

Anglian to Affinity Transfer Strategic Resource Option - A2AT Water Framework Directive Assessment

RAPID Gate 1 submission - Annex 2C

June 2021

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1 Introduction

1.1 Overview

This assessment supports the *Environmental Assessment Report* (EAR) that accompanies the Gate 1 submission to the Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the Anglian to Affinity Transfer (A2AT) Strategic Regional Option (SRO). It presents the findings of a Water Framework Directive (WFD) assessment applied to the four A2AT options.

1.2 A2AT options

The outputs of the initial SRO screening process identified four distinct options for transferring water from the Anglian Water region to the Affinity Water region. These options are shown in Table 1.1. Further details on the options are set out in Section 2.

Table 1.1: A2AT options

Option name	Description overview
Fens Reservoir	Abstraction of raw water from the proposed Fens Reservoir, and treatment at a new WTW. The treated water would then be pumped, via a break tank and intermediate pumping station, to a conditioning plant in WRZ5 – Stort (henceforth called WRZ5 Hub). The treated water would feed a new SR servicing supply zone WRZ5, Stort, in the Affinity Water network.
SLR to Preston	Abstraction of raw water from the proposed South Lincolnshire Reservoir where it would be treated at a new WTW and transferred to a break tank and pumping station near Etton Service Reservoir. The potable water would then be pumped, via an intermediate break tank and pumping station, to Sundon WTW for conditioning. From Sundon, the water would be transferred to Preston SR in WRZ3 for further distribution into the Affinity network.
SLR to WRZ5 Hub	Abstraction of raw water from the proposed South Lincolnshire Reservoir, and conveyance to a new SLR WTW. The treated water would then be pumped, via a break tank and intermediate pumping station, to a conditioning plant in WRZ5 – Stort (henceforth called WRZ5 Hub). The treated water would feed a new SR servicing supply zone WRZ5, Stort, in the Affinity Water network.
River Trent	Abstraction of raw water from the River Trent in the vicinity of East Bridgford, where it would be partially treated to prevent Invasive Non-Native Species (INNS) transfer. The partially treated water would then be transferred via a pipeline to Rutland Water. A new draw-off arrangement and WTW at Rutland Water would abstract, treat, and pump water from Rutland Water to Sundon WTW for conditioning, via an intermediate break tank and pumping station near Grafham. From Sundon, the water would be transferred to Preston SR for further distribution into the Affinity network.

1.3 Methodology

1.3.1 Approach to WFD assessment for SROs

The WFD requires all waterbodies (both surface and groundwater) to achieve 'good status'. The Directive also requires that the 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 will 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 based 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*.

While A2AT is a Water Resources East (WRE) scheme, the initial assessments to support the Gate 1 submission were undertaken using the method developed for use on the Water Resources South East (WRSE) regional programme. The WRE environmental assessment approach is currently being finalised following completion of the Integrated Environmental Assessment scoping consultation exercise. It is expected that the WRE methodology will be used to support the work for Gate 2 submission. As the WRSE and WRE methodologies are very similar, this will not invalidate the Gate 1 assessments undertaken for the A2AT SRO.

1.3.2 Level 1 – basic screening

The Level 1 WFD assessment was completed for all four A2AT options. Level 1 assessment follows these steps:

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

The outcomes for the A2AT options are summarised in Section 3 and Appendix A. Where waterbodies and option impacts were 'screened in', they have been taken forward to Level 2 assessment.

1.3.3 Level 2 – detailed impact screening

The second stage of WFD assessment has been completed for the A2AT option that was screened in at Level 1, following these steps:

- Waterbody scale detailed assessment of impacts to each WFD quality element for each activity proposed as part of an option;
- Assessment of data confidence level and design certainty (*note, confidence/certainty expected to be low at initial Gate 1 assessment and increase over time*);
- Identification of further mitigation needs;
- Assessment of impacts after mitigation (scoring on a 6-point scale); and
- Identification of activities to improve certainty of assessment outcomes.

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

1.3.4 WFD for Gate 2 and beyond

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

1.3.5 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 River Basin Management Plan (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).
- 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.
- At Gate 1 the geographical extent of the WFD assessment has been limited to waterbodies between the abstraction point and the discharge location. There is potential for some effects to continue downstream of the abstraction point, although it is assumed these would become increasingly limited to 'negligible' with distance to the point where they would not affect WFD compliance. At this stage of the design there is insufficient evidence to assess the WFD compliance risk to these downstream waterbodies and they may need to be rescoped into the assessment, as more evidence becomes available (for example following hydrological investigations).

2 Scheme description

2.1 Overview

The aim of the A2AT scheme is to address long term water deficits in Affinity Water’s Central region, with the objective of abstracting available raw water from the Anglian Water region, treating it to potable water standards and delivering to Affinity Water customers in WRZ 3 and WRZ 5 (Lee and Stort communities, respectively). Potential sources of raw water are the River Trent, proposed South Lincolnshire Reservoir, and proposed Fens Reservoir. Treated water would be delivered to one of two existing distribution points: Preston Service Reservoir in WRZ3 or WRZ5 Hub.

A full scheme description can be found in the A2AT *Concept Design Report*, however a summary of the main aspects of the options is included below.

2.2 Option descriptions

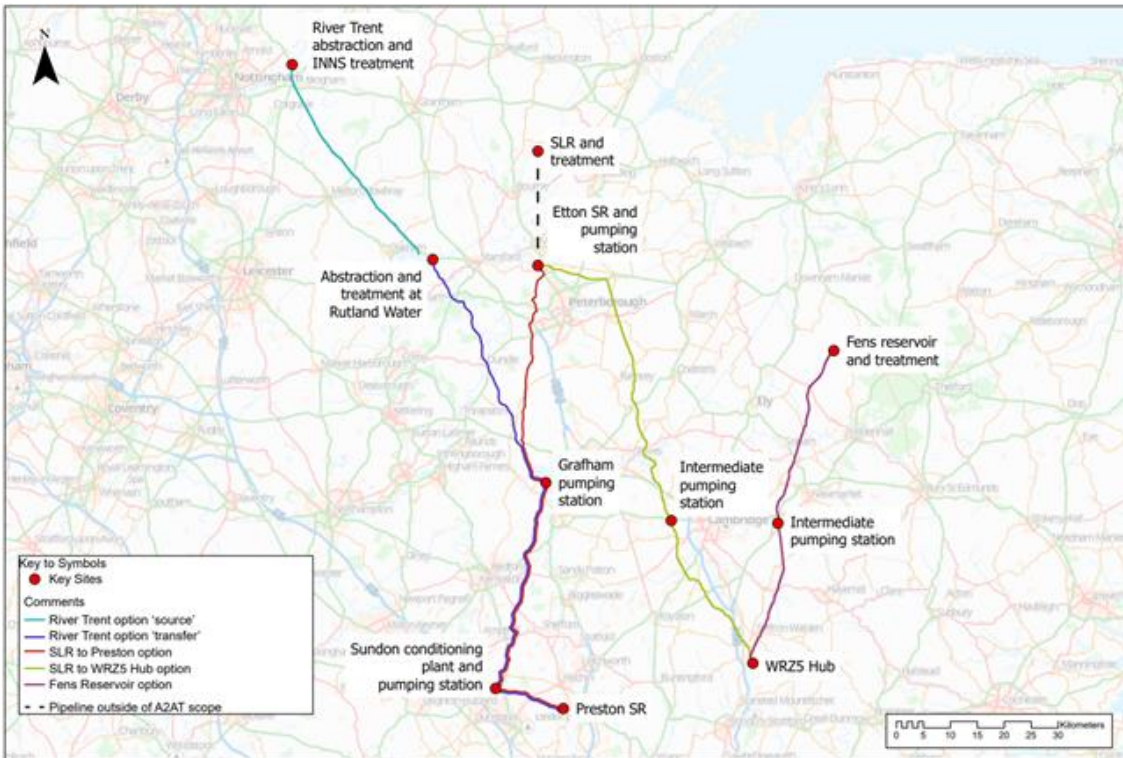
For Gate 1, there are four options for A2AT as described in Table 2.1. A map of the options is shown in Figure 2.1.

Table 2.1: A2AT Gate 1 options

Option name	Option description
Fens Reservoir	<p>Abstraction of raw water from the proposed Fens Reservoir, and treatment at a new Fens Reservoir WTW. The potable water will then be conveyed to a conditioning plant and SR in WRZ5 Hub via an intermediate break tank and pumping station. 50MI/d and 70MI/d alternatives.</p> <p>Interdependencies of the option: Fens Reservoir and network enhancement in WRZ5.</p> <p>Indicative intake location: Fens Reservoir</p> <p>Abstraction infrastructure: See Fens Reservoir scheme</p>
SLR to Preston	<p>Abstraction of raw water from the proposed South Lincolnshire Reservoir, and conveyance to new SLR WTW. The potable water will then be conveyed to Sundon WTW for conditioning, via Etton Service Reservoir and routing past and intermediate break tank and pumping station near Grafham. The treated water will be transferred to Preston SR. 50MI/d and 100MI/d alternatives.</p> <p>Interdependencies of the option: SLR SRO and network enhancement downstream of Preston</p> <p>Indicative intake location: South Lincolnshire Reservoir</p> <p>Abstraction infrastructure: See SLR SRO</p>
SLR to WRZ5 Hub	<p>Abstraction of raw water from the proposed South Lincolnshire Reservoir, and conveyance to new SLR WTW. The potable water will then be conveyed to a conditioning plant and SR in WRZ 5 Hub, routing past Etton SR and an intermediate break tank and pumping station. 50MI/d and 100MI/d alternatives.</p> <p>Interdependencies of the option: SLR SRO and network enhancement in WRZ5</p> <p>Indicative intake location: South Lincolnshire Reservoir</p> <p>Abstraction infrastructure: See SLR SRO</p>

Option name	Option description
River Trent	<p>Abstraction of raw water from the River Trent at East Bridgford (150MI/d or 300MI/d), and treatment to prevent Invasive Non-Native Species (INNS) transfer. The partially treated raw water will be conveyed to Rutland Water, where a new draw-off arrangement and Rutland Water WTW will abstract, treat, and convey water to Sundon WTW for conditioning, routing via an intermediate break tank and pumping station near Grafham. The treated water will be transferred to Preston SR. 50MI/d and 100MI/d alternatives.</p> <p>Interdependencies of the option: Network enhancement downstream of Preston</p> <p>Indicative intake location: River Trent at East Bridgford and Rutland Water</p> <p>Abstraction infrastructure: Inlet bar and fine screens (River Trent), and draw-off arrangement (Rutland Water).</p>

Figure 2.1: Map of the A2AT options



Source: Mott MacDonald

3 Level 1 Water Framework Directive assessments

3.1 Fens Reservoir

The Level 1 WFD assessment covered three components of the option in a single assessment, as seen in the option description. The outcome indicated no further assessment would be necessary for the option.

Table 3.1: Level 1 WFD assessment outcomes for the Fens Reservoir option

Fens Reservoir	
Option Description	Fens Reservoir Pipeline (70MI/d deployable output) Fens Reservoir WTW (70MI/d); WRZ5 WTW (70MI/d)
Number of waterbodies passing WFD assessment	11
Waterbodies passing WFD assessment	GB205033000070: Ely Ouse (South Level) GB105033042860: Soham Lode GB105033042700: Bottisham Lode - Quy Water GB105033042710: Swaffham - Bulbeck Lode GB105033042720: Burwell Lode GB105033042780: New River GB105033037810: Granta GB105033037480: Cam (US Newport) GB105033037490: Debden Water GB105033037550: Cam (Newport to Audley End) GB105033037580: Slade
Number of waterbodies requiring further WFD assessment	0

3.2 South Lincolnshire Reservoir to Preston

The Level 1 WFD assessment covered two components of the option in a single assessment, as seen in the option description. The outcome indicated no further assessment would be necessary for the option.

Table 3.2: Level 1 WFD assessment outcomes for the SLR to Preston option

SLR to Preston option	
Option Description	SLR to Preston Pipeline (100MI/d deployable output) Sundon WTW (100MI/d)
Number of waterbodies passing WFD assessment	24
Waterbodies passing WFD assessment	GB205033000050: Middle Level; GB105032050381: Nene - Islip to tidal; GB105032050330: Billing Brook; GB106038033460: Mimram (Whitwell to Codicote Bottom); GB106038033391: Lee (from Luton to Luton Hoo Lakes); GB105031050595: Brook Drain (including Marholm Brook); GB105033037670: Chicksands Brook; GB105033037690: Purwell; GB105033037790: Flit and Ivel Navigation d/s of Shefford; GB105033037800: Ickwell Brook;

SLR to Preston option	
	GB105033037500: Barton Brook; GB105033037530: New Inn Brook; GB105033043230: Begwary Brook; GB105033047921: Ouse (Roxton to Earith); GB105033043310: Diddington Brook; GB105033043220: Colmworth Brook; GB105033043260: Duloe Brook; GB105033043270: Kym; GB105033042870: Ellington Brook; GB105033042810: Cock Brook; GB105033042820: Alconbury Brook; GB105033042830: Ellington Brook (Trib); GB105033047923: Ouse (Newport Pagnell to Roxton); GB105033038090: Cople Brook;
Number of waterbodies requiring further WFD assessment	0

3.3 South Lincolnshire Reservoir to WRZ5 Hub

The Level 1 WFD assessment covered two components of the option in a single assessment, as seen in the option description. The outcome indicated no further assessment would be necessary for the option.

Table 3.3: Level 1 WFD assessment outcomes for the SLR to WRZ5 Hub option

SLR to WRZ5 Hub option	
Option Description	SLR to WRZ5 Hub Pipeline (100MI/d deployable output) WRZ5 WTW (100MI/d)
Number of waterbodies passing WFD assessment	24
Waterbodies passing WFD assessment	GB105033043140: Bury Brook; GB205033000050: Middle Level; GB205033000010: Counter Drain (Sutton and Mepal IDB incl. Cranbrook Drain); GB205033043375: Old West River; GB530503200200: Nene;GB105032050382: Mortons Leam; GB205032050385: North Level Pumped Areas 2 and 3; GB205032050395: North Level Main Drain; GB105031050560: Folly River (including Werrington and Marholm Brooks); GB105031050595: Brook Drain (including Marholm Brook); GB205031050685: Welland - conf Greatford Cut to tidal; GB105033042680: Bin Brook; GB105033042690: Bourn Brook; GB105033047921: Ouse (Roxton to Earith); GB105033042740: Fen Drayton Drain; GB105033042770: Swavesey Drain; GB105033042800: Marley Gap Brook; GB105033037610: Rhee (DS Wendy); GB105033037480: Cam (US Newport); GB105033037490: Debden Water; GB105033037550: Cam (Newport to Audley End); GB105033037570: Tributary of Cam; GB105033037590: Cam (Audley End to Stapleford); GB105033038120: Hoffer Brook
Number of waterbodies requiring further WFD assessment	0

3.4 River Trent

The Level 1 WFD assessment covered four components of the option in a single assessment, as seen in the option description. The outcome indicated a Level 2 assessment would be required for the 'Trent from Soar to The Beck' WFD waterbody (ID GB104028053110) and 'Rutland Water' WFD waterbody (ID GB30536479).

Table 3.4: Level 1 WFD assessment outcomes for the River Trent option

River Trent option	
Option Description	River Trent Pipeline (100MI/d deployable output) INNS treatment WTW (300MI/d) New Rutland Water WTW (100MI/d) Sundon WTW (100MI/d).
Number of waterbodies passing WFD assessment	45
Waterbodies passing WFD assessment	GB105032050350: Wittering Brook GB105032050381: Nene - Islip to tidal GB105032045210: Barnwell Brook GB105032045250: Glapthorn Brook GB105032045260: Southwick Brook GB105032045270: Stonepit Dyke GB104028053112: Shelford Brook Catchment (trib of Trent) GB104028052501: Car Dyke GB104028052631: Smite / Devon from Stroom Dyke to Cotham GB104028053030: Stroom Dyke Catchment (trib of Smite) GB104028053040: Smite from Dalby Brook to Stroom Dyke GB105031050440: Chater - Lower GB105031050480: South Gwash GB105031050490: North Gwash GB105031050500: North Brook (Welland) GB105031050580: Welland - conf Langton Bk to conf Gwash GB105031050610: Gwash GB105032050290: Willow Brook (Nene) GB104028047481: Langham Brook from Whissendine Brook to Eye GB104028047520: Langham Brook from Source to Whissendine Brook GB104028047540: Wymondham Brook Catchment (trib of Langham Brook) GB104028047610: Eye from Source to Langham Brook GB104028047580: Freeby Brook Catchment (trib of Eye) GB104028047590: Thorpe Brook Catchment (trib of Eye) GB104028047600: Scafford Brook Catchment (trib of Wreake) GB106038033460: Mimram (Whitwell to Codicote Bottom) GB106038033391: Lee (from Luton to Luton Hoo Lakes) GB105033037670: Chicksands Brook GB105033037690: Purwell GB105033037790: Flit and Ivel Navigation d/s of Shefford GB105033037800: Ickwell Brook GB105033037500: Barton Brook GB105033037530: New Inn Brook GB105033047921: Ouse (Roxton to Earith) GB105033043310: Diddington Brook GB105033043220: Colmworth Brook GB105033043260: Duloe Brook GB105033043270: Kym GB105033042870: Ellington Brook GB105033042810: Cock Brook GB105033042820: Alconbury Brook GB105033042830: Ellington Brook (Trib)

	GB105033047923: Ouse (Newport Pagnell to Roxton) GB105033038090: Cople Brook GB105033043230: Begwary Brook
Number of waterbodies requiring further WFD assessment	2
Waterbodies requiring further WFD assessment	GB104028053110: Trent from Soar to The Beck GB30536479: Rutland Water

The Level 1 WFD assessment indicated that three of the options are anticipated to have very low risks of being non-compliant with WFD objectives, and do not require further assessment:

- Fens Reservoir
- SLR to Preston
- SLR to WRZ5 Hub

The Level 1 WFD assessment identified the need to undertake a Level 2 WFD assessment for the below option:

- River Trent

4 Level 2 Water Framework Directive assessment

The second stage of WFD assessment has been completed for the A2AT option that was screened in at Level 1. Section 4.1 provides an overview of the Level 2 WFD assessment undertaken for the River Trent option. Section 4.2 provides a summary table for the option assessed.

4.1 River Trent option

The Level 1 WFD assessment identified potential impacts on two waterbodies: Rutland Water (GB30536479) and Trent from Soar to The Beck (GB104028053110).

In Rutland Water the Level 2 WFD assessment identified possible deterioration risks to phytoplankton, mitigation measures assessment and total phosphorus. These are primarily due to a potential risk to water quality and INNS from transfer from another waterbody and morphology changes due to new outlet and intake structures. Mitigation included in the design (partial water treatment at source of water) will be sufficient to prevent transfer of INNS and will ensure water quality sufficient to maintain current and future water quality standards. The Level 2 assessment also identified potential impediments to meeting Good Ecological Status, due to mitigation measures assessment linked to physical modifications.

In the Trent from Soar to The Beck waterbody the Level 2 assessment identified possible deterioration risks to water quality (due to potential for reduced flow leading to a reduction of dilution of discharges) and hydrological regime. These are primarily the reduction in flow due to increased abstraction.

A summary of the Level 2 WFD assessment is included in Table 4.1 and detailed outputs are presented in Appendix B.

4.2 Summary table

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

Table 4.1: River Trent option (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
GB30536479	Rutland Water	Low	Low	<p>Additional investigation into the Mitigation measures for this waterbody required to better understand the potential impact on mitigation assessment measures from new discharge and intake structures</p> <p>Additional design of intake and outlet structures to minimise the impact on morphology of the lakes.</p>	<p>Partially treatment of water at source before transfer to Rutland water. Treatment will be sufficient to prevent transfer of INNS and will ensure water quality sufficient to maintain current water quality standards (in particular no increase in total phosphorus)</p>	No	Possible	No	None
GB104028053110	Trent from Soar to The Beck	Low	Low	<p>Detailed review of all baseline ecological WFD data, including results of any surveys already undertaken for A2AT (e.g. macrophyte and invertebrate surveys).</p> <p>Detailed hydrological assessment of the impacts of abstraction (of up to 300MI/d) on water quality / concentration of key physicochemical parameters.</p> <p>Further information about option."</p>	<p>Fish and eel screening at new intake.</p> <p>Abstraction conditions to be set to minimise changes to hydrological regime that could cause deterioration of biological and physicochemical WFD elements</p>	Possible	Possible	No	None

5 Conclusions

5.1 Summary

For the A2AT scheme, four options have been subject to a WFD assessment.

The Level 1 WFD assessment indicated that three of the options are anticipated to have very low risks of being non-compliant with WFD objectives, and do not require further assessment:

- Fens Reservoir
- SLR to Preston
- SLR to WRZ5 Hub

Level 2 WFD assessments were completed for components of the River Trent option. The findings indicate that there are potentially precautionary WFD compliance risks associated primarily with the operation of the new abstraction on two waterbodies: Rutland Water (GB30536479) and Trent from Soar to The Beck (GB104028053110). The potential effects could **conflict with achieving WFD status objectives**. This is particularly the case where physical modifications or water quality are an existing limiting factor, recorded in WFD baseline data as a 'reason for not achieving good'. The potential biological effects, particularly on physico-chemical changes (for example, reduced dilution) would require further assessment as outlined in Section 5.2. Further investigations are required to design suitable mitigation to ensure compliance with the WFD (see Section 5.2).

At Gate 1 the geographical extent of the WFD assessment has been limited to waterbodies between the abstraction point and the discharge location. There is potential for some effects to continue downstream of the abstraction point, although it is assumed these would become increasingly 'negligible' with distance, to the point where they would not affect WFD compliance. There is currently insufficient evidence to assess the WFD compliance risk to these downstream waterbodies and they may need to be rescoped into the assessment, as more evidence becomes available (for example following hydrological investigations, see Section 5.2).

For new intakes, it is recognised that appropriate fish and eel screening would be required to prevent entrainment, although neither waterbody has a status classification for fish.

5.2 Further assessment

Subject to its progression through the approvals process, further WFD assessment would be required for the River Trent option, to improve the certainty of the levels of WFD risk outlined in the Gate 1 WFD Level 2 assessments.

Areas for future focus include:

- Consultation with the Environment Agency to present and discuss key WFD risks and proposed approach to improving certainty of assessments
- Collation and review of Heavily Modified Waterbody (HMWB) measures and mitigation measures assessment information from the Environment Agency for inclusion into the assessment of potential impediment to obtaining Good Ecological Potential (GEP)
- Collation and review of detailed baseline data concerning WFD biological, physicochemical and hydromorphological elements identified as being at yellow, amber, or red risk in the Level 2 assessment. This may include existing Environment Agency long term WFD and water quality monitoring data within the relevant waterbodies, and targeted baseline surveys being undertaken specifically for the option assessment

- Hydrological study to investigate the likely changes in flow in the River Trent (and downstream waterbodies).
- Development of a conceptual model linking together how potential hydrological changes in the River Trent could influence water quality and the sensitivity of aquatic communities to those changes
- Further information on the design and operation of the option
- Update the Level 2 WFD assessments to incorporate additional information
- Outlining further work or modelling required to demonstrate compliance into Gate 3.

It is noted that there may be potential changes to WFD-related legislation related to Britain's exit from the European Union (EU). The EU WFD legislation is transposed in England and Wales by *The Water Environment (WFD) (England and Wales) Regulations 2017*¹. 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.

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

A. Level 1 WFD assessment output tables

The Level 1 WFD outputs are available on the South Lincs Reservoir Community SharePoint site here:

<https://anglianwater.sharepoint.com/:f:/r/sites/fcmSouthLincsReservoir/Shared%20Documents/A2AT/Gate%201%20submission%20-%20ready%20for%20review/02%20Environmental%20Assessment%20Report/Stage%201%20Environmental%20Assessments/WFD?csf=1&web=1&e=cpNEsg>

The outputs can be provided as digital files upon request.

B. Level 2 WFD assessment output tables

The Level 2 WFD outputs are available on the South Lincs Reservoir Community SharePoint site here:

<https://anglianwater.sharepoint.com/:f:/r/sites/fcmSouthLincsReservoir/Shared%20Documents/A2AT/Gate%201%20submission%20-%20ready%20for%20review/02%20Environmental%20Assessment%20Report/Stage%201%20Environmental%20Assessments/WFD?csf=1&web=1&e=cpNEsg>

The outputs can be provided as digital files upon request.

