemelH Construction & Operation	GUC SRO transfer – HemelH Construction & Operation – via Route 3 (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Ensor's Pool SAC 1km east from the nearest section of the transfer (canal) 110km from the abstraction point	Annex I habitats that are a primary reason for selection of this site Not ApplicableAnnex I habitats present as a qualifying feature, but not a primary reason for selection of this site Not ApplicableAnnex II species that are a primary reason for selection of this site 1092 White-clawed (or Atlantic stream) crayfish Austropotamobius pallipesAnnex II species present as a qualifying feature, but not a primary reason for site selection Not Applicable	Ensor's Pool SSSI: Favourable - 0.00% Unfavourable - Recovering - 0.00% Unfavourable - No change - 0.00% Unfavourable - Declining - 100.00%	No Likely Significant Effects	No apparent hydrological connection from map. Largely separated from the GUC by urban area.
		GUC SRO transfer – HemelH Construction & Operation – via Route 3 (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits Ramsar 7.8km north east of the GUC 60.4km from the abstraction point	Ramsar criterion 5Regularly supports 20,000 or more waterbirds.In the non-breeding season, the site regularly supports23,821 individual waterbirds (5 year peakmean 1999/2000 – 2003/04).Ramsar criterion 6Regularly supports 1% of the individuals in the populationsof the following species or subspecies of waterbird in anyseason.Mute swan Cygnus olor 629 individuals – wintering. 5 yearpeak mean 1999/2000 – 2003/04 – 1.7% BritainGadwall Anas strepera 773 individuals – wintering. 5 yearpeak mean 1999/2000 – 2003/04 – 2.0% strepera NWEurope (breeding)	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.
		GUC SRO transfer – <b>HemelH</b> Construction & Operation – via Route 3 (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits SPA 7.8km north east of the GUC 58.4km from the abstraction point	Article 4.1 Qualification Used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season: Bittern <i>Botaurus stellaris</i> 2 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of GB population. Golden plover <i>Pluvialis apricaria</i> 5790 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2.3% of GB population. Article 4.2 Qualification Used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season: Gadwall Anas strepera (migratory species) 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of strepera subspecies/population in NW Europe (breeding).	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
		GUC SRO transfer – HemelH Construction & Operation – via Route 3 (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Chiltern Beechwoods SAC 0.6km east of closest point to GUC. ~6km north of the proposed Hemel Hempstead abstraction point	Annex I habitats that are a primary reason for selection of this site 9130 Asperulo-Fagetum beech forests Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites) Annex II species that are a primary reason for selection of this site Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection 1083 Stag beetle Lucanus cervus	Ashridge Commons and Woods SSSI: Favourable - 86.33% Unfavourable - Recovering - 13.67% Unfavourable - No change - 0.00% Unfavourable - Declining - 0.00%	No Likely Significant Effects	No hydrological connection apparent. Separated by railway line. Construction at Tring for abstraction is 6.5km from this N2K site and is therefore considered to be far enough away that no LSE will occur, even without detailed Construction methodologies.
3B	GUC SRO transfer - Tring Construction & Operation	GUC SRO transfer – <b>Tring</b> <b>Construction &amp; Operation – via</b> <b>Route 3</b> (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Ensor's Pool SAC 1km east from the nearest section of the transfer (canal) 95.6km from the abstraction point	Annex I habitats that are a primary reason for selection of this site Not Applicable Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site Not Applicable Annex II species that are a primary reason for selection of this site 1092 White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes Annex II species present as a qualifying feature, but not a primary reason for site selection Not Applicable	Ensor's Pool SSSI: Favourable - 0.00% Unfavourable - Recovering - 0.00% Unfavourable - No change - 0.00% Unfavourable - Declining - 100.00%	No Likely Significant Effects	No apparent hydrological connection from map. Largely separated from the GUC by urban area. Extreme distance from the abstraction point, no LSE at this distance.
		GUC SRO transfer – Tring Construction & Operation – via Route 3 (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits Ramsar 7.8km north east of the GUC 47.5km from the abstraction point	<ul> <li>Ramsar criterion 5</li> <li>Regularly supports 20,000 or more waterbirds.</li> <li>In the non-breeding season, the site regularly supports 23,821 individual waterbirds (5 year peak mean 1999/2000 – 2003/04).</li> <li>Ramsar criterion 6</li> <li>Regularly supports 1% of the individuals in the populations of the following species or subspecies of waterbird in any season.</li> <li>Mute swan Cygnus olor 629 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04 – 1.7% Britain Gadwall Anas strepera 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04 – 2.0% strepera NW Europe (breeding)</li> </ul>	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
		GUC SRO transfer – <b>Tring</b> <b>Construction &amp; Operation – via</b> <b>Route 3</b> (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Upper Nene Valley Gravel Pits SPA 7.8km north east of the GUC 47.5km from the abstraction point	<ul> <li>Article 4.1 Qualification</li> <li>Used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season:</li> <li>Bittern Botaurus stellaris 2 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of GB population.</li> <li>Golden plover Pluvialis apricaria 5790 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2.3% of GB population.</li> <li>Article 4.2 Qualification</li> <li>Used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season:</li> <li>Gadwall Anas strepera (migratory species) 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of strepera subspecies/population in NW Europe (breeding).</li> </ul>	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.
		GUC SRO transfer – <b>Tring</b> <b>Construction &amp; Operation – via</b> <b>Route 3</b> (Minworth to Atherston pipeline followed by Coventry canal, Oxford Canal, GUCanal)	Chiltern Beechwoods SAC 0.6km east of the Grand Union Canal at the closest point. ~0.8km from proposed Tring abstraction point.	Annex I habitats that are a primary reason for selection of this site 9130 Asperulo-Fagetum beech forests Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites) Annex II species that are a primary reason for selection of this site Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection 1083 Stag beetle <i>Lucanus cervus</i>	Ashridge Commons and Woods SSSI: Favourable - 86.33% Unfavourable - Recovering - 13.67% Unfavourable - No change - 0.00% Unfavourable - Declining - 0.00%	Uncertain Effects	No hydrological connection, no cause of increase in water levels to the dry grassland. Construction is 0.6km from designated site and uncertainty whether associated intake infrastructure will be required in close proximity to the SAC. No direct cause to losses of important sites to stag beetles, i.e. rotten mature trees or habitat loss and no land take from beech forests or cause for enrichment. There may be potential for disturbance-related effects from construction through noise, vibration and air emissions given the close proximity of the site.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
1C	GUC SRO transfer - Grove Construction & Operation	GUC SRO transfer – <b>Grove</b> <b>Construction &amp; Operation – via</b> <b>Route 6</b> (Minworth to Leamington pipeline followed by GUCanal)	Chiltern Beechwoods SAC 0.6km east of the closest point of to the GUC. ~15km north of the proposed Grove abstraction point	Annex I habitats that are a primary reason for selection of this site 9130 Asperulo-Fagetum beech forests Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites) Annex II species that are a primary reason for selection of this site Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection 1083 Stag beetle Lucanus cervus	Ashridge Commons and Woods SSSI: Favourable - 86.33% Unfavourable - Recovering - 13.67% Unfavourable - No change - 0.00% Unfavourable - Declining - 0.00%	No Likely Significant Effects	No hydrological connection apparent. Separated by railway line. No construction impacts.
		GUC SRO transfer – Grove Construction & Operation – via Route 6 (Minworth to Leamington pipeline followed by GUCanal)	Upper Nene Valley Gravel Pits Ramsar 7.8km north east of the GUC	<ul> <li>Ramsar criterion 5</li> <li>Regularly supports 20,000 or more waterbirds.</li> <li>In the non-breeding season, the site regularly supports 23,821 individual waterbirds (5 year peak mean 1999/2000 – 2003/04).</li> <li>Ramsar criterion 6</li> <li>Regularly supports 1% of the individuals in the populations of the following species or subspecies of waterbird in any season.</li> <li>Mute swan <i>Cygnus olor</i> 629 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04 – 1.7% Britain Gadwall <i>Anas strepera</i> 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04 – 2.0% strepera NW Europe (breeding)</li> </ul>	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.
		GUC SRO transfer – Grove Construction & Operation – via Route 6 (Minworth to Leamington pipeline followed by GUCanal)	Upper Nene Valley Gravel Pits SPA 7.8km north east of the GUC	Article 4.1 Qualification Used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season: Bittern <i>Botaurus stellaris</i> 2 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of GB population. Golden plover <i>Pluvialis apricaria</i> 5790 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2.3% of GB population. Article 4.2 Qualification Used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season: Gadwall <i>Anas strepera</i> (migratory species) 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of strepera subspecies/population in NW Europe (breeding).	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
2C	GUC SRO transfer - HemelH Construction & Operation	GUC SRO transfer – HemelH Construction & Operation – via Route 6 (Minworth to Leamington pipeline followed by GUCanal)	Chiltern Beechwoods SAC 0.6km east of the Grand Union Canal at the closest point. 6.5km from the Hemel Hempstead abstraction point.	Annex I habitats that are a primary reason for selection of this site 9130 Asperulo-Fagetum beech forests Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites) Annex II species that are a primary reason for selection of this site Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection 1083 Stag beetle Lucanus cervus	Ashridge Commons and Woods SSSI: Favourable - 86.33% Unfavourable - Recovering - 13.67% Unfavourable - No change - 0.00% Unfavourable - Declining - 0.00%	No Likely Significant Effects	No hydrological connection apparent. Separated by railway line. No construction impacts anticipated.
		GUC SRO transfer – HemelH Construction & Operation – via Route 6 (Minworth to Leamington pipeline followed by GUCanal)	Upper Nene Valley Gravel Pits Ramsar 7.8km north east of the GUC	<ul> <li>Ramsar criterion 5</li> <li>Regularly supports 20,000 or more waterbirds.</li> <li>In the non-breeding season, the site regularly supports 23,821 individual waterbirds (5 year peak mean 1999/2000 – 2003/04).</li> <li>Ramsar criterion 6</li> <li>Regularly supports 1% of the individuals in the populations of the following species or subspecies of waterbird in any season.</li> <li>Mute swan Cygnus olor 629 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04 – 1.7% Britain Gadwall Anas strepera 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04 – 2.0% strepera NW Europe (breeding)</li> </ul>	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.
		GUC SRO transfer – HemelH Construction & Operation – via Route 6 (Minworth to Leamington pipeline followed by GUCanal)	Upper Nene Valley Gravel Pits SPA 7.8km north east of the GUC	Article 4.1 Qualification Used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season: Bittern <i>Botaurus stellaris</i> 2 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of GB population. Golden plover <i>Pluvialis apricaria</i> 5790 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2.3% of GB population. Article 4.2 Qualification Used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season: Gadwall <i>Anas strepera</i> (migratory species) 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of strepera subspecies/population in NW Europe (breeding).	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
3C	GUC SRO transfer - Tring Construction & Operation	GUC SRO transfer – <b>Tring</b> <b>Construction &amp; Operation – via</b> <b>Route 6</b> (Minworth to Leamington pipeline followed by GUCanal)	Chiltern Beechwoods SAC 0.6km east of the Grand Union Canal at the closest point. ~0.8km from proposed Tring abstraction point.	Annex I habitats that are a primary reason for selection of this site 9130 Asperulo-Fagetum beech forests Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites) Annex II species that are a primary reason for selection of this site Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection 1083 Stag beetle <i>Lucanus cervus</i>	Ashridge Commons and Woods SSSI: Favourable - 86.33% Unfavourable - Recovering - 13.67% Unfavourable - No change - 0.00% Unfavourable - Declining - 0.00%	Uncertain Effects	No hydrological connection, no cause of increase in water levels to the dry grassland. Construction is 0.6km from designated site and uncertainty whether associated intake infrastructure will be required in close proximity to the SAC. No direct cause to losses of important sites to stag beetles, i.e. rotten mature trees or habitat loss and no land take from beech forests or cause for enrichment. There may be potential for disturbance-related effects from construction through noise, vibration and air emissions given the close proximity of the site.
		GUC SRO transfer – <b>Tring</b> <b>Construction &amp; Operation – via</b> <b>Route 6</b> (Minworth to Leamington pipeline followed by GUCanal)	Upper Nene Valley Gravel Pits Ramsar 7.8km north east of the GUC	<ul> <li>Ramsar criterion 5</li> <li>Regularly supports 20,000 or more waterbirds.</li> <li>In the non-breeding season, the site regularly supports 23,821 individual waterbirds (5 year peak mean 1999/2000 – 2003/04).</li> <li>Ramsar criterion 6</li> <li>Regularly supports 1% of the individuals in the populations of the following species or subspecies of waterbird in any season.</li> <li>Mute swan Cygnus olor 629 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04 – 1.7% Britain Gadwall Anas strepera 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04 – 2.0% strepera NW Europe (breeding)</li> </ul>	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.

Option ID Number	Option Title	Option Description	Natura 2000 Sites Assessed (inc distances)	Qualifying Features	SSSI Condition Assessment	Screening Result	Justification for Assessment
		GUC SRO transfer – <b>Tring</b> <b>Construction &amp; Operation – via</b> <b>Route 6</b> (Minworth to Leamington pipeline followed by GUCanal)	Upper Nene Valley Gravel Pits SPA 7.8km north east of the GUC	Article 4.1 Qualification Used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season: Bittern <i>Botaurus stellaris</i> 2 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of GB population. Golden plover <i>Pluvialis apricaria</i> 5790 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2.3% of GB population. Article 4.2 Qualification Used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season: Gadwall <i>Anas strepera</i> (migratory species) 773 individuals – wintering. 5 year peak mean 1999/2000 – 2003/04. 2% of strepera subspecies/population in NW Europe (breeding).	Upper Nene Valley Gravel Pits SSSI: Favourable - 1.49% Unfavourable - Recovering - 48.48% Unfavourable - No change - 50.03% Unfavourable - Declining - 0.00%	Uncertain Effects	Hydrological connection from the GUC downstream along Wilton Brook/River Nene. No construction nearby but alterations to flow and water quality could have significant effects on the N2k site.

## **C.** Designated Site Information

#### C.1 Chiltern Beechwood SAC

**Name:** Chilterns Beechwoods Unitary Authority/County: Buckinghamshire, Hertfordshire, Oxfordshire, Windsor and Maidenhead

SAC status: Designated on 1 April 2005

Grid reference: SP97 S

AC EU code: UK0012724

Area (ha): 1276.48

**Component SSSI:** Ashridge Commons and Woods SSSI, Aston Rowant Woods SSSI, Bisham Woods SSSI, Bradenham Woods, Park Wood and The Coppice SSSI, Ellesborough and Kimble Warrens SSSI, Hollowhill and Pullingshill Woods SSSI, Naphill Common SSSI, Tring Woodlands SSSI, Windsor Hill SSSI

**Site description:** The Chilterns Beechwoods represent a very extensive tract of ancient seminatural beech Fagus sylvatica forests in the centre of the habitat's UK range. The woodland is an important part of a mosaic with species-rich chalk grassland and scrub. A distinctive feature in the woodland flora is the occurrence of the rare coralroot *Cardamine bulbifera*. Standing and fallen dead timber provide habitat for dead-wood (saproxylic) invertebrates, including stag beetle *Lucanus cervus*.

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

- Asperulo-Fagetum beech forests. (Beech forests on neutral to rich soils)
- Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*). (Dry grasslands and scrublands on chalk or limestone)

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

• Stag beetle Lucanus cervus

**Conservation Objectives:** With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

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.





## Grand Union Canal Strategic Resource Option

Water Framework Directive Assessment: Level 2 Assessment

May 2021

The content of this document is draft and relates to material [or data] which is still in the course of completion in travel to Gate 2 and should not be relied upon at this early stage of development. We continue to develop our thinking and our approach to the issues raised in the document in preparation for Gate 2. Mott MacDonald 22 Station Road Cambridge CB1 2JD United Kingdom

T +44 (0)1223 463500 mottmac.com

Affinity Water, Tamblin Way, Hatfield, Hertfordshire, AL10 9EZ.

# Grand Union Canal Strategic Resource Option

Water Framework Directive Assessment: Level 2 Assessment

May 2021

### **Issue and Revision Record**

Revision	Date	Originator	Checker	Approver	Description
P01	Apr 2021				First draft for client comment
P02	May 2021				Final following client comments

#### Document reference:

Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the abovecaptioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

### Contents

Exe	ecutive Summary	5
1	Introduction	6
	1 1 Overview	6
	1.2 Severn Trent to Affinity Transfer Grand Union Canal Options	6
2	Methodology	7
	2.1 Approach to WFD assessment for SROs	7
	2.2 Information used	8
	2.3 Limitations and assumptions	8
	2.4 Recommendations for WFD for Gate 2 and beyond	10
3	Scheme description	11
	3.1 Overview	11
	3 2 Option descriptions	11
4	Level 1 WFD findings	15
	4.1 WRSE review	15
	4 2 Level 1 WFD Assessment Summary	15
5	Level 2 WFD assessments	20
	5 1 Review of river waterbodies for assessment	20
	5.2 Summary of results / outcomes	20
	5 3 Level 2 summary tables	21
6	Conclusions	40
	6.1 Summary	40
	6 2 Further assessment	40
A.	WRSE output tables	45
В	Further assessment output tables	46

### Figures

1	4
	1

### Tables

Table 1 1: GUC options	6
Table 3 1: Option descriptions for Severn Trent to Affinity Water GUC transfer	12
Table 4.1: Level 1 summary results key	15
Table 4.2: Severn Trent to AfW Transfer Options Level 1 WFD Assessment Summary (see	
Table 4 1 for key)	16
Table 5 1: Explanation of WFD outcomes, based on ACWG methodology	21
Table 5 2: Description of WFD risk levels/outcomes, based on ACWG methodology       2	21
Table 5.3: Option 1A: Treated wastewater transfer from Minworth WwTW to The Grove viaRoute 1 (50 or 100MI/d) Level 2 WFD summary	22
Table 5.4: Option 2A: Treated wastewater transfer from Minworth WwTW to Hemel         Hempstead via Route 1 (50 or 100MI/d) Level 2 WFD summary	24
Table 5.5: Option 3A: Treated wastewater transfer from Minworth WwTW to Tring via Route1 (50 or 100MI/d) Level 2 WFD summary	26
Table 5.6: Option 1B: Treated wastewater transfer from Minworth WwTW to The Grove viaRoute 3 (50 or 100MI/d) Level 2 WFD summary	28
Table 5 7: Option 2B: Treated wastewater transfer from Minworth WwTW to HemelHempstead via Route 3 (50 or 100MI/d) Level 2 WFD summary	30
Table 5.8: Option 3B: Treated wastewater transfer from Minworth WwTW to Tring via Route3 (50 or 100MI/d) Level 2 WFD summary	32
Table 5 9: Option 1C: Treated wastewater transfer from Minworth WwTW to The Grove viaRoute 6 (50 or 100MI/d) Level 2 WFD summary	34
Table 5.10: Option 2C: Treated wastewater transfer from Minworth WwTW to Hemel         Hempstead via Route 6 (50 or 100MI/d) Level 2 WFD summary	36
Table 5 11: Option 3C: Treated wastewater transfer from Minworth WwTW to Tring viaRoute 6 (50 or 100MI/d) Level 2 WFD summary	38
Table 6.1: Summary of Level 2 outcomes – number of WFD waterbodies per option	40
Table 6.2: Design assumptions and next steps for WFD assessment	42
Table 6 3: WFD assessment limitations / assumptions and next steps	43

## Glossary

Acronym	Definition
ACWG	All Company Working Group
AWB	Artificial Waterbody
CDR	Concept Design Report
EA	Environment Agency
EAR	Environmental Assessment Report
EU	European Union
EQS	Environmental Quality Standard
GEP	Good Ecological Potential
GES	Good Ecological Status
GUC	Grand Union Canal
HMWB	Heavily Modified Waterbody
INNS	Invasive Non Native Species
MI/d	Megalitres per day
PMB	Programme Management Board (GUC)
РОМ	Programme of Measures [WFD measures required to improve waterbody status]
PS	Pumping station
RAPID	Regulators' Alliance for Progressing Infrastructure Development
RBMP	River Basin Management Plan
RNAG	Reason for Not Achieving Good [WFD status]
SRO	Strategic Resource Option
WFD	Water Framework Directive
WRSE	Water Resources South East
WSR	Water supply reservoir
WSW	Water Supply Works
WwTW	Water Treatment Works

### **Executive Summary**

This Water Framework Directive (WFD) Assessment Annex supports the accompanying Environmental Assessment Summary Report (EAR) in support of the Gate 1 submission to Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the Grand Union Canal (GUC) Strategic Resource Option (SRO). This Annex presents the results of the WFD assessment applied to the GUC transfer route and abstraction location options (nine combined options in total). The transfer would be reliant on operation of the Minworth SRO as the source of additional water. The Minworth SRO is not part of the GUC WFD assessment at this stage and will be covered in the equivalent Annex for Minworth SRO Gate 1 submission.

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 GUC Options Appraisal (GUC PMB (2021), Grand Union Canal SRO Options Appraisal – Gate 1, **March 2021**, 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 multiple WFD waterbodies which required further assessment.

Level 2 WFD assessments have been completed for screened-in waterbodies, following an additional connectivity review, 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 WFD compliance risks associated with operation of the transfer for all options. Potential water quality effects could conflict with achieving WFD status objectives. This is particularly the case for waterbodies where physico-chemical conditions (in particular nutrient levels) are the existing limiting factors, recorded in WFD baseline data as a 'reason for not achieving good'. Potential subsequent biological effects would require further assessment.

For all options it has been assumed that the Minworth SRO would be used in combination with this option to source the transfer water into the GUC network.

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 Summary Report (EAR) accompanying the Gate 1 submission to the Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the Severn Trent to Affinity Transfer via the Grand Union Canal (GUC) Strategic Resource Option (SRO). The scheme would transfer water from Minworth Wastewater Treatment Works (WwTW) in the Midlands, to Affinity Water in the South East using the existing canal network.

6

This Annex presents the findings of a Water Framework Directive (WFD) assessment applied to the transfer route options. The route options were shortlisted by GUC PMB in 2020 (WP1a) and shortlisted options reviewed in more detail in 2021. Details of the options and wider assessment are reported in *WP1B – Engineering Route Development report (March 2021)*.

#### 1.2 Severn Trent to Affinity Transfer - Grand Union Canal Options

The outputs of options appraisal WP1a and WP1b identified three viable transfer routes and WP2 reviewed and short-listed three potential abstraction locations for the GUC transfer as shown in Table 1.1. The transfer would be reliant on operation of the Minworth SRO as the source of additional water. The Minworth SRO is not part of the GUC WFD assessment at this stage. Further detail of scheme options is included in Section 3. Assumptions and limitations are outlined in Section 2.3.

WFD Option	GUC route	Abstraction location	Option description
1A	1	Grove	Treated wastewater transfer from Minworth WwTW to The Grove via Route 1 (Birmingham to Fazeley, Coventry, Oxford and Grand Union Canals)
1B	3	Grove	Treated wastewater transfer from Minworth WwTW to The Grove via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford and Grand Union Canals)
1C	6	Grove	Treated wastewater transfer from Minworth WwTW to The Grove via Route 6 (Pipeline from Minworth to Leamington Spa then transfer via Grand Union Canal)
2A	1	Hemel Hempstead	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 1 (Birmingham to Fazeley, Coventry, Oxford and Grand Union Canals)
2B	3	Hemel Hempstead	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford and Grand Union Canals)
2C	6	Hemel Hempstead	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 6 (Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal)
3A	1	Tring	Treated wastewater transfer from Minworth WwTW to Tring via Route 1 (Birmingham to Fazeley, Coventry, Oxford and Grand Union Canals)
3B	3	Tring	Treated wastewater transfer from Minworth WwTW to Tring via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford and Grand Union Canals)
3C	6	Tring	Treated wastewater transfer from Minworth WwTW to Tring via Route 6 (Pipeline from Minworth to Leamington Spa then transfer via Grand Union Canal)

#### Table 1.1: GUC options

## 2 Methodology

#### 2.1 Approach to WFD assessment for SROs

The WFD requires all waterbodies (both surface and groundwater) to achieve 'good status'. The Directive also requires that waterbodies experience no deterioration in status. Good status is a function of good ecological status (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 would not cause deterioration in status of any WFD waterbodies. The assessment considers mitigation that would need to be put in place to protect waterbody status. The assessment also considers WFD future objectives.

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*.

#### 2.1.1 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. The assessment followed the methodology in the WRSE Regional Plan Environmental Assessment Methodology Guidance, July 2020 for all options, and GUC PMB were engaged in the review process and provided comments. Level 1 assessment follows these steps:

- Identify affected waterbodies;
- Review SRO options;
- Identify possible impacts;
- Apply 'embedded' mitigation measures; and
- Calculate a screening score (using a 6-point scale from -2 to 3) to 'screen out' waterbodies and options with no or very minor potential impacts from further assessment. If the maximum impact score is greater than 1 (minor localised impact) then the waterbody is taken forward into level 2 screening.

The outcomes for Severn Trent to Affinity Water GUC options are summarised in Section 3.1 and Appendix A. Where waterbodies and option impacts were 'screened in', they have been taken forward to Level 2 assessment.

#### 2.1.2 Level 2 – detailed impact screening

The second stage of WFD assessment has been completed for GUC SRO options and waterbodies 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 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 to raise this confidence level for future Gates will be listed (Section 6.2);

- 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 5 and Appendix B.

#### 2.2 Information used

The Gate 1 stage Level 2 WFD assessments have been completed on the basis of relatively early design development of the engineering requirements, early stages of hydrological/hydraulic and environmental water quality work packages and limited information on aquatic ecology, presence of Invasive Non Native Species (INNS) etc. Key sources of information obtained from the GUC PMB included:

- Consultancy Services for the Provision of Data Gathering and Option Selection: Severn Trent Minworth - Concept Design Report (March 2021)
- Grand Union Canal WP1b Engineering Route Development Report (March 2021)
- Grand Union Canal WP2 Company Assets Abstraction Site Appraisal Report (March 2021)
- Grand Union Canal Gate 1 Model Report including Appendices (March 2021)
- Grand Union Canal Strategic Transfer Ecological Monitoring: Phase 1 Report (March 2021)
- Grand Union Canal Water Quality Stages 1 & 2 Report (April 2021)

The approach taken in the Level 2 assessments is precautionary, given the limited certainty / detail in design information and the low level of detail in WFD baseline data reviewed at this stage. Section 2.3 provides further detail on limitations and assumptions and Section 6.2 sets out the next steps and requirements for updating the Level 2 WFD assessment to reduce the uncertainty.

#### 2.3 Limitations and assumptions

As the project is still in the early stages of design development a precautionary approach has been exercised because of residual uncertainty. The WFD assessment has the following limitations and assumptions:

- The ACWG approach uses WFD 2015 data, as it is the current officially reported baseline in the 2015-2021 Cycle 2 RBMP. The RBMPs are anticipated to be updated in 2021, and 2019 WFD baseline data released in late 2020 would then become the new baseline. To make sure of consistency, the 2015 data has been used at Gate 1, but acknowledge that this will need to be updated to the 2019 status as soon as the RBMPs are published (proposed for Gate 2).
- New water storage reservoirs adjacent to intakes at abstraction points have not been included at this stage due to limited design information. This will need to be added to assessment at Gate 2, depending on location and proximity to watercourses, once more certain design information becomes available. This is unlikely to substantially change the WFD assessment of route options. Screens/intakes in themselves as physical structures would only affect a relatively small length of water body.

- Assessment assumes pipelines are underground (directionally drilled or pipe-jacked beneath any watercourses) and therefore will not cross watercourses above ground or cause direct impacts.
- Assessment does not currently include structural changes to canals, although some modifications would likely be necessary. Modifications to canals would be unlikely to pose risk of deterioration to WFD status given their artificial nature but would need to consider future objectives and environmentally sensitive designs/mitigation to be integrated when design information becomes available.
- Assessment assumes fail safes / stop of transfer will be in place in the case of a significant failure of Minworth treatment.
- Assessment assumes that some existing mixing of rivers and canals would naturally occur during floods (over and above canal infrastructure connections) and does not attempt to address such impacts.
- Assumption that the current Minworth discharge water quality would fail to meet Good status for at least some of the WFD water quality parameters in receiving canals. This is based on current situation evidence from ongoing environmental water quality assessment work as noted in the Grand Union Canal Water Quality Stages 1 & 2 Report (April 2021). The report highlights the main substances of concern as soluble reactive phosphate, nitrate and dissolved nickel. The requirement to upgrade wastewater treatment at Minworth is set out in the Minworth SRO Concept Design Report (CDR) (March 2021). This report identifies technically feasible options to meet or maintain Moderate status for key physico-chemical WFD parameters in receiving canals. At this stage the WFD assessment retains a risk of changes to physico-chemical conditions until further evidence is provided by treatment process design and water quality dispersion modelling. It is also noted that while the treatment levels set out in the CDR would potentially maintain Moderate status in canal waterbodies, it does not outline potential limitations on achieving the WFD overriding Good status objective or consider impacts on river waterbodies further downstream.
- The risk to WFD status has been assessed to increase in the more sensitive chalk river systems downstream, although it is recognised that there is existing connectivity between the GUC and these river systems, and that dilution of wastewater would increase downstream. River waterbodies may have different EQS requirements to the canals for some parameters. Environmental water quality sampling and analysis (Grand Union Canal Water Quality Stages 1 & 2 Report, April 2021) currently only includes the canal network at proposed transfer discharge points. Inclusion of Environment Agency (EA) monitoring data from the interconnected chalk river lengths of the Gade, Bulbourne and Chess at the downstream end of the transfer is recommended. This addition would provide a more holistic evidence base to the regulator(s) and a more complete data set to enable calibration of any water quality dispersion modelling during later Gate stages.
- The geographical extent of the WFD assessment has been limited to waterbodies between the start point of the transfer and the abstraction point for each option. There is potential for some effects continuing downstream of the abstraction point, although it is assumed these would become increasingly limited to 'negligible' with distance.
- The potential for improvements in flow volume to stressed chalk streams within lower reaches of the transfer is recognised as an ongoing opportunity, though it presents particular challenges in terms of duration and timing of flows.
- Options for either a 50 or 100 MI/d transfer have been assessed to be the same at this initial high level stage and have not been separated for the WFD assessment. Once flow and dilution data are available this may enable differentiation between the effects of the alternative volumes at a later stage.

- Abstraction activity has been assessed to have a limited/localised WFD impact, because it is assumed that the water balance would not be changed (i.e. additional volume of water supplied from Minworth will subsequently be abstracted).
- Transfer operational requirements are unknown at this stage and the assessment has not accounted for seasonality (e.g. with respect to flows in chalk rivers, especially the Bulbourne and Gade).

#### 2.4 Recommendations for WFD for Gate 2 and beyond

Where waterbodies and option impacts have been identified, recommendations will be made for increasing the confidence in the assessment (see Section 6.2). This is expected with the greater level of detail available during later stages of option development for subsequent gateways. In combination assessments, where reliant SRO option delivery is interdependent, would also be required.

It is noted that there may be changes to WFD-related legislation related to Britain's exit from the European Union (EU). The EU WFD legislation is currently 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 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, for example to include 2019 status classifications.

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

### 3 Scheme description

#### 3.1 Overview

The aim of the GUC SRO is to investigate options for transferring water from Severn Trent Water's Minworth WwTW into the GUC, to supplement Affinity Water's supply. From the GUC, it is proposed to transfer the additional resource southwards towards Affinity Water's supply area using Canal and River Trust assets.

There are nine proposed option combinations to assess under the WFD at this stage, comprising three separate routes and three separate Affinity Water abstraction locations. Each route option is being considered for a transfer volume of either 50MI/d or 100MI/d. A summary of the options is provided below. Table 3.1 provides a summary of each option whilst Figure 3.1 displays a map of the three potential route options and three Affinity Water abstraction locations. The ultimate solution will be a single route and abstraction location. i.e. the routes and abstraction locations are mutually exclusive with one another.

Information regarding the proposed route options and abstraction locations has been obtained from the 'Route Development' and 'Site Appraisal' reports by WSP<sup>2</sup>,<sup>3</sup>. It should be noted that the scheme is at the early stages of design development and therefore detail of each option is currently limited. This has led to several limitations / assumptions within the WFD assessment, as outlined in Section 2.3.

#### 3.2 **Option descriptions**

#### 3.2.1 Route sub-options

Each of the proposed transfer options utilises one of three proposed routes, as outlined below (Figure 3.1):

- Route 1 (all 'A' options): Birmingham to Fazeley, Coventry, Oxford (upper section) and Grand Union Canals
- Route 3 (all 'B' options): Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford and Grand Union Canals
- Route 6 (all 'C' options): Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal

#### 3.2.2 Affinity Water abstraction location options

There are three potential abstraction locations that could be applied to any transfer route option (Figure 3.1):

- The Grove (options 1A, 1B, 1C): The proposed Grove abstraction site is located near the town of Abbots Langley and Hunton Bridge, downstream of GUC interactions with the River Gade and Bulbourne and upstream of the River Colne.
- Hemel Hempstead (options 2A, 2B, 2C): The proposed Hemel Hempstead abstraction site is in the GUC stretch adjacent to the village of Bourne End in Hertfordshire, between Berkhamsted and Hemel Hempstead, within the reach of GUC interactions with the River Bulbourne and upstream of the River Gade.

<sup>&</sup>lt;sup>2</sup> WSP March 2021. Grand Union canal – WP1B Engineering. Route Development. Project No 70076064.

<sup>&</sup>lt;sup>3</sup> WSP March 2021. Grand Union Canal – WP2 Company Assets. Site Appraisal. Project No 70075218.

• Tring (options 3A, 3B, 3C): The proposed Tring abstraction site is located between the towns of Tring and Berkhamsted, downstream of Tring WwTW (Thames Water) and upstream of GUC interactions with the River Bulbourne or Gade.

#### Table 3.1: Option descriptions for Severn Trent to Affinity Water GUC transfer

Option ref	Option name	Option description
1A	Treated wastewater transfer from Minworth WwTW to The Grove via Route 1 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to The Grove via Route 1 (Birmingham to Fazeley, Coventry, Oxford (upper section) and Grand Union Canals). The Grove abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
1B	Treated wastewater transfer from Minworth WwTW to The Grove via Route 3 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to The Grove via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford (upper section) and Grand Union Canals). The Grove abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
1C	Treated wastewater transfer from Minworth WwTW to The Grove via Route 6 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to The Grove via Route 6 (Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal). The Grove abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
2A	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 1 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 1 (Birmingham to Fazeley, Coventry, Oxford (upper section) and Grand Union Canals). The Hemel Hempstead abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
2В	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 3 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford (upper section) and Grand Union Canals). The Hemel Hempstead abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
2C	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 6 (50 or 100MI/d)	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 6 (Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal). The Hemel Hempstead abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
3A	Treated wastewater transfer from Minworth WwTW to Tring via Route 1 (50 or 100Ml/d)	Treated wastewater transfer from Minworth WwTW to Tring via Route 1 (Birmingham to Fazeley, Coventry, Oxford (upper section) and Grand Union Canals). The Tring abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.

Option ref	Option name	Option description
3B	Treated wastewater transfer from Minworth WwTW	Treated wastewater transfer from Minworth WwTW to Tring via Route 3 (Pipeline from Minworth to Atherstone then transfer via Coventry, Oxford (upper section) and Grand Union Canals).
	to Tring via Route 3 (50 or 100Ml/d)	drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.
3C	Treated wastewater transfer from Minworth WwTW to Tring via Route 6 (50 or 100Ml/d)	Treated wastewater transfer from Minworth WwTW to Tring via Route 6 (Pipeline from Minworth to Learnington Spa then transfer via Grand Union Canal). The Tring abstraction location is proposed for abstraction, treatment, and injection into drinking water supply of between 50-100Mld of additional water resources supplied from the GUC.



Figure 3.1: Map of GUC route options<sup>4</sup> and potential abstraction locations

<sup>&</sup>lt;sup>4</sup> APEM, March 2021. Grand Union Canal Water Quality Stages 1 & 2. Severn Trent Water Limited P5953.

### 4 Level 1 WFD findings

#### 4.1 WRSE review

Following receipt of the outcomes of the options appraisal for the GUC SRO, WRSE undertook the Level 1 WFD for the options in January to 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. WRSE Level 1 output tables are included in Appendix A.

#### 4.2 Level 1 WFD Assessment Summary

Table 4.2 provides a summary of the Level 1 WFD assessment for all nine options across 48 WFD river waterbodies. Table 4.1 presents a key to explain the colours as to whether waterbodies were screened in or out of further assessment.

#### Table 4.1: Level 1 summary results key

Colour coding for Table 4.2 Green – Passes Level 1 WFD, no further assessment Amber – Level 1 WFD score >1, screened in for Level 2 Grey – waterbody not assessed for this option (N/A)

Within the WRSE WFD assessment, the transfer of water via canal has been set as an impact score of '2'. Consequently, based on the nature of the transfer options utilising the canal network, the majority of waterbodies have scored at least 2. This led to the majority of waterbodies being identified as requiring Level 2 WFD assessment. The Level 2 WFD Assessment is presented in Section 5 of this report.

Table 4.2: Severn Trent to Affinity Water Transfer Options Level 1 WFD Assessment Summary (see Table 4.1 for Key
--

			-						
	Option 1A	Option 1B	Option 1C	Option 2A	Option 2B	Option 2C	Option 3A	Option 3B	Option 3C
WRSE option ID	AFW_AZ1_HI- IMP_SVE_CNO _gucsrotragro_ Route1	AFW_AZ1_HI- IMP_SVE_CNO _gucsrotragro_ Route3	AFW_AZ1_HI- IMP_SVE_CNO _gucsrotragro_ Route6	AFW_AZ1_HI- IMP_SVE_CNO _gucsrotrahem _Route1	AFW_AZ1_HI- IMP_SVE_CNO _gucsrotrahem _Route3	AFW_AZ1_HI- IMP_SVE_CNO _gucsrotrahem _Route6	AFW_AZ1_HI- IMP_SVE_CNO _gucsrotratri_R oute1	AFW_AZ1_HI- IMP_SVE_CNO _gucsrotratri_R oute3	AFW_AZ1_HI- IMP_SVE_CNO _gucsrotratri_R oute6
Option description	Treated wastewater transfer from Minworth WwTW to The Grove via Route 1	Treated wastewater transfer from Minworth WwTW to The Grove via Route 3	Treated wastewater transfer from Minworth WwTW to The Grove via Route 6	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 1	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 3	Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 6	Treated wastewater transfer from Minworth WwTW to Tring via Route 1	Treated wastewater transfer from Minworth WwTW to Tring via Route 3	Treated wastewater transfer from Minworth WwTW to Tring via Route 6
WFD Waterbodies									
GB105032045360: Welton Village Trib, Whilton branch of R. Nene;									
GB104028046841: Tame - R Rea to R Blythe;	N/A			N/A			N/A		
GB104028046901: Langley Bk - source to conf R Tame;	N/A		N/A	N/A		N/A	N/A		N/A
GB105033037971: Ouzel US Caldecote Mill;									
GB104028046440: Tame from R Blythe to River Anker;	N/A		N/A	N/A		N/A	N/A		N/A
GB104028046460: Anker from River Sence to River Tame;			N/A			N/A			N/A
GB105033037900: Loughton Brook;									
GB105033038180: Tove (DS Greens Norton);									

	Option 1A	Option 1B	Option 1C	Option 2A	Option 2B	Option 2C	Option 3A	Option 3B	Option 3C
GB106039029860: Gade (from confluence with Bulbourne to Chess);				N/A	N/A	N/A	N/A	N/A	N/A
GB106039029890: Bulbourne;							N/A	N/A	N/A
GB106039029900: Gade (Upper stretch Great Gaddesden to confluence with Bulbourne / GUC);							N/A	N/A	N/A
GB104028042630; Dog Lane Brook from Source to R Tame	N/A		N/A	N/A		N/A	N/A		N/A
GB109054044402: Avon (Wark) conf R Leam to Tramway Br, Stratford;	N/A	N/A		N/A	N/A		N/A	N/A	
GB104028042420: Cole from Hatchford- Kingshurst Brook to R Blythe;	N/A	N/A		N/A	N/A		N/A	N/A	
GB104028042490: Hatchford-Kingshurst Brook from Source to R Cole;	N/A	N/A		N/A	N/A		N/A	N/A	
GB104028042571: Blythe from Temple Balsall Brook to Patrick Bridge;	N/A	N/A		N/A	N/A		N/A	N/A	
GB104028042572: Blythe from Patrick Bridge to R Tame;	N/A	N/A		N/A	N/A		N/A	N/A	
GB109054044470: Finham Bk - source to conf Canley Bk;	N/A	N/A		N/A	N/A		N/A	N/A	
GB109054043840: Avon (Warks) - conf R Sowe to conf R Leam;	N/A	N/A		N/A	N/A		N/A	N/A	
	Option 1A	Option 1B	Option 1C	Option 2A	Option 2B	Option 2C	Option 3A	Option 3B	Option 3C
--	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------
GB70410212: Coventry and Ashby Canals			N/A			N/A			N/A
GB70410515: Birmingham and Fazeley Canal upper section		N/A	N/A		N/A	N/A		N/A	N/A
GB70510191: Grand Union Canal, Tring summit to Milton Keynes									
GB70510192: Grand Union Canal, Milton Keynes trough pound									
GB70510193: Grand Union Canal, Braunston summit									
GB70510251: Grand Union Canal, Milton Keynes to Braunston summit									
GB70610182: Grand Union Canal, Tring summit									
GB70910511: Grand Union Canal, Braunston to Leamington Spa									
GB70910203: Grand Union Canal, Leamington Spa to Warwick trough pound	N/A	N/A		N/A	N/A		N/A	N/A	
GB70910513: North Oxford Canal			N/A			N/A			N/A
GB70610185: Grand Union Canal, Berkhamstead to Maple Lodge (Rivers Bulbourne, Gade and Colne)							N/A	N/A	N/A

	Option 1A	Option 1B	Option 1C	Option 2A	Option 2B	Option 2C	Option 3A	Option 3B	Option 3C
GB70610184: Grand Union Canal, Tring summit to Berkhamstead							N/A	N/A	N/A
Total no. of river and canal waterbodies screened out at Level 1 WFD assessment	0	4	7	0	4	7	0	4	7
Total no. of river and canal waterbodies requiring Level 2 WFD assessment	19	18	17	18	17	16	14	13	12

#### Level 2 WFD assessments 5

#### 5.1 Review of river waterbodies for assessment

Before completing the Level 2 assessments, an interim step was undertaken to review the WRSE Level 1 screening. The Level 1 assessment had screened in all river waterbody catchments on the basis of route option canal sections passing through the catchment. This was irrespective of the level of direct connectivity between canals and rivers, which create a pathway for impacts from the transfer. A simple GIS-based review was undertaken to provide an improved consideration of existing interconnections of rivers and canals<sup>5</sup> looking at locations of canal sluices and aerial photos/maps. This stage reduced the number of river waterbodies requiring Level 2 WFD assessment. The WRSE Level 1 WFD assessment has been updated to reflect this additional assessment. Further information/data on canal-river interactions should be used to verify this for Gate 2.

#### 5.2 Summary of results / outcomes

Section 5.3 provides summary tables of the Level 2 WFD results. Detailed outputs are presented in Appendix B.

It is difficult to discern between options at this stage (at a strategic level) on the basis of WFD compliance risks and the option/design information so far selected/developed. The strategic geographic scale and limited design information precludes a more robust or quantitative assessment being carried out. In general, at this stage, all sub-options have similar risks relating to changes in water quality and hydrologic/ hydraulic processes caused by the transfer of Minworth WwTW water. The potential pathways for WFD effects are similar for all options because over half the route is the same regardless of the option under consideration; i.e. from Braunston Junction downstream, all options use the same canal route with only the abstraction locations being different.

For waterbodies where physico-chemical conditions (in particular nutrient levels) are existing limiting factors recorded in WFD baseline data as a 'reason for not achieving good', WFD compliance risks are considered to be slightly higher if there is a risk of conflicting with targets for future improvements in water quality. Potential subsequent biological effects would require further assessment.

There is potential that changes caused by the transfer will cause deterioration of waterbodies, although it is acknowledged that a permit level for key substances or parameters would need to be agreed and that work within the Environmental Water Quality workstream and subsequent process design work will progress this.

There are particular local sensitivities identified at this stage: the proposals incorporate a number of sensitive chalk rivers at the 'downstream' end, including the River Colne catchment. There are associated impacts of potentially introducing INNS to lengths of canal/ river channel not previously colonised. It is important that the options appraisal remains flexible and iterative and options/ sub-options re-evaluated (rather than dismissed prematurely) once there is more data/ information available.

<sup>&</sup>lt;sup>5</sup> Accepting that in flood flows there may be 'natural interconnections' with several more waterbodies

#### 5.3 Level 2 summary tables

Summary tables of the Level 2 WFD outcomes are below and detailed outputs are presented in Appendix B. Explanations of levels of confidence are given in Table 5.1, and descriptions of the WFD risks/outcomes are given in Table 5.2.

#### Table 5.1: Explanation of WFD confidence levels, based on ACWG methodology

Confidence Level	Description	Acceptable at Gate stage
Low	Limited data and evidence available, based mainly or completely on expert judgement with many assumptions. Preliminary design information only, detailed information on location/routes, construction methods etc not yet available.	1
Medium	Some data and evidence available, based partially on expert judgement with some assumptions. Design progressed but some assumptions made on construction methods etc.	2
High	Lots of good data and evidence available, minimal assumptions. Design advanced minimal assumptions needed.	3 & 4

#### Table 5.2: Description of WFD risk levels/outcomes, based on ACWG methodology

Deterioration between status classes	Compromises waterbody objectives	Assists attainment of waterbody objectives
<b>Yes</b> = activities have a clear potential to cause deterioration of WFD status	Yes = activities clearly conflict with delivery of future improvements in WFD status	<b>No</b> = activities unlikely to contribute to achieving 'Good' status or potential
<b>Possible</b> = activities could cause deterioration of WFD status but unclear extent/level of effect	<b>Possible</b> = activities conflict with future improvements in WFD status but unclear extent/level of effect	<b>Possible</b> = activities could contribute to achieving 'Good' status or potential but unclear extent/level of effect
<b>No</b> = activities unlikely to pose any risk of deterioration in status	<b>No</b> = activities unlikely to pose any risk of deterioration in status	Yes = activities could directly contribute to achieving 'Good' status or potential
Uncert	tain = insufficient information or evidence	e to assess

#### Table 5.3: Option 1A: Treated wastewater transfer from Minworth WwTW to The Grove via Route 1 (50 or 100MI/d) 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
GB104028046460	Anker from River Sence to River Tame	Low	Low			Possible	Possible	No	Connections with canals between Birmingham and Atherstone. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105032045360	Welton Village Trib, Whilton branch of R. Nene	Low	Low	Design development and confidence around physical changes to canals and around Minworth treatment requirements. Further water quality (WQ) and hydrological assessments, including canal-river connections, hydraulic and WQ modelling and ongoing baseline data collection, including: - inclusion of data for river lengths of waterbodies from EA monitoring; - request for further specific details of RBMP measures (including A/HMWB measures where relevant) from EA - update to WFD baseline data to include 2019 status in line with Cycle 3 2021-2027 RBMPs once published.	Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels	Possible	Possible	No	Evidence of connection with GUC east of Braunston. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Assessment assumes connections with canal through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105033037900	Loughton Brook	Low	Low		required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No	Assume connections with GUC through Milton Keynes. May be less affected or at risk than some other WBs. Note phosphate is at Good status, so risk of deterioration to be checked in more detail against EQS during assessment leading to Gate 2.
GB105033037971	Ouzel US Caldecote Mill	Low	Low			Possible	Possible	No	Assume connections with GUC through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105033038180	Tove (DS Greens Norton)	Low	Low			Possible	Possible	No	Interacts with GUC north of Milton Keynes. Phosphate at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB106039029860	Gade (from confluence with Bulbourne to Chess)	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels. Fish and eel screening at abstraction point intake	Possible	Possible	Uncertain	Chalk river. Macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Flow stressed. Potential to augment flow using additional water is uncertain. Higher risk flagged, subject to further assessment of water quality during Gate 2. Abstraction point would be in this waterbody for the Grove abstraction.
GB106039029890	Bulbourne	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a	Possible	Possible	Uncertain	Chalk river. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Flow stressed. Potential to augment flow using additional water is uncertain. Higher risk flagged, subject to further assessment of water quality during Gate 2.
GB106039029900	Gade (Upper stretch Great Gaddesden to confluence with Bulbourne / GUC)	Low	Low		Further assessment of the permit levels Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels	Possible	Possible	Uncertain	Connected to GUC at downstream extent of waterbody at Hemel Hempstead. May be precautionary and unlikely to be affected by transfer as water not anticipated to flow up into Gade, potential to remove or reduce risks at Gate 2.
GB70410212	Coventry and Ashby Canals	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken. Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.

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 attain of water body objectives
GB70410515	Birminglam and Fazeley Canal upper section	Low	Low			Possible	Possible	No
GB70510191	Grand Union Canal, Tring summit to Milton Keynes	Low	Low			Possible	Possible	No
GB70510192	Grand Union Canal, Milton Keynes trough pound	Low	Low			Possible	Possible	No
GB70510193	Grand Union Canal, Braunston summit	Low	Low			Possible	Possible	No
GB70510251	Grand Union Canal, Milton Keynes to Braunston summit	Low	Low			Possible	Possible	No
GB70610182	Grand Union Canal, Tring summit	Low	Low			Possible	Possible	No
GB70910511	Grand Union Canal, Braunston to Leamington Spa	Low	Low			Possible	Possible	No
GB70910513	North Oxford Canal	Low	Low			Possible	Possible	No
GB70610185	Grand Union Canal, Berkhamstead to Maple Lodge (RIvers Bulbourne, Gade and Colne)	Low	Low			Possible	Possible	No
GB70610184	Grand Union Canal, Tring summit to Berkhamstead	Low	Low			Possible	Possible	No

ment	Further comments
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken. Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.

# Table 5.4: Option 2A: Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 1 (50 or 100MI/d) 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				
GB104028046460	Anker from River Sence to River Tame	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels	Possible	Possible	No	Connections with canals between Birmingham and Atherstone. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.				
GB105032045360	Welton Village Trib, Whilton branch of R. Nene	Low	Low			Possible	Possible	No	Evidence of connection with GUC east of Braunston. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Assessment assumes connections with canal through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.				
GB105033037900	Loughton Brook	Low	Low		required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No	Assume connections with GUC through Milton Keynes. May be less affected or at risk than some other WBs. Note phosphate is at Good status, so risk of deterioration to be checked in more detail against EQS during assessment leading to Gate 2.				
GB105033037971	Ouzel US Caldecote Mill	Low	Low	Design development and confidence around physical changes to canals and around Minworth treatment requirements. Further WQ and hydrological assessments, including canal-river connections, hydraulic and WQ modelling and ongoing baseline data collection, including: - inclusion of data for river lengths of waterbodies from EA monitoring; - request for further specific details of RBMP measures (including A/HMWB measures where relevant) from EA - update to WFD baseline data to include 2019 status in line with Cycle 3 2021-2027 RBMPs once published.			,		-	Possible	Possible	No	Assume connections with GUC through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105033038180	Tove (DS Greens Norton)	Low	Low			Possible	Possible	No	Interacts with GUC north of Milton Keynes. Phosphate at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.				
GB106039029890	Bulbourne	Low	Low		odelling and ongoing baseline tion, including: of data for river lengths of is from EA monitoring; or further specific details of RBMP (including A/HIWB measures vant) from EA WFD baseline data to include s in line with Cycle 3 2021-2027 ce published. Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels. Fish and eel screening at abstraction point	Possible	Possible	Uncertain	Chalk river. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Flow stressed. Potential to augment flow using additional water is uncertain. Higher risk flagged, subject to further assessment of water quality during Gate 2. Abstraction point would be in this waterbody for the Hemel Hempstead abstraction.				
GB106039029900	Gade (Upper stretch Great Gaddesden to confluence with Bulbourne / GUC)	Low	Low			Possible	Possible	Uncertain	Connected to GUC at downstream extent of waterbody at Hemel Hempstead. May be precautionary and unlikely to be affected by transfer as water not anticipated to flow up into Gade, potential to remove or reduce risks at Gate 2.				
GB70410212	Coventry and Ashby Canals	Low	Low		Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key	Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken. Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.				
GB70410515	Birminglam and Fazeley Canal upper section	Low	Low		WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken. Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.				
GB70510191	Grand Union Canal, Tring summit to Milton Keynes	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.				

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
GB70510192	Grand Union Canal, Milton Keynes trough pound	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510193	Grand Union Canal, Braunston summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510251	Grand Union Canal, Milton Keynes to Braunston summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70610182	Grand Union Canal, Tring summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70910511	Grand Union Canal, Braunston to Leamington Spa	Low	Low			Possible	Possible	No	
GB70910513	North Oxford Canal	Low	Low			Possible	Possible	No	
GB70610185	Grand Union Canal, Berkhamstead to Maple Lodge (Rivers Bulbourne, Gade and Colne)	Low	Low			Possible	Possible	No	
GB70610184	Grand Union Canal, Tring summit to Berkhamstead	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.

# Table 5.5: Option 3A: Treated wastewater transfer from Minworth WwTW to Tring via Route 1 (50 or 100MI/d) 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
GB104028046460	Anker from River Sence to River Tame	Low	Low			Possible	Possible	No	Connections with canals between Birmingham and Atherstone. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105032045360	Welton Village Trib, Whilton branch of R. Nene	Low	Low			Possible	Possible	No	Evidence of connection with GUC east of Braunston. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Assessment assumes connections with canal through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105033037900	Loughton Brook	Low	Low			Possible	Possible	No	Assume connections with GUC through Milton Keynes. May be less affected or at risk than some other WBs. Note phosphate is at Good status, so risk of deterioration to be checked in more detail against EQS during assessment leading to Gate 2.
GB105033037971	Ouzel US Caldecote Mill	Low	Low	Design development and confidence around physical changes to canals and around Minworth treatment requirements. Further WQ and hydrological assessments, including canal-river connections, hydraulic and WQ modelling and ongoing baseline data collection, including: - inclusion of data for river lengths of waterbodies from EA monitoring:		Possible	Possible	No	Assume connections with GUC through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105033038180	Tove (DS Greens Norton)	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No	Interacts with GUC north of Milton Keynes. Phosphate at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB70410212	Coventry and Ashby Canals	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken. Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.
GB70410515	Birminglam and Fazeley Canal upper section	Low	Low	request for further specific details of RBMP measures (including A/HMWB measures where relevant) from EA - update to WFD baseline data to include 2019 status in line with Cycle 3 2021-2027 PBMPs anco published		Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken. Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.
GB70510191	Grand Union Canal, Tring summit to Milton Keynes	Low	Low	Romrs once published.		Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510192	Grand Union Canal, Milton Keynes trough pound	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510193	Grand Union Canal, Braunston summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510251	Grand Union Canal, Milton Keynes to Braunston summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70610182	Grand Union Canal, Tring summit	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent	Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment can be undertaken. Abstraction point would be in this waterbody for the Tring abstraction.

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
					mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels. Fish and eel screening at abstraction point intake.				
GB70910511	Grand Union Canal, Braunston to Leamington Spa	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme.	Possible	Possible	No	
GB70910513	North Oxford Canal	Low	Low		Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No	

# Table 5.6: Option 1B: Treated wastewater transfer from Minworth WwTW to The Grove via Route 3 (50 or 100MI/d) 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
GB104028046460	Anker from River Sence to River Tame	Low	Low			Possible	Possible	No	Connections with canals between Birmingham and Atherstone. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105032045360	Welton Village Trib, Whilton branch of R. Nene	Low	Low	Design development and confidence around physical changes to canals and around Minworth treatment requirements. Further WQ and hydrological assessments, including canal-river connections, hydraulic and WQ modelling and ongoing baseline data collection, including: - inclusion of data for river lengths of waterbodies from EA monitoring; - request for further specific details of RBMP measures (including A/HMWB measures where relevant) from EA - update to WFD baseline data to include 2019 status in line with Cycle 3 2021-2027 RBMPs once published.	Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No	Evidence of connection with GUC east of Braunston. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Assessment assumes connections with canal through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105033037900	Loughton Brook	Low	Low			Possible	Possible	No	Assume connections with GUC through Milton Keynes. May be less affected or at risk than some other WBs. Note phosphate is at Good status, so risk of deterioration to be checked in more detail against EQS during assessment leading to Gate 2.
GB105033037971	Ouzel US Caldecote Mill	Low	Low			Possible	Possible	No	Assume connections with GUC through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105033038180	Tove (DS Greens Norton)	Low	Low		F	Possible	Possible	No	Interacts with GUC north of Milton Keynes. Phosphate at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB106039029860	Gade (from confluence with Bulbourne to Chess)	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels. Fish and eel screening at abstraction point	Possible	Possible	Uncertain	Chalk river. Macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Flow stressed. Potential to augment flow using additional water is uncertain. Higher risk flagged, subject to further assessment of water quality during Gate 2. Abstraction point would be in this waterbody for the Grove abstraction.
					intake				Chalk river. Phosphate and macrophytes at poor status and
GB106039029890	Bulbourne	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	Uncertain	RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Flow stressed. Potential to augment flow using additional water is uncertain. Higher risk flagged, subject to further assessment of water quality during Gate 2.
GB106039029900	Gade (Upper stretch Great Gaddesden to confluence with Bulbourne / GUC)	Low	Low			Possible	Possible	Uncertain	Connected to GUC at downstream extent of waterbody at Hemel Hempstead. May be precautionary and unlikely to be affected by transfer as water not anticipated to flow up into Gade, potential to remove or reduce risks at Gate 2.
GB70410212	Coventry and Ashby Canals	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken. Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.

| May 2021

GB70510191	Grand Union Canal, Tring summit to Milton Keynes	Low	Low
GB70510192	Grand Union Canal, Milton Keynes trough pound	Low	Low
GB70510193	Grand Union Canal, Braunston summit	Low	Low
GB70510251	Grand Union Canal, Milton Keynes to Braunston summit	Low	Low
GB70610182	Grand Union Canal, Tring summit	Low	Low
GB70910511	Grand Union Canal, Braunston to Leamington Spa	Low	Low
GB70910513	North Oxford Canal	Low	Low
GB70610185	Grand Union Canal, Berkhamstead to Maple Lodge (Rivers Bulbourne, Gade and Colne)	Low	Low
GB70610184	Grand Union Canal, Tring summit to Berkhamstead	Low	Low

# Table 5.7: Option 2B: Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 3 (50 or 100MI/d) 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			
GB104028046460	Anker from River Sence to River Tame	Low	Low			Possible	Possible	No	Connections with canals between Birmingham and Atherstone. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.			
GB105032045360	Welton Village Trib, Whilton branch of R. Nene	Low	Low	Design development and confidence around physical changes to canals and around Minworth treatment requirements. Further WQ and hydrological assessments, including canal-river connections, hydraulic and WQ modelling and ongoing baseline	Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No	Evidence of connection with GUC east of Braunston. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Assessment assumes connections with canal through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.			
GB105033037900	Loughton Brook	Low	Low			required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No	Assume connections with GUC through Milton Keynes. May be less affected or at risk than some other WBs. Note phosphate is at Good status, so risk of deterioration to be checked in more detail against EQS during assessment leading to Gate 2.
GB105033037971	Ouzel US Caldecote Mill	Low	Low			Possible	Possible	No	Assume connections with GUC through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.			
GB105033038180	Tove (DS Greens Norton)	Low	Low			Possible	Possible	No	Interacts with GUC north of Milton Keynes. Phosphate at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.			
GB106039029890	Bulbourne	Low	Low	data collection, including: - inclusion of data for river lengths of waterbodies from EA monitoring; - request for further specific details of RBMP measures (including A/HMWB measures where relevant) from EA - update to WFD baseline data to include 2019 status in line with Cycle 3 2021-2027 RBMPs once published.		Possible	Possible	Uncertain	Chalk river. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Flow stressed. Potential to augment flow using additional water is uncertain. Higher risk flagged, subject to further assessment of water quality during Gate 2. Abstraction point would be in this waterbody for			
					Fish and eel screening at abstraction point intake.				the Hemel Hempstead abstraction.			
GB106039029900	Gade (Upper stretch Great Gaddesden to confluence with Bulbourne / GUC)	Low	Low		Understanding of improved treatment at	Possible	Possible	Uncertain	Connected to GUC at downstream extent of waterbody at Hemel Hempstead. May be precautionary and unlikely to be affected by transfer as water not anticipated to flow up into Gade, potential to remove or reduce risks at Gate 2.			
GB70410212	Coventry and Ashby Canals	Low	Low	L M S F F	Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent	Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken. Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.			
GB70510191	Grand Union Canal, Tring summit to Milton Keynes	Low	Low		mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.			
GB70510192	Grand Union Canal, Milton Keynes trough pound	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.			

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
GB70510193	Grand Union Canal, Braunston summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510251	Grand Union Canal, Milton Keynes to Braunston summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70610182	Grand Union Canal, Tring summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70910511	Grand Union Canal, Braunston to Leamington Spa	Low	Low			Possible	Possible	No	
GB70910513	North Oxford Canal	Low	Low			Possible	Possible	No	
GB70610185	Grand Union Canal, Berkhamstead to Maple Lodge (RIvers Bulbourne, Gade and Colne)	Low	Low			Possible	Possible	No	
GB70610184	Grand Union Canal, Tring summit to Berkhamstead	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.

# Table 5.8: Option 3B: Treated wastewater transfer from Minworth WwTW to Tring via Route 3 (50 or 100MI/d) 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
GB104028046460	Anker from River Sence to River Tame	Low	Low			Possible	Possible	No	Connections with canals between Birmingham and Atherstone. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105032045360	Welton Village Trib, Whilton branch of R. Nene	Low	Low		F	Possible	Possible	No	Evidence of connection with GUC east of Braunston. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Assessment assumes connections with canal through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105033037900	Loughton Brook	Low	Low			Possible	Possible	No	Assume connections with GUC through Milton Keynes. May be less affected or at risk than some other WBs. Note phosphate is at Good status, so risk of deterioration to be checked in more detail against EQS during assessment leading to Gate 2.
GB105033037971	Ouzel US Caldecote Mill	Low	Low	Design development and confidence around hysical changes to canals and around Minworth treatment requirements. Further WQ and hydrological assessments, including canal-river connections, hydraulic and WQ modelling and ongoing baseline lata collection, including: inclusion of data for river lengths of vaterbodies from EA monitoring;	Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a	Possible	Possible	No	Assume connections with GUC through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB105033038180	Tove (DS Greens Norton)	Low	Low		reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	Uncertain	Interacts with GUC north of Milton Keynes. Phosphate at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
GB70410212	Coventry and Ashby Canals	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken. Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.
GB70510191	Grand Union Canal, Tring summit to Milton Keynes	Low	Low	- request for further specific details of RBMP measures (including A/HMWB measures where relevant) from EA - update to WFD baseline data to include 2019 status in line with Cycle 3 2021-2027		Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510192	Grand Union Canal, Milton Keynes trough pound	Low	Low	RBMPs once published.		Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510193	Grand Union Canal, Braunston summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510251	Grand Union Canal, Milton Keynes to Braunston summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70610182	Grand Union Canal, Tring summit	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment can be undertaken. Refer to Grand Union Canal Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality. Abstraction point would be in this waterbody for the Tring abstraction.

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
					Fish and eel screening at abstraction point intake.				
GB70910511	Grand Union Canal, Braunston to Leamington Spa	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme.	Possible	Possible	No	
GB70910513	North Oxford Canal	Low	Low		Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No	

# Table 5.9: Option 1C: Treated wastewater transfer from Minworth WwTW to The Grove via Route 6 (50 or 100MI/d) 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 water body objectives
GB105032045360	Welton Village Trib, Whilton branch of R. Nene	Low	Low		Understanding of improved treatment at	Possible	Possible	No
GB105033037971	Ouzel US Caldecote Mill	Low	Low	- U M st re Fi re W m ris le	Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent	Possible	Possible	No
GB105033037900	Loughton Brook	Low	Low		mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No
GB105033038180	Tove (DS Greens Norton)	Low	Low	Design development and confidence around physical changes to canals and around Minworth treatment requirements.		Possible	Possible	No
GB106039029860	Gade (from confluence with Bulbourne to Chess)	Low	Low	Further WQ and hydrological assessments, including canal-river connections, hydraulic and WQ modelling and ongoing baseline data collection, including: - inclusion of data for river lengths of waterbodies from EA monitoring; - request for further specific details of RBMP measures (including A/HMWB measures where relevant) from EA - update to WFD baseline data to include 2019 status in line with Cycle 3 2021-2027 RBMPs once published.	Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels. Fish and eel screening at abstraction point intake.	Possible	Possible	Uncertain
GB106039029890	Bulbourne	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS	Possible	Possible	Uncertain
GB106039029900	Gade (Upper stretch Great Gaddesden to confluence with Bulbourne / GUC)	Low	Low		Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green)	Possible	Possible	Uncertain
GB109054044402	Avon (Wark) conf R Leam to Tramway Br, Stratford	Low	Low		levels.	Possible	Possible	No

of	Further comments
	Evidence of connection with GUC east of Braunston. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Assessment assumes connections with canal through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
	Assume connections with GUC through Milton Keynes. May be less affected or at risk than some other WBs. Note phosphate is at Good status, so risk of deterioration to be checked in more detail against EQS during assessment leading to Gate 2.
	Assume connections with GUC through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
	Interacts with GUC north of Milton Keynes. Phosphate at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
	Chalk river. Macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Flow stressed. Potential to augment flow using additional water is uncertain. Higher risk flagged, subject to further assessment of water quality during Gate 2. Abstraction point would be in this waterbody for the Grove abstraction.
	Chalk river. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Flow stressed. Potential to augment flow using additional water is uncertain. Higher risk flagged, subject to further assessment of water quality during Gate 2.
	Connected to GUC at downstream extent of waterbody at Hemel Hempstead. May be precautionary and unlikely to be affected by transfer as water not anticipated to flow up into Gade, potential to remove or reduce risks at Gate 2.
	River connected to GUC around location of pipeline discharge from Minworth into canal at Learnington Spa. Phosphate at poor status (macrophytes moderate) and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.

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
	Grand Union Canal,								Discharge would be from Minworth-Leamington pipeline into this section of canal.
GB70910203	Leamington Spa to Warwick trough pound	Low	Low			Possible	Possible	No	Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.
GB70910511	Grand Union Canal, Braunston to Leamington Spa	Low	Low			Possible	Possible	No	
GB70510251	Grand Union Canal, Milton Keynes to Braunston summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510192	Grand Union Canal, Milton Keynes trough pound	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510191	Grand Union Canal, Tring summit to Milton Keynes	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70610182	Grand Union Canal, Tring summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510193	Grand Union Canal, Braunston summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70610184	Grand Union Canal, Tring summit to Berkhamstead	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70610185	Grand Union Canal, Berkhamstead to Maple Lodge (RIvers Bulbourne, Gade and Colne)	Low	Low			Possible	Possible	No	Canal highly interconnected with rivers through this section.

# Table 5.10: Option 2C: Treated wastewater transfer from Minworth WwTW to Hemel Hempstead via Route 6 (50 or 100MI/d) 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
GB105032045360	Welton Village Trib, Whilton branch of R. Nene	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards	Possible	Possible	No
GB105033037971	Ouzel US Caldecote Mill	Low	Low		WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitination would successfully reduce WFD	Possible	Possible	No
GB105033037900	Loughton Brook	Low	Low		risks to (low) yellow or negligible (green) levels.	Possible	Possible	No
GB105033038180	Tove (DS Greens Norton)	Low	Low			Possible	Possible	No
GB106039029890	Bulbourne	Low	Low	Design development and confidence around physical changes to canals and around Minworth treatment requirements. Further WQ and hydrological assessments, including canal-river connections, hydraulic and WQ modelling and ongoing baseline data collection, including: - inclusion of data for river lengths of waterbodies from EA monitoring; - request for further specific details of RBMP measures (including A/HMWB measures where relevant) from EA	Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels. Fish and eel screening at abstraction point intake.	Possible	Possible	Uncertain
GB106039029900	Gade (Upper stretch Great Gaddesden to confluence with Bulbourne / GUC)	Low	Low	<ul> <li>update to WFD baseline data to include 2019 status in line with Cycle 3 2021-2027 RBMPs once published.</li> </ul>		Possible	Possible	Uncertain
GB109054044402	Avon (Wark) conf R Leam to Tramway Br, Stratford	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further	Possible	Possible	No
GB70910203	Grand Union Canal, Leamington Spa to Warwick trough pound	Low	Low		assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No
GB70910511	Grand Union Canal, Braunston to Leamington Spa	Low	Low			Possible	Possible	No
GB70510251	Grand Union Canal, Milton Keynes to	Low	Low			Possible	Possible	No

f	Further comments
	Evidence of connection with GUC east of Braunston. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Assessment assumes connections with canal through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
	Assume connections with GUC through Milton Keynes. May be less affected or at risk than some other WBs. Note phosphate is at Good status, so risk of deterioration to be checked in more detail against EQS during assessment leading to Gate 2.
	Assume connections with GUC through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
	Interacts with GUC north of Milton Keynes. Phosphate at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
	Chalk river. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Flow stressed. Potential to augment flow using additional water is uncertain. Higher risk flagged, subject to further assessment of water quality during Gate 2. Abstraction point would be in this waterbody for the Hemel Hempstead abstraction.
	Connected to GUC at downstream extent of waterbody at Hemel Hempstead. May be precautionary and unlikely to be affected by transfer as water not anticipated to flow up into Gade, potential to remove or reduce risks at Gate 2.
	River connected to GUC around location of pipeline discharge from Minworth into canal at Leamington Spa. Phosphate at poor status (macrophytes moderate) and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
	Discharge would be from Minworth-Leamington pipeline into this section of canal. Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.

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
	Braunston summit								
GB70510192	Grand Union Canal, Milton Keynes trough pound	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510191	Grand Union Canal, Tring summit to Milton Keynes	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70610182	Grand Union Canal, Tring summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70510193	Grand Union Canal, Braunston summit	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70610184	Grand Union Canal, Tring summit to Berkhamstead	Low	Low			Possible	Possible	No	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
GB70610185	Grand Union Canal, Berkhamstead to Maple Lodge (RIvers Bulbourne, Gade and Colne)	Low	Low			Possible	Possible	No	Canal highly interconnected with rivers through this section.

# Table 5.11: Option 3C: Treated wastewater transfer from Minworth WwTW to Tring via Route 6 (50 or 100MI/d) 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
GB105032045360	Welton Village Trib, Whilton branch of R. Nene	Low	Low			Possible	Possible	No
GB105033037971	Ouzel US Caldecote Mill	Low	Low			Possible	Possible	No
GB105033037900	Loughton Brook	Low	Low			Possible	Possible	No
GB105033038180	Tove (DS Greens Norton)	Low	Low		Understanding of improved treatment at	Possible	Possible	No
GB109054044402	Avon (Wark) conf R Leam to Tramway Br, Stratford	Low	Low	Design development and confidence around physical changes to canals and around Minworth treatment requirements. Further WQ and hydrological assessments, including canal-river connections, hydraulic and WQ modelling and ongoing baseline data collection, including: - inclusion of data for river lengths of waterbodies from EA monitoring; - request for further specific details of RBMP measures (including A/HMWB measures	Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No
GB70910203	Grand Union Canal, Leamington Spa to Warwick trough pound	Low	Low			Possible	Possible	No
GB70910511	Grand Union Canal, Braunston to Leamington Spa	Low	Low	where relevant) from EA - update to WFD baseline data to include 2019 status in line with Cycle 3 2021-2027 RBMPs once published.		Possible	Possible	No
GB70510251	Grand Union Canal, Milton Keynes to Braunston summit	Low	Low			Possible	Possible	No
GB70510192	Grand Union Canal, Milton Keynes trough pound	Low	Low			Possible	Possible	No
GB70510191	Grand Union Canal, Tring summit to Milton Keynes	Low	Low			Possible	Possible	No
GB70610182	Grand Union Canal, Tring summit	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No

nt of dy s	Further comments
	Evidence of connection with GUC east of Braunston. Phosphate and macrophytes at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives. Assessment assumes connections with canal through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
	Assume connections with GUC through Milton Keynes. May be less affected or at risk than some other WBs. Note phosphate is at Good status, so risk of deterioration to be checked in more detail against EQS during assessment leading to Gate 2.
	Assume connections with GUC through Milton Keynes. Phosphate at moderate status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
	Interacts with GUC north of Milton Keynes. Phosphate at poor status and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
	River connected to GUC around location of pipeline discharge from Minworth into canal at Leamington Spa. Phosphate at poor status (macrophytes moderate) and RNAGs related to existing wastewater pollution - risk of not meeting future objectives.
	Discharge would be from Minworth-Leamington pipeline into this section of canal.
	Refer to GUC Transfer SRO Water Quality Stages 1 & 2 report P5953 for further detail on canal water quality.
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment can be undertaken. Abstraction point would be in this waterbody for the Tring abstraction.

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
					Fish and eel screening at abstraction point intake.			
GB70510193	Grand Union Canal, Braunston summit	Low	Low		Understanding of improved treatment at Minworth WwTW to meet WFD EQS standards is the key mitigation to enable a reduction in WFD risks across the scheme. Further assessment of the permit levels required (volume and concentrations of key WQ parameters) to establish that inherent mitigation would successfully reduce WFD risks to (low) yellow or negligible (green) levels.	Possible	Possible	No

1	Further comments
	Canal waterbody only has WFD classification for Mitigation Measures Assessment, so limited assessment has been undertaken.

# 6 Conclusions

#### 6.1 Summary

For the GUC SRO, three transfer route options with three potential abstraction locations have been subject to a WFD assessment.

The Level 1 WFD assessment completed for Gate 1 by WRSE indicated that all options had multiple WFD waterbodies which required further assessment.

Level 2 WFD assessments have been completed for screened-in waterbodies, following an additional connectivity review and inclusion of the canal waterbodies. The findings indicate that there are potential WFD compliance risks associated with operation of the transfer for all options. The risks are outlined in the tables in Section 5.3 and summarised in Table 6.1.

Option	Number of water bodies assessed	Risk of WFD status deterioration	Risk of compromising WFD objectives	Assists attainment of WFD objectives		
		Possible	Possible	No	Uncertain	
1A	19	19	19	16	3	
2A	18	18	18	16	2	
3A	14	14	14	14	0	
1B	18	18	18	15	3	
2B	17	17	17	15	2	
3B	13	13	13	13	0	
1C	17	17	17	14	3	
2C	16	16	16	14	2	
3C	12	12	12	12	0	

#### Table 6.1: Summary of Level 2 outcomes – number of WFD waterbodies per option

It is difficult to meaningfully discern between route or abstraction point options at this stage, at a strategic level on the basis of WFD compliance risks and the option/design information so far developed. Potential water quality effects could conflict with achieving WFD status objectives. This is particularly the case for waterbodies where physico-chemical conditions (in particular nutrient levels) are existing limiting factors, recorded in WFD baseline data as a 'reason for not achieving good'.

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 where relevant until option designs and assessments are further progressed.

#### 6.2 Further assessment

Further WFD assessment would be required for all options that progress to Gate 2 and beyond, to improve the confidence and certainty levels of WFD impacts and compliance risk outlined in the Gate 1 WFD Level 2 assessments. The limitations of the WFD assessment at Gate 1, and proposed actions to improve certainty are summarised in Table 6.2 and Table 6.3. It is likely that the majority of WFD assessment data requirements will be met by existing ongoing work packages around design and water quality, although some specific data requests are recommended below. Water quality is likely to remain the biggest challenge for compliance through all stages of assessment.

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, with a particular focus on water quality within both canal and river lengths;
- Collation and review of Artificial and Heavily Modified Waterbody (A/HMWB) measures information from the Environment Agency for inclusion into the assessment of potential impediment to achieving Good Ecological Potential (GEP);
- Collation and review of detailed water quality baseline data concerning WFD biological, physico-chemical and hydromorphological elements identified as being at low, moderate and high risk (respectively coloured yellow, amber, and red) in the Level 2 assessments.
   Specifically, the WFD assessment to date has identified potential gaps in the Environmental Water Quality workstream relating to integration of Environment Agency long term water quality monitoring data within river waterbodies connected with canals.
- Assessment of inter-reliant multiple SRO options (as the option is reliant on the Minworth SRO being delivered);
- Development of a conceptual model(s) linking together how potential hydrological and water quality changes could influence water quality, and the sensitivity of aquatic habitats and biological communities to changes (e.g. fine sediment deposition and re-suspension (creating morphological features) and changing patterns of macrophyte vegetation growth);
- Further information on the design and operation of the options to allow a more explicit assessment of physical changes;
- Update to Level 2 WFD assessments at Gate 2 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>6</sup>. 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.

<sup>&</sup>lt;sup>6</sup> https://www.legislation.gov.uk/uksi/2017/407/made

# Table 6.2: Design assumptions and next steps for WFD assessment

Issue	Limitations and Assumptions	Next Steps (further work required)
Design - New pipelines	Assumed to be underground and directionally drilled beneath surface waterbodies (so no WFD impact anticipated)	Confirmation of methods of construction recommended for Gate 2 (viz-a-viz surface water crossings).
	Pipeline options reduce the number of waterbodies along a route with potential water quality impacts, but impacts would remain on the lower waterbodies including the chalk river sections	
	Gate 1 WFD assessment uses high level information held in reports WP1b and WP2	
Design - New outfalls and intake structures	For the purpose of Gate 1 assessment assumed to be relatively small/ local structures (with headwall into canal and fish screens across abstraction points)	Design details developed through Gate 2 and used to inform performance criteria for next round of WFD assessment
Design - Pumping around/ over canal summits/ watersheds	For the purpose of Gate 1 assessment assumed to be relatively small/ local structures (with headwall into canal and fish screens across abstraction points) and associated pumps.	Design details developed through Gate 2 and used to inform performance criteria for next round of WFD assessment
Design - New water storage reservoirs	These would be adjacent to intake abstraction points but have not been explicitly included during Gate 1. Impact would depend on location and proximity of watercourses although assumed to be limited.	May need to be added to the Options Appraisal during Gate 2. As a structure unlikely to significantly affect assessment of route or abstraction options for WFD compliance.
Design - Structural changes to canals (to allow conveyance of flow)	Assumed at this stage that these are design (engineering) issues with little or no impact under WFD.	Develop through Gate 1 into Gate 2 to allow a more informed future WFD assessment.
	Unlikely to pose risk of deterioration to WFD (e.g. already on heavily engineered artificial canal waterbodies heavily modified for navigation but would need to consider future objectives and environmentally sensitive designs/mitigation, to be integrated once further design information available.	May need to be re-evaluated as environmentally sensitive design/construction sequence.
Operation - Pollution Incident	Assessment assumes fail safes would stop the transfer in the case of a significant failure of Minworth WwTW or other operational aspects.	Operational requirements etc to be developed and integrated into WFD assessment during Gate 2.
Operation - Frequency	Understanding of frequency and seasonality of transfer operation has not been included at this stage. This could influence the level of WFD compliance risk.	Operational requirements etc to be developed and integrated into hydrological and water quality modelling and WFD assessment during Gate 2.

#### Table 6.3: WFD assessment limitations / assumptions and next steps

Issue	Limitations and Assumptions	Next Steps (further work required)
Footprint impacts (new structures affecting bed and banks)	Any new or modified physical structures required for the transfer option are assumed to be on canal waterbodies, except abstraction points which may be located on canal or river waterbodies. See "design" section above. Assumed works would be at a local scale and therefore not significant at a water body scale.	Design detail required in due course in Gate 2.
Volume of flow and changes to velocity	Assumed flow velocities may be sufficient to cause some channel changes (e.g. redistribution of silt etc). Based on preliminary outcomes of Gate 1 modelling report (2021). Channel changes of connected river water bodies and structural issues due to scour of canal have been considered likely to be minimal for additional flows but needs to be subject to further assessment. Assumed relatively localised and limited to canal operational requirements for relatively low velocity – WFD low risk colour-coded yellow/localised changes.	Hydrological/ hydraulic studies showing calculations for canal and river waterbodies for whole route length, including detailed review of canal- river existing interactions/connectivity. Further work recommended at Gate 2 for examining flow augmentation of hydrologically 'stressed' chalk streams. NB. This is likely to be challenging given potential temporary augmentation from wastewater rather than natural groundwater sources, and reflecting seasonal hydrological cycles characteristic of chalk streams.
Water quality relating to treated wastewater (from Minworth) and passage/transfer through canals	<ul> <li>Water quality monitoring and assessments are 'works in progress' extending into Gate</li> <li>Assumed that this is based on the values noted in the April 2021 water quality report i.e. that there is at least some risk of deterioration of WFD status or of not meeting WFD objectives – therefore scored at least moderate (amber) WFD risk at this stage. Assumed from available information that the existing Minworth wastewater as it stands has different physico-chemical properties to receiving canal and downstream river water bodies, potentially causing deterioration. Required levels of treatment outlined in the CDR identify requirements to maintain Moderate status for physico-chemical conditions in canals and are subject to future refinement.</li> <li>Assumed higher risk at lower reaches of scheme which interact with the highly sensitive chalk streams (e.g. Gade and Bulbourne), although conceptually it is likely that dilution and some displacement of water would have occurred at this distance downstream. Risk level initially high ('red) with potential to reduce at future Gates with further modelling / evidence of dilution.</li> <li>Assessment assumes that there would be some existing level of mixing of rivers and canals waters during floods and that this would occur naturally (over and above canal infrastructure connections). The assessment has not therefore attempted to address these impacts.</li> </ul>	<ul> <li>Further work to indicate what additional treatment would be required at Minworth before discharge into canal (direct) and river water bodies (indirect) (NB water quality assessment to date appears not to look at all interconnected surface water bodies with the canals). Further work on WFD EQS failures and procedures therefore recommended to be followed.</li> <li>Mixing/dilution studies recommended for Gate 2 on volume of wastewater vs receiving water bodies – linking with ongoing studies, but with additional consideration of whether these would be sufficiently geographically extensive to provide evidence of effects or lack of in downstream reaches.</li> <li>Level of WFD risk needs to be reviewed/reduced in line with further water quality assessment outcomes – e.g. Gate 2 should identify the likely nature and extent of Minworth treatment that would be required to avoid/minimise WFD risk and confirm technically feasible.</li> </ul>

Issue	Limitations and Assumptions	Next Steps (further work required)
Invasive species (INNS)	The limited information included in the Ecological Monitoring, Phase 1 Report (March 2021) suggests that there are some differences in species between north and south reaches. However, assumed (using existing information) for Gate 1 that INNS is unlikely to be a key performance criterion on which to discern between options for WFD compliance. Most INNS will have already colonised canals and rivers in the study area by virtue of existing interconnection and navigational use. Colour coded 'Yellow' WFD low risk, on assumption that there are already connections allowing INNS colonisation, but these could be increased.	Bespoke survey information leading to a report on nature and extent of relevant species. Could be used to discern better between options at Gate 2.
HMWB/ artificial waterbody	A/HMWB information (specific details of measures) was not available for Gate 1, so the level of assessment was relatively high level.	Specific data request to be made to EA for Gate 2.
nyaromorphology		Potential for measures to be updated by EA during 2021 for Cycle 3 RBMP; consultation with EA over timing of publication or early sight of draft measures for A/HMWBs recommended to be incorporated during Gate 2.
Overall WFD risk scoring	Scores 'without' and 'with' mitigation almost entirely do not change in this assessment as the level of mitigation to be provided at this stage is uncertain.	The impact level changing is around certainty and evidence of impacts (to be improved at Gate 2 in line with recommendations in ACWG methodology).
	The exception is that is assumed that potential high (red) risks to downstream chalk rivers flagged as 'worst case' scenario, would in reality be more likely to be a moderate (amber) level of risk once permit and treatment requirements are established.	
Future objectives	Main part of assessment has been to concentrate at this stage on physico-chemical status relating to Phosphate. The majority of waterbodies fail to meet Good status for Phosphate and it is already an issue recognised by RNAGs, with a risk of not meeting future objectives.	'Refine' as more water quality information becomes available during Gate 2.
	With available information at this stage a negative score is obtained on each occasion. Assumed, for example, that putting more phosphate or ammonia into individual potentially affected water bodies could set back other measures (POMs) being implemented and therefore potential for non-compliance with future objectives.	
WFD baseline Cycle 2 vs Cycle 3	WFD status data at Gate 1 based on 2015 Cycle 2 RBMP data (in line with ACWG) – publication of the Cycle 3 RBMP is due in 2021 at which point the baseline data for assessments should be updated. Noted that the recent water quality assessments (APEM) are using 2019 data already in anticipation of update.	Note in report and recommend ongoing liaison with EA over expected publication date of Cycle 3 RBMP to form official baseline and point at which this should be used with respect to Gate 2 or 3 (depending on programme).

# A. WRSE output tables

The WRSE GUC outputs are available upon request.

# **B.** Further assessment output tables

The further assessment output tables are available upon request.

