



ANNEX B4

Regulatory
Environmental
Assessment:
Tame & Trent
WFD

Minworth Strategic Resource Option (SRO)

Regulatory Environmental Assessments for Gate 2

Appendix I: Water Framework Directive Assessment

Affinity Water and Severn Trent Water





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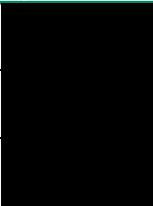
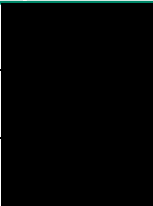
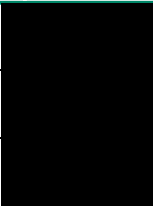
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1. Introduction

1.1 Purpose of Report

- 1.1.1 This Water Framework Directive (WFD) Assessment report forms an appendix to the Environmental Assessment Report (EAR), which supports the Gate 2 submission report to the Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the Minworth Strategic Resource Option (SRO). Minworth SRO supports the Severn to Thames Transfer (STT) SRO and the Grand Union Canal (GUC) SRO. Minworth was identified as an SRO in the PR19 Final Determination, with funding allocated to Affinity Water and Severn Trent Water Ltd.
- 1.1.2 Ofwat identified an opportunity for Water Companies to deliver joint strategic regional water resource solutions as an outcome of the PR19 Final determination process¹. The purpose of these solutions is to secure long-term resilience on behalf of customers, reducing the impact of climate change and protecting the environment, while also providing additional benefits to wider society. Within the assessment of water company PR19 business plans, Ofwat has introduced proposals to support the delivery of Strategic Regional Water Resource Options over the next five to fifteen years with solutions required to be 'construction ready' for the 2025-2030 period. Ofwat's Final Determination was published in December 2019. This set out a Gated process for the development of SROs to ensure consistent co-ordination and development.
- 1.1.3 This WFD assessment has been completed to support the Gate 2 Submission for the Minworth SRO scheme, according to the Strategic regional water resource solutions: detailed feasibility and concept design: Gate Two Guidance² (April 2022).
- 1.1.4 In addition, the assessment has been completed in accordance with:
- All Company Working Group: WRMP environmental assessment guidance and applicability with SROs (October 2020); and
 - All Company Working Group: Water Framework Directive: Consistent framework for undertaking no deterioration assessments (November 2020); and the accompanying ACWG WFD No Det Consistent Framework Assessment Spreadsheet (November 2020).
- 1.1.5 The All Company Working Group (ACWG) guidance ensures the consistency of environmental assessments across the various SROs, including the evaluation of potential impacts and benefits on environmental water quality and associated watercourses, habitats, and designated sites. The ACWG methodology indicates that the process requires Water Companies to provide the following information related to each SRO at the stages outlined in Figure 1-1. This summarises the level of detail required for each assessment at each stage of the Gated process.

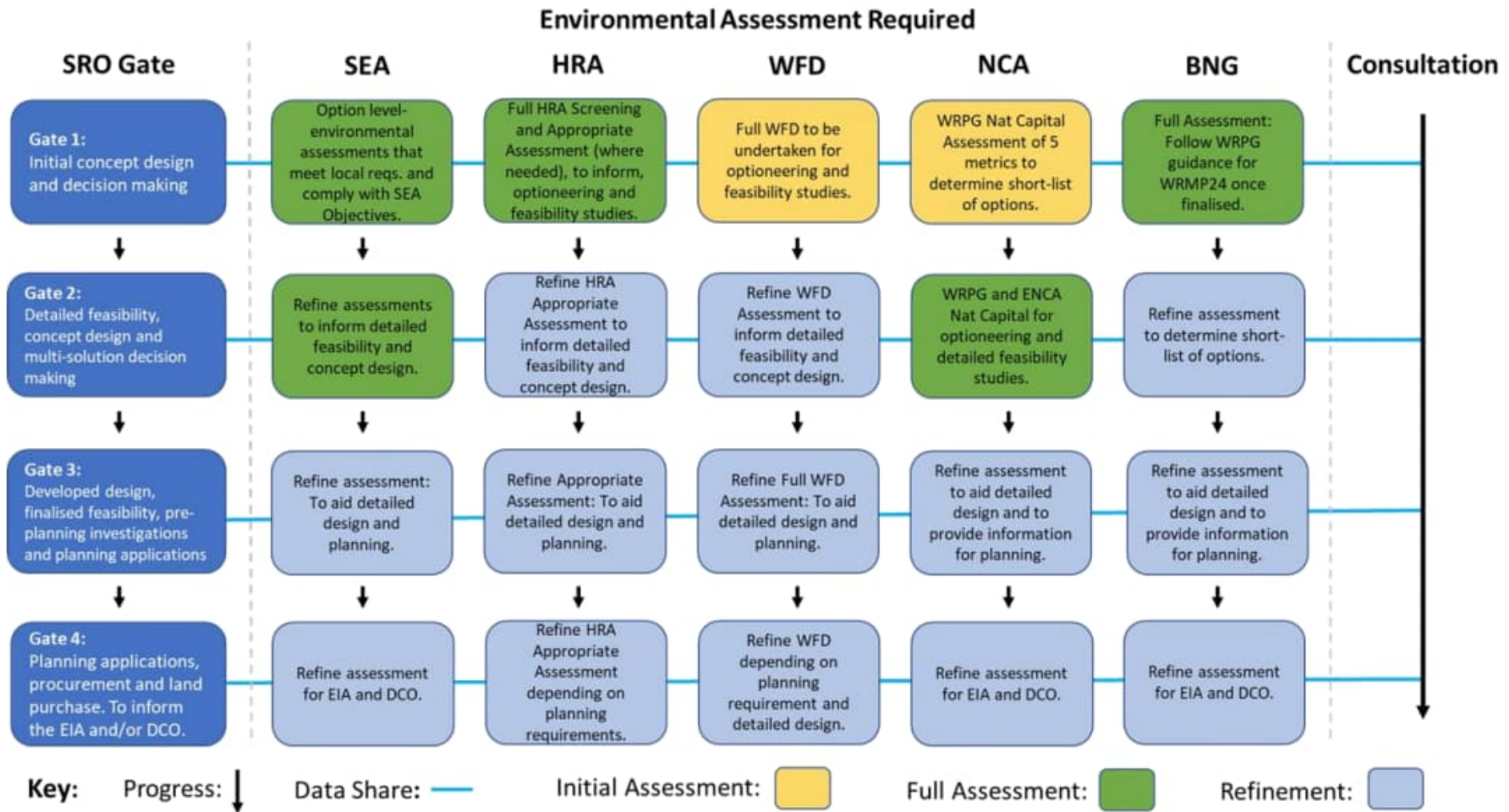
1.2 Water Framework Directive Assessment

- 1.2.1 This report sets out the Water Framework Directive Regulations Compliance Assessment for the Minworth SRO at Gate 2, with scenario options to transfer treated final effluent to the River Avon as a part of the STT SRO, and/or to the GUC SRO. The WFD is a European Union (EU) Directive which is no longer applicable to the United Kingdom from 31/12/2020. Therefore, the principle legal basis is the national legislation which currently mirrors the EU Directive. The WFD has been translated into UK legislation as the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 in England and Wales. From this point forward "WFD" refers to the legislation applicable to England and Wales, and not the EU Directive.

¹ Ofwat. (2019) PR19 final determinations. Available at: [Final determinations - Ofwat](#)

² <https://www.ofwat.gov.uk/publication/strategic-regional-water-resource-solutions-guidance-for-gate-two/>

Figure 1-1: Environmental Assessment Integration with SRO Gates³



³ All Company Working Group: WRMP environmental assessment guidance and applicability with SROs (October 2020)

- 1.2.2 The WFD compliance assessment of the Minworth SRO has been undertaken with reference to the ACWG guidance. This approach has been adopted to assess the various components of the Minworth SRO, thus determining the environmental risk of the Minworth SRO in a manner consistent with the assessments that are undertaken for the regional and individual water company WRMPs.
- 1.2.3 The assessment has been undertaken for environmental impacts for each scenario of the options that form Minworth SRO, including:

Site construction:

- 1.2.4 Impacts of the proposed new treatment processes at Minworth Wastewater treatment works (WwTW) for:
- 57 MI/d (Megalitres per day) discharge to Grand Union Canal (GUC) SRO;
 - 115 MI/d discharge to Grand Union Canal (GUC) SRO;
 - 57 MI/d discharge to River Avon for Severn to Thames Transfer (STT) SRO;
 - 115 MI/d discharge to River Avon for STT SRO;
 - Combined 230 MI/d transfer to both River Avon and GUC (115 MI/d to each); and
 - Impacts of the pipeline transporting water to River Avon for STT.

River impacts:

- 1.2.5 Impacts of reducing discharge to the River Tame and Trent system by:
- 115 MI/d discharge to Grand Union Canal (GUC) SRO;
 - 115 MI/d discharge to River Avon for Severn to Thames Transfer (STT) SRO;
 - Combined 230 MI/d transfer to both River Avon and GUC (115 MI to each); and
 - “Step” assessments e.g., 57 MI/d and 172 MI/d (both ways – Avon and/or GUC).

1.3 Background – The Gated Process

- 1.3.1 Through the PR19 Final Determination, Ofwat set up RAPID (a partnership made up of the three water regulators – Ofwat, the Environment Agency (EA) and the Drinking Water Inspectorate (DWI)) in 2019. The National Infrastructure Commission estimated that new water supplies equivalent to the water consumed by over nine million people would be needed by the mid-2030s. Responding to the scale of that challenge, RAPID was formed to help facilitate the development and funding of new, large scale strategic water supply options (SROs) by the water companies. RAPID is working alongside the five regional water resources planning groups (including Water Resources West), to ensure the timely delivery of new infrastructure.
- 1.3.2 The gated process relates to the funding of investigations and development of water resources solutions from April 2020 until March 2024.
- 1.3.3 There are four gates during this period. At each gate, Water Companies submit information about their work on a solution, which is assessed to ensure companies are making progress on investigation and development of solutions. Ofwat also decides whether companies should continue to be allowed funding to further investigate and develop a solution to the next gate.
- 1.3.4 The purpose of the gated process is to ensure at each gate that:
- companies are progressing strategic water resource solutions that have been allocated funding at PR19;
 - costs incurred in doing so are efficient; and
 - solutions merit continued investigation and development during the period 2020 to 2025.

Gate 1

- 1.3.5 Gate 1 was a first opportunity to check progress on investigations and development of solutions in the gated process. At Gate 1, all solutions were expected to proceed to Gate 2, meaning that companies could continue to spend ring-fenced funding on their investigation and development to Gate 2, unless there was a clear reason why this was no longer merited.

Gate 2

- 1.3.6 Gate 2 looks at the solutions in more detail with focus on ensuring that funding for continued investigation and development of solutions is aligned to water resources planning. Decisions about whether or not a solution goes ahead will be made through water resources planning and subsequently applications for local planning and environmental consents.
- 1.3.7 The scheme will be resubmitted to RAPID for Gate 2 review in November 2022 with a decision from RAPID on whether the scheme can commence to Gate 3 in March 2023.

Work Completed to Date

- 1.3.8 AECOM previously completed the Concept Design Report (CDR) for the Minworth SRO, and the Hydrology, Environment and Ecological (HEE) gap analysis of the River Tame, River Trent and Humber (TTH) system for Gate 1, jointly for Minworth and South Lincolnshire Reservoir (SLR) SROs. Also underway are the overall environmental assessments for the River Tame and Trent systems in support of the Minworth and SLR SROs, and the Monitoring and Environmental Assessment work packages, due in June/July 2022. This Gate 2 Environmental Assessment Report is built upon the parallel work undertaken for Gate 2, as well as updating the corresponding assessments completed for RAPID Gate 1 (refer to sections below).
- 1.3.9 The Gate 1 work involved considering Water Framework Directive (WFD) related impacts and benefits, baseline ecological data, and in particular the potential impacts of changes in flow to ecological receptors such as designated sites and their qualifying features, protected and notable species, and particular constraints from the presence or future spread of Invasive Non-Native Species (INNS). Other topics assessed were Navigation, Sedimentation, Assets along the Trent, Abstraction and Discharge Licences, Saline Intrusion, Fish Habitats and Migration, Biodiversity Net Gain, Natural and Social Capital, and Soil and Humidity. Some of these topics were carried forward for further detailed assessment at Gate 2 upon the recommendations of stakeholders including the EA and Natural England (NE).
- 1.3.10 The Gate 2 WFD assessment presented in this report pulls upon the work completed for Gate 1, and the on-going environmental assessments for Gate 2, including work completed to inform the Minworth SRO scheme by AECOM and other Consultants.
- 1.3.11 Previous and current assessments in support of Minworth SRO of relevance to the Gate 2 WFD assessment are summarised below.

Gate 1 Assessments

- Gate 1 submission documents for the Minworth, GUC, and STT SROs⁴

Gate 2 Assessments

- Environmental Assessment for the Trent Strategic Resource Options (SRO): Minworth SRO and South Lincolnshire Reservoir (SLR) SRO: Results and Recommendations. Report to Affinity Water, Anglian Water Services Ltd and Severn Trent Water Ltd. (60669746_REP_002_Env-Ass_Trent_SRO_V5: Annex B3.1), AECOM, September 2022 [And supporting Technical Appendices].
- Annex B5: Water Quality - Baseline Monitoring and Modelling: Minworth Strategic Resource Option. Report to Affinity Water and Severn Trent Water Ltd. AECOM, October 2022.
- Annex B1: Trent Strategic Resource Options: Aquatic Ecology Monitoring Final Report to Affinity Water, Anglian Water Services Ltd and Severn Trent Water Ltd. AECOM, July 2022.

⁴ <https://www.ofwat.gov.uk/regulated-companies/rapid/the-rapid-gated-process/gate-one-submissions-and-final-decisions/>

- Annex B2: Tame and Trent Hydraulic and Hydrological Modelling Report: Minworth SRO and South Lincolnshire Reservoir (SLR) SRO. Report to Affinity Water, Anglian Water Services Ltd and Severn Trent Water Ltd. AECOM, October 2022.
- Grand Union Canal Strategic Resource Option Water Quality Monitoring Quarterly Report 3 2022. Severn Trent Water, Affinity Water, and the Canal & River Trust. Atkins, 31st March 2022 [including Minworth effluent water quality data].
- Avon Pipeline for STT (Ricardo) – received GIS corridor, and details on CDR document, including details of currently proposed construction methods and watercourse crossings. Received April 2022.

1.4 Assessment Rationale

- 1.4.1 The purpose of this Gate 2 assessment is to assess the impact of the reduction of discharge to the River Tame and Trent system, where Minworth currently discharges a Dry Weather Flow (DWF) of 417 MI/d (as confirmed by Jacobs in the Gate 2 Concept Design Report). This assessment is critical to supporting concept design and scheme environmental assessment for the key SROs at Gate 2.
- 1.4.2 This WFD Assessment Report will inform the next stage of environmental assessment in support of the Minworth SRO scheme.
- 1.4.3 A key element of the Minworth SRO is to investigate the environmental risks and opportunities for wider environmental benefits associated with delivery of the scheme.

Objectives

- 1.4.4 The key objectives of the Gate 2 Environmental Assessments are as follows:
- Build on the work completed in Gate 1 to provide a robust impact assessment of the discharge reduction from Minworth into the River Tame system and surrounding environment (particularly, connected WFD water bodies), and assess the impact the proposed transfer could have on WFD status.
 - Define what mitigation measures may need to be implemented to satisfy regulators that the SRO is viable. Any mitigation measures that require engineering solutions will be fed back into the Engineering workstream.
 - Support engagement with key stakeholders including the EA, NE, Water Resources West, etc. This has taken the form of monthly workshops to present findings and/or discuss key themes, risks, or mitigations, and to ensure stakeholder buy-in to the scope of the WFD assessment.
 - Identify any likely significant environmental effects of the proposed SRO schemes and make recommendations for further work to support the development of the schemes to be completed at Gate 3.
- 1.4.5 This report sets out the results of the regulatory environmental assessments, the requirements for which are set out in the RAPID Gate 2 Guidance; to drive engagement with relevant regulators and other decision-makers.

1.5 WFD Assessment

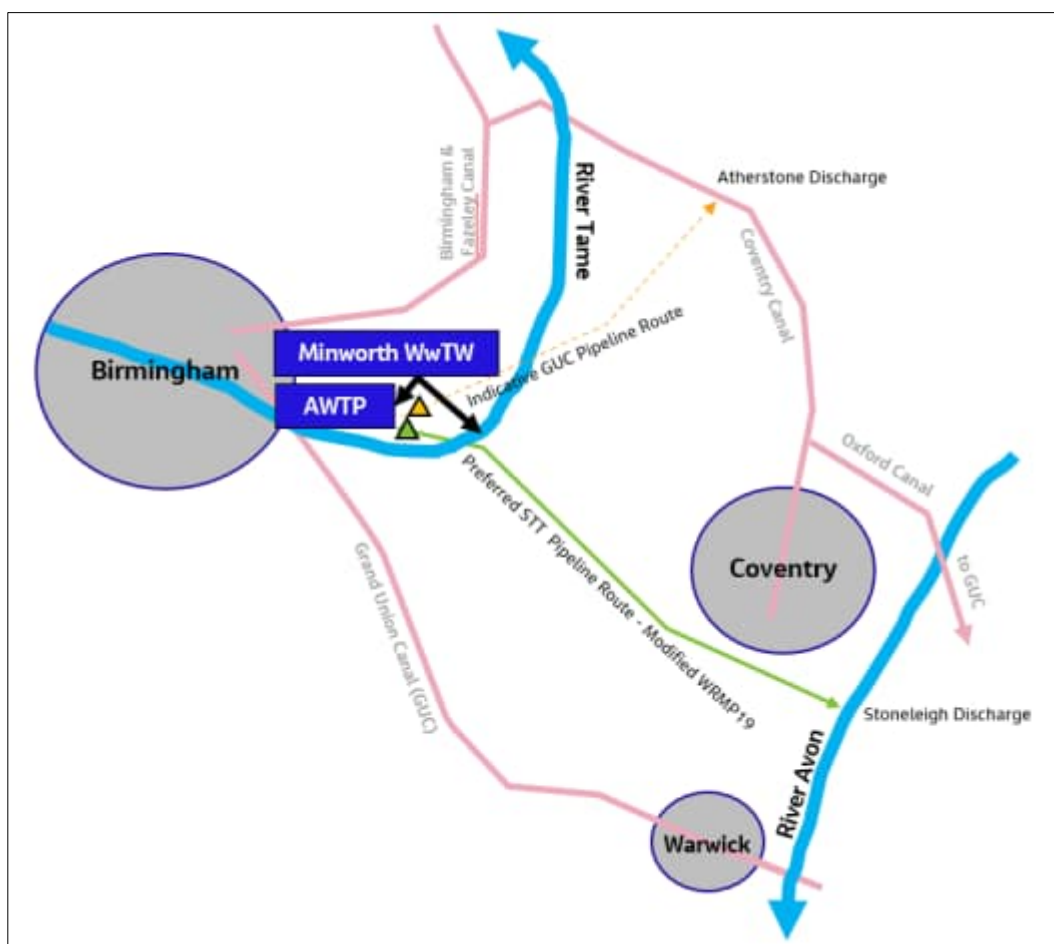
- 1.5.1 As per ACWG and Draft Gate 2 Guidance this Gate 2 WFD assessment includes WFD Screening, and requirements for further detailed assessment.

2. Minworth SRO – Scheme Details

2.1 Site Location

- 2.1.1 Minworth Wastewater Treatment Works (WwTW), located to the east of Birmingham and south east of Sutton Coldfield, is Severn Trent Water’s largest sewage treatment works, treating sewage from an equivalent population of 2.5 million. The WwTW discharges treated effluent, according to consented discharge permit, to the River Tame at two outfall locations, the first downstream of Water Orton Lane, the second upstream of Edison Road.
- 2.1.2 Minworth SRO will provide water to the STT SRO by diverting some of the Minworth WwTW final effluent to the River Avon (a tributary of the River Severn), as well as to the GUC via the Coventry Canal. Additional treatment at Minworth WwTW – the Advanced Water Treatment Plant (AWTP) will be provided to ensure water quality is appropriate for discharge to the River Avon and the Coventry Canal allowing water to be diverted from the final effluent flow at Minworth and transferred to a combination of the River Avon and Coventry Canal.
- 2.1.3 Figure 2-1 provides an overview of the Minworth site location and associated SRO schemes.

Figure 2-1: Overview of Minworth WwTW and the associated SRO schemes⁵



⁵ Concept Design Report (Draft), Revision no: 0B. Report to Severn Trent Water: Minworth SRO. Jacobs, 27 April 2022 [and accompanying appendices].

2.2 Area of Focus

2.2.1 The area of focus relevant to the Minworth SRO is the River Trent catchment area this (Figure 2-2, and Appendix A), which includes the River Tame and River Trent. The existing Minworth Wastewater Treatment Works (hereafter as WwTW) discharges final effluent via an outfall directly to the River Tame. Also considered are the water bodies crossed by the STT pipeline transfer to the River Avon. The River Avon itself and the GUC water body are outside the scope of this assessment and will be considered in the relevant transfer SRO submission.

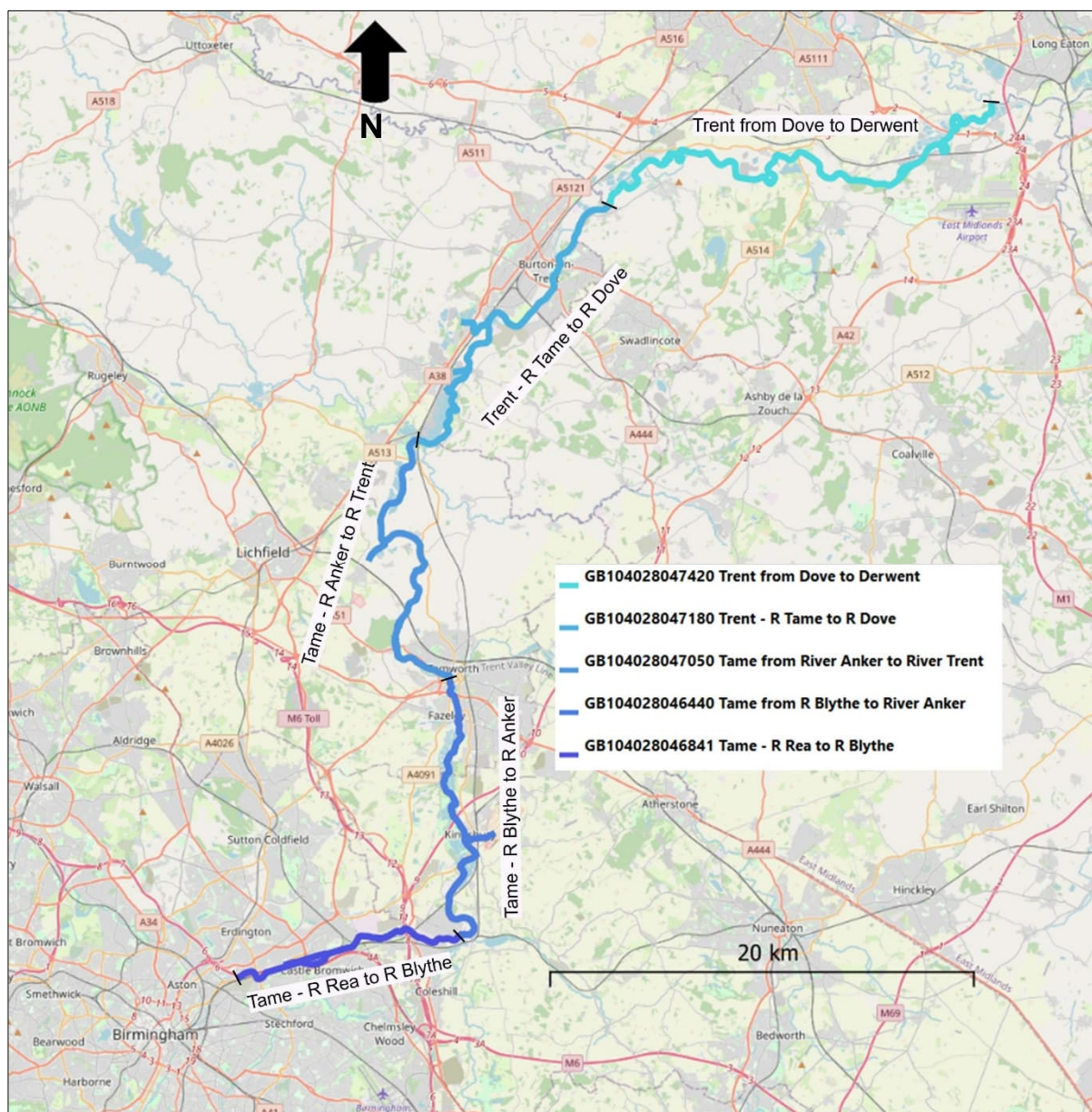


Figure 2-2: Tame and Trent water bodies included within the WFD assessment for the Minworth SRO

2.2.2 Specific tributaries of the Rivers Tame and Trent, namely the River Blythe (Tame) and River Mease (Trent), have been the subject of other assessment topics. While the corresponding WFD water bodies (GB104028042572 Blythe from Patrick Bridge to R Tame; GB104028046560 Mease from Hooborough Brook to Trent) have the potential to be affected by the SRO schemes at their downstream ends, impacts at the water body scale have been scoped out of this Gate 2 WFD assessment. Reference should be made to other assessment reports as referenced in the main Environmental Assessment Report, to which this WFD report forms an appendix.

2.3 Assessment Scenarios

2.3.1 Assessment of different scenarios for operation of the SRO schemes has been undertaken – the assessment scenarios in Section 1.2 are further informed by predicted utilisation for the STT and GUC SROs. This is based on the likely seasonal operation and operational regime requirements for the Minworth transfers, summarised as detailed in the sections below.

Minworth SRO

2.3.2 The Minworth SRO supports two options for transfer of final effluent, resulting in corresponding reductions in the discharge of effluent to the River Tame. These are transfer to the Grand Union Canal (GUC) SRO, and transfer to the River Avon for the Severn to Thames Transfer (STT) SRO. This is currently divided into the volume options detailed in Section 1.2.

2.3.3 Therefore, the current approximately 417 MI/d DWF discharge of final treated effluent from Minworth will reduce by a maximum of 230 MI/d.

2.3.4 Typically, at time of low flow (such as Q_{95}), flow in the River Tame upstream of Minworth are around 180 MI/d while the DWF of Minworth is 417 MI/d. As such, once the treated effluent enters the river it makes up approximately 70% of the downstream flow in the river. The four flow options for Minworth SRO, as identified above, are as high as 230 MI/d, which is approximately 55% of the current Minworth DWF. This therefore implies that there is likely to be sufficient volume for transfer throughout the year⁶.

2.3.5 The potential environmental impacts of the transfer options described above, taking into account wherever possible the predicted utilisation of the transfers as described below, have informed the environmental assessments in this EAR.

GUC Transfer

2.3.6 For GUC transfer, current modelling suggests that the full volume (115 MI/d) would be required primarily in significant drought conditions (likely close to Q_{99} flows); however, it would also operate to some extent constantly as sweetening flow for the treatment processes. It may also be required in the event of a resilience issue, for example if supply from the River Thames was interrupted.

2.3.7 In most dry years, GUC would only be run at 80% (92 MI/d) but only for summer months during peak demands; and for normal years around 25% (28.75 MI/d). It is considered that in most drought years the GUC scheme would operate less than 80% because hosepipe bans, and non-essential-use bans would kick in and reduce demand accordingly.

2.3.8 The GUC transfer is demand-driven except in the most significant drought years when hydrological constraints (groundwater levels) also take effect. Operation of the GUC scheme is not constant and the environmental assessment should take into account this likely frequency and scale of operation, as summarised in the bullet points below:

- Full utilisation expected in the summer months to cope with increased summer peak demands;
- Most dry years, GUC will run at 80% capacity (92 MI/d);
- 25% (28.75 MI/d) utilisation October-April (inclusive);
- May: 50% utilisation (57 MI/d) to ramp up to June-Aug c. 80% utilisation;
- September dropping to 50% utilisation.

2.3.9 Further detail of the proposed operational regime of the Minworth SRO is presented in Table 3-3.

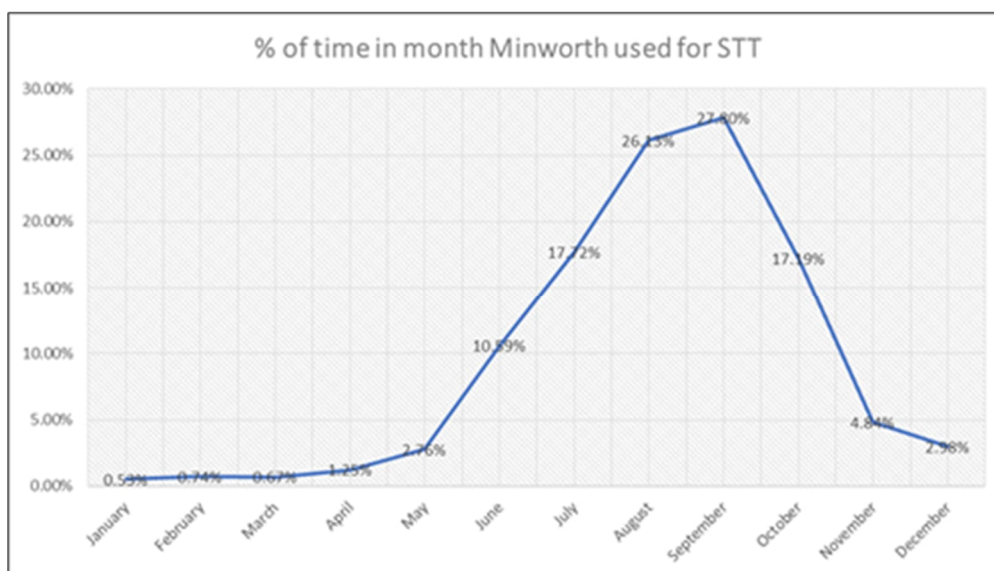
⁶ Concept Design Report (Draft), Revision no: 0B. Report to Severn Trent Water: Minworth SRO. Jacobs, 27 April 2022 [and accompanying appendices].

Severn to Thames Transfer (STT)

2.3.10 Minworth will support the STT as required, dependent upon transfer from other sources. When support for STT is required, 188 MI/d comes preferentially from Lake Vyrnwy reservoir (Powys, Wales) releases and Netheridge Wastewater Treatment Works (WwTW) – Minworth is third in line in terms of supply hierarchy. Netheridge WwTW serves the city of Gloucester, currently discharging final effluent to the River Severn.

2.3.11 The likely frequency of use of the Minworth transfer for STT has been modelled as a percentage of time used over the 90-year record, as shown in Figure 2-3.

Figure 2-3: STT modelled utilisation, percentage of time (CDR Report, Jacobs 2022)



2.3.12 Modelled STT utilisation is based on a 500 MI/d transfer (although it is likely that there will be no limit on abstraction during large spate flows), with a maximum of 300 MI/d coming from supported sources, i.e., Lake Vyrnwy, Netheridge WwTW, and Minworth. Peak transfer from Minworth (112 MI/d⁷) would only be required 9% of the time over the 90-year period; otherwise Minworth is rarely used to support STT.

⁷ 112 MI/d is the modelled maximum requirement for STT from Minworth (Jacobs 2022), equivalent to the proposed 115 MI/d

Table 2-1: Operational regime of the Minworth and SLR SROs

Operation / Seasonality	Minworth GUC Transfer	Minworth STT Transfer
Winter / Autumn – during periods of moderate to high flow	<p>September to April</p> <p>Outside of the summer months (May to August) this will mostly operate at 25% capacity (around 27 MI/d)</p>	<p>November to May</p> <p>Lake Vyrnwy and Netheridge are prioritised to supply STT up to 188 MI/d.</p> <p>Minworth, being third-in-line in the supply hierarchy, is rarely used to support STT.</p>
Summer – during periods of low flow	<p>May to August</p> <p>During summer this will increase up to 80% (around 92 MI/d) but only during dry years.</p> <p>During extreme dry years (> 1 in 50-year drought) this may increase in the summer to the full transfer of 115 MI/d.</p>	<p>June to October</p> <p>Peak transfer from Minworth (112 MI/d) would only be required 9% of the time over the modelled 90-year period.</p>
Activation of Trent HoF	<p>During extreme dry years (> 1 in 50-year drought) this may increase in the summer to the full transfer of 115 MI/d, and therefore consideration will need to be given to its contribution to HoF in the Trent.</p>	<p>Consideration will need to be given to contribution to HoF in the Trent, in combination with GUC and SLR.</p>
Additional operational requirements	<p>Additional treatment will be installed at Minworth to ensure that effluent quality is of a suitable standard to be transferred to the River Avon and GUC. This will be a combination of CoMag flocculation and settlement, ozonation, BAC/GAC, and UV disinfection.</p> <p>Some effluent treated to this higher standard will be returned to the River Tame when not required for GUC and/or STT.</p>	

3. Methodology

3.1 Overview

- 3.1.1 This section summarises the assessment methodology for the WFD assessment, including the specific requirements of the RAPID Gate 2 guidance and ACWG methodologies.

3.2 General Assessment Approach

- 3.2.1 The assessment approach follows the ACWG guidance for environmental assessments and requires robust Gate 1 and Gate 2 assessments be undertaken and completed for the SRO schemes. Key objectives to take Minworth SRO from Gate 1 through to Gate 2 submission include:
- **Adherence to ACWG methodologies** – To ensure that Gate 2 submission is robust, the assessment has been completed according to Gate 2 requirements and the relevant ACWG methodologies for Gate 2 submission. Any inconsistencies, either technically or specific to Minworth SRO, have been highlighted. Changes to ACWG methodologies have been implemented to ensure that the positioning of the scheme for Gate 2 aligns with expectations for the flight path to future gates.
 - **Engagement with the delivery engineering consultant** – It has been critical to understand any updates/changes on engineering design since the initial engineering concept design report was completed. In particular, predicted (if any) quality changes of the remaining effluent discharge and a review of the most likely volumes to be utilized.
 - **Refine WFD Assessment to inform detailed feasibility and concept design** – A review has been undertaken of the Gate 1 WFD assessment and the consistent ACWG framework to assess WFD no deterioration, including impacts on raw water quality and WFD supporting elements. Risks associated with the presence and movement of INNS are not assessed through the WFD methodology but are assessed using the EA INNS Risk Assessment Tool (refer to Tame and Trent Environmental Assessments: Appendix D INNS, AECOM 2022). The approach to confirming existing WFD status and reasons for not achieving good (RNAG) status for all relevant water bodies has included use of GIS and interaction with the EA Catchment Explorer API via Python script. The outcome of the WFD assessment will be linked back into the engineering design team to ensure a fully integrated approach to Gate 2 assessment.
- 3.2.2 The environmental assessments provide a clear line of sight to further detailed assessment at Gate 3 and beyond. This will identify potential significant effects and inform the scope for future assessments, including further appraisal of WFD related impacts and benefits.

3.3 WFD Background

- 3.3.1 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, commonly referred to as the Water Framework Directive (WFD), aims to protect and enhance the water environment.
- 3.3.2 The WFD aims to protect and enhance the water environment. The WFD takes a holistic approach to sustainable management of the water environment by considering interactions between surface water, groundwater, and water-dependent ecosystems. Ecosystem conditions are evaluated according to interactions between classes of biological, chemical, physico-chemical and hydromorphological elements known as 'Quality Elements'.
- 3.3.3 The WFD requires water bodies to be classified according to their current condition (i.e., the 'Status' or 'Potential,' depending on whether they are heavily modified or artificial water bodies) and to set a series of objectives for maintaining or improving conditions so that water bodies maintain or reach Good Status or Potential.
- 3.3.4 Under the WFD, 'water bodies' are the basic management units, defined as all or part of a river system or aquifer. Water bodies form part of a larger 'river basin district' (RBD), for which 'River Basin

Management Plans' (RBMPs) are used to summarise baseline conditions and set broad improvement objectives. RBMPs are produced every six years, in accordance with the river basin management planning cycle. The current RBMPs at the date of this assessment are the 2015 Cycle 2 plans, which were published in February 2016, and the most recent RBMP data available on the online Catchment Data Explorer is from 2019. Cycle 2 plans were due to be updated to Cycle 3 plans in 2021 but have not yet been published (at time of writing in July 2022). They are due to be submitted to the Secretary of State for approval by September 2022. Guidance states to use the most recent classification information in any assessment, with an assumption that most water bodies have a target to achieve Good status (with exemptions of setting of less stringent objectives where applicable).

- 3.3.5 In England, the EA is the competent authority for implementing the WFD, although many objectives are delivered in partnership with other relevant public bodies and private organisations, for example local planning authorities, water companies, rivers trusts, and private landowners and developers.
- 3.3.6 The EA is also responsible for managing flood risk and other activities on Main Rivers. Local planning authorities or drainage boards are responsible for consenting certain activities on Ordinary Watercourses. Local planning authorities are responsible for highways drains, and landowners are responsible for ditches and watercourses and also piped watercourses and culverts. While the EA is ultimately responsible for the WFD on any water body, local authorities are required to plan and consent WFD related activities on Ordinary Watercourses.
- 3.3.7 As part of its regulatory and statutory consultee role on planning applications and environmental permitting (under the Environmental Permitting Regulations (England and Wales) 2016), the EA and WFD-partnering organisations, must consider whether proposals for new developments have the potential to:
- Cause a deterioration of any quality element of a water body from its current status or potential; and / or
 - Prevent future attainment of good status or potential where not already achieved.
- 3.3.8 Regulation 33 of the Water Environment Regulations 2017 (i.e., the WFD) states that, like other public bodies, local authorities have a statutory duty to “have regard to the River Basin Management Plan” and “any supplementary plans” covering proposed activities when exercising its functions. Local authorities must therefore reflect water body improvement priorities as outlined in RBMPs.
- 3.3.9 In determining whether a development is compliant or non-compliant with the WFD objectives for a water body, the EA and partnering organisations must also consider the conservation objectives of any Protected Areas (i.e., Natura 2000 sites or water dependent Sites of Special Scientific Interest) and adjacent WFD water bodies, where relevant.

3.4 SRO WFD Assessment Methodology

ACWG Methodology

- 3.4.1 The ACWG SRO assessment process undertakes Environmental Assessments, as a part of the SRO assessment process must demonstrate that a scheme option will not cause a deterioration in status of any relevant water bodies as measured and defined by the WFD. This assessment should include and consider any mitigation methods that would be put in place to protect a water body status. The SRO assessment processes has four gate assessment stages.
- 3.4.2 The Minworth SRO assessment for WFD compliance is currently at Gate 2.
- 3.4.3 As an alternative to the standard WFD assessment approach methodology, the ACWG approach for WFD assessments⁸ has been developed so that a standard approach is used to drive consistency and comparability between SRO schemes. This is so they can be compared easily to ensure options are uniformly assessed and presented. This has been followed during this review and is described next.

⁸ 3.3 Framework Outline - All Company Working Group Water Framework Directive: Consistent framework for undertaking no deterioration assessments, November 2020

Framework Outline

3.4.4 The basic structure of the assessment is:

Level 1 basic screening for impact

- Identification of affected water bodies;
- Identification of possible impacts;
- Identification of embedded mitigation measures; and
- Screening to remove water bodies where there are no/minor localised impacts.

Level 2 detailed screening for impact

- Water body scale detailed assessment of impacts to each WFD quality element for each activity;
- Assessment of data confidence level and design certainty;
- Identification of further mitigation needed; and
- Assessment of impacts after mitigation.

Cumulative assessment of SRO with other possible options

3.4.5 The WFD framework focuses on surface water and transitional water bodies. Whilst this does not explicitly discuss the assessment of groundwater or coastal water, the same principles can be applied.

Impact scoring system

3.4.6 The scoring system used in the ACWG WFD assessment for SROs is illustrated in Table 3-1. Scoring ranges from -2, 'Very beneficial', to 3, 'high impact'. These scores can be applied at various stages during assessment, including:

- The likely impact of an activity involved with constructing/operating an SRO on the WFD status of a whole water body
- The likely impact of an activity involved with constructing/operating an SRO on the status of a WFD element of a water body
- The overall likely impact of constructing/operating an SRO on the WFD status of a whole water body

3.4.7 When separately assessing multiple components involved in construction/operation of an SRO and/or multiple WFD elements of a water body, the scores given may be combined for the overall SRO and/or water body, both by taking the mean impact score, and the max impact score.

Table 3-1: Impact scoring system for the ACWG scoring assessments⁹

Impact	Score	Description
Very beneficial	-2	Impacts that, taken on their own, have the potential to lead to the improvement in the ecological status or potential of a WFD quality element for the entire water body
Beneficial	-1	Impacts that, when taken on their own, have the potential to lead to a minor localised or temporary improvement that does not affect the overall WFD status of the water body or any quality elements
No/minimal	0	No measurable change in the quality of the water environment or the ability for target WFD objectives to be achieved.
Low	1	Impacts that, when taken on their own, have the potential to lead to a minor localised, short-term, and fully reversible effects none or more of the quality elements but would not result in the lowering of WFD status. Impacts would be very unlikely to prevent any target WFD objectives from being achieved.
Medium	2	Impacts that, when taken on their own, have the potential to lead to a widespread or prolonged effect on the quality of the water environment that may result in the

⁹ WFD Impact Scoring System, All Company Working Group Water Framework Directive: Consistent framework for undertaking no deterioration assessments, November 2020.

Impact	Score	Description
		temporary reduction in WFD status. Impacts have the potential to prevent target WFD objectives from being achieved.
High	3	Impacts when taken on their own have the potential to lead to a significant effect and permanent deterioration of WFD status. Potential for high impact on preventing target WFD objectives from being achieved.

Level 1 basic screening

- 3.4.8 This process involves the identification of all activities involved in construction, operation and decommissioning for the SRO, and identification of all WFD water bodies which these activities may affect. We recognise that the SRO may be at different stages of development and in the early stages some assumptions may need to be made on the activities and the assessment updated when further information becomes available. The baseline WFD data (status, objectives, reasons for not achieving good) is then collated for these water bodies.
- 3.4.9 Following this, each activity is automatically assigned an impact score using the level 1 scoring system shown in Table 3-1. The scoring assumes some embedded mitigation is applied. If these mitigation measures do not apply or further measures are in place, then the impact score can be reassessed, and the score manually updated. The mean and maximum impact score for the SRO is then calculated for each water body. If the maximum impact is one or less, then the water body is not to be considered further and no further action is needed. If the maximum impact score is greater than 1 then the water body is taken forward into level 2 screening.

Level 2 detailed screening

- 3.4.10 The level 2 assessment, carried out on all watercourses that have been identified as having more than a low potential for impact on WFD resulting from the SRO. At this level, the process relies on expert judgement, with the availability of data on WFD elements and the planned option used to give a confidence level to each assessment.
- 3.4.11 Each identified activity is then automatically assigned potential impact types which could affect the WFD status including:
- Changes in channel footprint;
 - Changes in flow velocity and volume;
 - Changes in sediment deposition;
 - Noise and vibration;
 - Shading;
 - Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream;
 - Change in water quality due to discharge of groundwater to a surface water body;
 - Change in water quality due to new or changes to existing discharge of surface water into surface water body;
 - Change in INNS present in surface water body; and
 - Creation of new habitats.

- 3.4.12 Each potentially impacted water body is then assessed. Assessment is carried out on each activity, and each impact type against applicable WFD quality elements within the waterbody classification. A score is given for each based on professional judgement using the scores set out in Table 3-1. Once each activity and impact type has been assessed the water body is given an overall impact score. This is largely based on the maximum score given, but the overall score can increase if there are numerous lower scoring impacts within the water body. An example being in one water body there may be 20 new culverts added on to one water body which each individually have an impact score of 1, however when assessed in combination at a water body scale the overall impact score may be increase to an impact score of 2. Alongside this water body scale impact score, a pair of confidence levels are assigned for each assessment, based on the quality and availability of both physical data and design information about the SRO. Further details are described in Table 3-2.

Table 3-2. Confidence levels used in SRO WFD level 2 assessment¹⁰

Confidence level	Description
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.
Medium	Some data and evidence available, based partially on expert judgement with some assumptions. Design progressed but some assumptions made on construction methods etc.
High	Lots of good data and evidence available, minimal assumptions. Design advanced minimal assumptions needed.

- 3.4.13 For impact scores with a confidence level of medium or low, the requirements for further data or design information in order to raise this confidence level for future gates should be listed. For any option with an impact score greater than zero, further mitigation measures that could reduce this impact should also be detailed. The water body impact score after the application of these mitigation measures is then provided.

Cumulative assessment

- 3.4.14 If more than one option may affect the same water body, a cumulative assessment of impact must be made. This is facilitated using the developed tool, where the detailed impacts of more than one option can be combined in the level 2 assessment. The water body scale impacts scores can then be reassessed using expert judgement and informed by the already identified single option scores.

Framework progression through gates

- 3.4.15 The WFD compliance framework remains the same throughout the gated process, but the options should be reassessed as further information becomes available. To pass through each Gate the confidence level in the data and design must reach an appropriate level as set out in Table 3-3; **Gate 2 is highlighted in bold**. The additional data required will be identified in the previous gate. Measures should be implemented immediately after assessment and the need identified to collect this data, whether from environmental sampling or computational modelling.

¹⁰ Level 2 Detailed Screening, All Company Working Group Water Framework Directive: Consistent framework for undertaking no deterioration assessments, November 2020

Table 3-3: Data confidence required for each gate during SRO WFD assessment¹¹

Gate	Confidence needed
1 Initial concept design and decision making	No requirements
2 Detailed feasibility, concept design and multi-solution decision making	All confidence levels should aim to be medium
3 Developed design, finalised feasibility, pre-planning investigations and planning applications	All confidence levels should aim be high
4 Planning applications, procurement, and land purchase	All confidence levels must be high

3.5 Water Framework Directive (WFD) Assessment: Gate 2 Review

- 3.5.1 The main task defined in the ACWG methodology for SRO Gate 2 is “detailed feasibility, concept design, and multi-solution decision making”. The Gate 2 task relevant to WFD is to “refine WFD assessments to inform detailed feasibility and concept design”.
- 3.5.2 With the exception of the 115MI/d transfer from Minworth to STT, it has been noted that the flow transfer scenarios for the Gate 2 assessment are different to those that were assessed at Gate 1 (see Section 4).
- 3.5.3 The specific tasks making up the Gate 2 assessment are to assess the environmental impacts for each scenario of the options that form Minworth SRO relating to impacts on the Rivers Tame and Trent system; refer to the flow scenarios detailed in Section 2.1.
- 3.5.4 The current minimum 417 MI/d DWF discharge of final treated effluent from Minworth WwTW will reduce by a maximum of 230MI/d.
- 3.5.5 The RAPID Gate 2 Guidance states that all options must be assessed ‘to ensure they comply with and support the achievement of WFD Regulations requirements and objectives set out in the River Basin Management Plans’ (RBMP), specifically:
- Screening: Updated water body risk assessment.
 - Options assessment: An assessment of options in relation to WFD objectives, allowing a comparison of the options and identification of those options are uncertain/unlikely to meet WFD objectives.
 - Consideration of mitigation measures and monitoring, implementation of monitoring to reduce uncertainty of impacts and support identification of potential mitigation in relation to options within solutions that are uncertain/or are unlikely to be able to meet WFD objectives. Where options within solutions that could not meet objectives are taken forward, justification should be given to allow a clear audit trail.
 - Regulation 19¹²: If applicable, gather evidence to meet Regulation 19 criteria.
 - Addressing uncertainties: Provide a plan to gather further evidence for Gate 3. Report initial evidence at Gate 2.
- 3.5.6 All options have been assessed to ensure they comply with and support the achievement of WFD Regulations requirements and objectives set out in the River Basin Management Plans. This includes, but is not limited to, those to protect eels under the Eels (England and Wales) Regulations 2009; and improving fish passage under the Salmon and Freshwater Fisheries Act 1975. The effects that these and other measures will have on each option have been assessed.

¹¹ Framework progression through gates, All Company Working Group Water Framework Directive: Consistent framework for undertaking no deterioration assessments, November 2020

¹² The Water Environment (Water Framework Directive) Regulations 2017

- 3.5.7 The WFD assessment, according to the ACWG methodologies, includes the following steps:
- Screening: Updated water body risk assessment;
 - Options assessment: An assessment of options in relation to WFD objectives, allowing a comparison of the options and identification of those options are uncertain/unlikely to meet WFD objectives;
 - Consideration of mitigation measures and monitoring: Implementation of monitoring to reduce uncertainty of impacts and support Identification of potential mitigation in relation to options that are uncertain/or are unlikely to be able to meet WFD objectives. Where options that could not meet objectives are taken forward, justification should be given to allow a clear audit trail;
 - Regulation 19: If applicable, gather evidence to meet Regulation 19 criteria; and
 - Addressing uncertainties: Provide a plan to gather further evidence for Gate 3. Report initial evidence at Gate 2.
- 3.5.8 It is important that assessments adequately test prevention of future target status (as well as no deterioration) to highlight where the full WFD objective requirements could be at risk; this is considered by reviewing the mitigation measures required to reach future status proposed in each affected water body to determine whether any option would prevent those measures from being successful.
- 3.5.9 Existing work from Gate 1 has been reviewed to identify:
- i. All downstream WFD water bodies that could be impacted by abstraction and discharge points; and
 - ii. All WFD water bodies that will be crossed by new pipelines.
- 3.5.10 Following this, up to date information on water body and element WFD status and RNAG status were obtained.

3.6 Data sources for Gate 2 WFD assessment

- 3.6.1 The reports and data sources referenced in Section 1.3 were used to inform the Gate 2 WFD assessment.
- 3.6.2 There were additional sources of information for each water body taken from the EA Catchment Explorer webpage.

Hydro-Ecological Modelling (HEM)

- 3.6.3 The EA HEM Tool has been used to provide additional context in relation to hydrological pressures on biological WFD elements as a result of the proposed flow reductions. Macroinvertebrate community data can be summarised by ecological indices which reflect different environmental pressures acting upon the macroinvertebrate community.
- 3.6.4 The Whalley, Hawkes, Paisley & Trigg (WHPT) Average Score Per Taxon (ASPT), and Number of scoring taxa (NTAXA) values summarise macroinvertebrate community data to provide an indication of the ecological quality in the watercourse (WFD-UKTAG, 2021¹³). The WHPT method has been primarily designed to respond to organic pollution, however it is suitable for monitoring other types of impact and is used for assessing the WFD classification parameter “General degradation” (WFD-UKTAG, 2021¹²). WHPT-ASPT and WHPT-NTAXA are used to derive the invertebrate WFD classification for a WFD water body when combined with scores from other monitoring locations within the same water body.

¹³ WFD-UKTAG (Water Framework Directive – United Kingdom Advisory Group). (2021). UKTAG River Assessment Method (Benthic Invertebrate Fauna Invertebrates (General Degradation): Whalley, Hawkes, Paisley & Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT). May 2021.

- 3.6.5 The Lotic-invertebrate Index for Flow Evaluation (LIFE) links benthic macroinvertebrate community data to antecedent flow conditions in UK waters (Extence et al., 1999¹⁴). LIFE allows the mean flow preference of invertebrates colonising a site to be determined so that environmental changes influencing flow conditions and the resulting biological effect can be quantified and monitored.
- 3.6.6 In order to allow comparisons between sites and across different seasons, the River Invertebrate Classification Tool version 2 (RICT, available on the Freshwater Biological Association website¹⁵) web application is used to generate observed: expected (O:E) ratio values for WHPT-ASPT and WHPT-NTAXA, and LIFE. The O:E values provide a standardised measure of the pressure to which the respective metric is related (i.e., flow for LIFE and water quality for WHPT-ASPT and WHPT-NTAXA) resulting from anthropogenic influences. An O:E value of less than 1.00 may indicate ecological stress and the lower the calculated value, the greater the degree of stress.
- 3.6.7 If the O:E value for a metric falls below an established threshold value, then the pressure to which the respective metric is related can be inferred as having a detrimental effect on the ecology. For WHPT-ASPT and WHPT-NTAXA the threshold values are the WFD Good: Moderate boundaries used in Cycle 2 (0.86 for WHPT-ASPT and 0.68 for WHPT-NTAXA). WFD boundary values are yet to be established for LIFE. A threshold value of 0.94 (Good: Moderate) for LIFE O:E values has been established in the EA's Catchment Abstraction Management Strategy.
- 3.6.8 RICT is also used in the procedure to generate an invertebrate WFD classification for a WFD water body.
- 3.6.9 The HEM tool uses historical flow data and LIFE O:E values to create bespoke hydroecological models for a site, which can be used to predict what would be the macroinvertebrate community response (demonstrated through LIFE O:E values) if the historic flow was modified. This can then be used to inform what may be the macroinvertebrate community response at a site if flows are modified in the future.

3.7 Limitations and Assumptions

- 3.7.1 It is assumed that the most current EA WFD data available for water bodies is WFD RBMP cycle 2 (2019) data.
- 3.7.2 Acid Neutralising Capacity (ANC) data was not included within the AECOM water quality monitoring and modelling. The WFD quality element pH was used as an analogue to determine potential impacts for ANC within the assessed water bodies.
- 3.7.3 Assessment has been made on the basis of data that was available at the time of the review. A number of additional analyses and environmental modelling were undertaken to support the appraisal, as well as extensive monitoring, though information was not exhaustive, and some activities are ongoing following completion of this review.
- 3.7.4 Assessed 'uncertain' or 'possible' WFD non-compliances do not take into account the frequency or seasonality of operation of the proposed transfers; refer to Section 2.3. The assessment of possible WFD non-compliance is dependent upon the outcome of further 2D hydraulic modelling, and subsequent fish passage assessment, which is on-going at the time of submission of this report. Where possible, the results of the on-going assessments will be incorporated into the work undertaken for Gate 2; otherwise, the assessments will be refined further at Gate 3.

¹⁴ Extence, C.A., Balbi B.M. & Chadd, R. (1999). River flow indexing using British benthic macroinvertebrates: a framework for setting hydroecological objectives. *Regulated Rivers: Research and Management* 15: 543-574.

¹⁵ https://fba.org.uk/FBA/Public/Discover-and-Learn/Projects/RIVPACS_Landing.aspx

4. Gate 1 Review

4.1 Introduction

- 4.1.1 The Minworth SRO Gate 1 submission included comprehensive environmental assessment of the Tame and Trent catchments, engineering feasibility study, and was supported by assessment of the associated schemes focused on the STT System, and the transfer to the GUC SRO.
- 4.1.2 The STT is designed to convey raw water from the lower River Severn catchment into the upper or middle River Thames via an interconnector, this would increase the catchment area from which water resources can be drawn into the south-east of England. This would be in addition to any flows that would be available to be abstracted under licence from the River Severn. A range of raw water transfer supporting source options for the STT are under consideration to provide additional resource.
- 4.1.3 The STT SRO comprises two principal aspects:
- Severn to Thames Conveyance – Deerhurst to Culham pipeline or canal conveyance, including piping to Culham; and
 - Source rivers used to transport water associated with supported abstractions (Rivers Vyrnwy, Severn, Avon, and Thames).
- 4.1.4 The Minworth SRO would be required in addition to the other source SROs to act as a combined system to provide an output into the River Thames. Additionally, the Minworth SRO is also critical for the delivery of the GUC transfer SRO, which will supply raw water to Affinity Water via a direct discharge of treated final effluent into the GUC.

4.2 Familiarisation

- 4.2.1 AECOM has previously completed the Concept Design Report for the Minworth SRO, including a Hydrology, Environment and Ecological (HEE) gap analysis for the River Tame, River Trent and Humber river system during Gate 1. The initial WFD Gate 1 ACWG work for the Minworth SRO was undertaken by Ricardo, AECOM has received the Gate 1 report and the ACWG WFD compliance assessment templates completed for the sections of the Rivers Trent and Tame.

Scenario options explored at SRO WFD assessment at Gate 1

- 4.2.2 The Minworth SRO WFD Gate 1 assessment reviewed three scenario options:
- Minworth transfer of up to 100Ml/d of treated final effluent to the GUC;
 - Minworth transfer of up to 115Ml/d of treated final effluent to the SST via a pipeline to the River Avon; and
 - A combined transfer to 215Ml/d of treated final effluent to the SST via a pipeline to the River Avon.
- 4.2.3 The Minworth SRO Gate 1 assessment involved the following water bodies:
- Tame from R. Rea to R. Blythe (GB104028046841);
 - Tame from R Blythe to River Anker (GB104028046440);
 - Tame from River Anker to River Trent (GB104028047050);
 - Trent - R Tame to R Dove (GB104028047180); and
 - Trent from Dove to Derwent (GB104028047420).

SRO WFD Gate 1 output and conclusions

- 4.2.4 The Gate 1 assessment determined that there is potential for status deterioration or introducing impediments to target status within all five water bodies.

- 4.2.5 The Minworth 100MI/d transfer to the GUC and Minworth/Combined 215MI/d transfer scheme was assessed as having the potential to not comply with WFD objectives due to low confidence in current data for the following criteria:
- Tame from R. Rea to R. Blythe – Objective 1 status deterioration for fish, macroinvertebrates, dissolved oxygen, and ammonia
 - Tame from R Blythe to River Anker - Objective 1 status deterioration for fish, macroinvertebrates, and ammonia. Objective 1 status deterioration or Objective 2 impediments for dissolved oxygen.
 - Tame from River Anker to River Trent - Objective 1 status deterioration for fish, dissolved oxygen, and ammonia. Objective 1 status deterioration or Objective 2 impediments for macroinvertebrates.
 - Trent - R Tame to R Dove - Objective 1 status deterioration for dissolved oxygen and ammonia. Objective 1 status deterioration or Objective 2 impediments for fish and macroinvertebrates.
 - Trent from Dove to Derwent - Objective 1 status deterioration for fish, dissolved oxygen, and ammonia. Objective 1 status deterioration or Objective 2 impediments for macroinvertebrates.
- 4.2.6 The Minworth 115MI/d transfer to the River Avon for STT was assessed as compliant with WFD objectives. Hydrological effects of discharge reduction from Minworth WwTW on the downstream River Tame were assessed as having minor negative flow effect (on Tame from R Rea to R Blythe, Tame from R Blythe to River Anker, and Tame from River Anker to River Trent). In this context and with the assumption at Gate 1 of the same water quality discharged, the assessment suggested compliance with WFD objectives with medium confidence on account of the evidenced magnitude of flow change.
- 4.2.7 With respect to hydrological regime change, the Gate 1 assessment suggested that a prolonged reduction in river flow at times of lower river flow/discharge is likely to impact upon diversity, connectivity, and usable area of fish habitat within the channel. The review found that flow changes would also impact macroinvertebrates due to a reduction of the wetted in-stream habitat within the channel. This would be mostly due to a changing configuration of macrophyte communities within the channel which support macroinvertebrate communities. The recommendation was that impacts of lower flows on fish habitats, macroinvertebrates, and macrophyte community distribution would require further assessment at Gate 2 through a review of available information on the ecological communities, habitats present, and the magnitude of habitat change due to flow reduction.
- 4.2.8 The seasonal duration and variable extent of hydrological regime were considered during the Gate 1 assessment and determined to have a potential effect on physico-chemical processes due to changes in velocity, timing of flow, water depth as well as aeration by turbulence mixing from surface and other in-stream features. The Gate 1 assessment suggested that dissolved oxygen and water temperature were likely to be directly affected by a reduction in flow and that they should be further assessed in Gate 2.
- 4.2.9 The RNAG assessment identified continuous and/or intermittent water quality pressures as impacting on RBMP2 target status for macroinvertebrates in four out of five water bodies, with the exception being the furthest downstream water body (the Trent from Dove to Derwent water body (GB104028047420)).
- 4.2.10 The Gate 1 assessment suggested that an impact of hydrological regime within the affected water bodies was likely (for 115MI/d and more) due to a reduction in flow, but that this required reassessment at Gate 2.
- 4.2.11 The assessment at Gate 1 identified WFD compliance for the Minworth/STT (115MI/d) scheme with medium confidence. This was supported by a bespoke hydrological assessment in the STT SRO Gate 1 documentation which identified only minor hydrological impacts in the River Tame.
- 4.2.12 The Minworth/Combined (215MI/d) scheme was determined to potentially be non-compliant with WFD objectives, but this may be subject to further development of operating rules together with a research programme in Gate 2.

- 4.2.13 The Gate 1 assessment suggested that Gate 2 should include a review of habitat and ecological information in addition to a gap analysis and additional bespoke aquatic habitat assessment, water quality gap analysis, water quality monitoring modelling (Table 4-1).

Table 4-1: Gap analysis and recommendations from the Gate 1 assessment.

Listed gap or limitation	Recommendations for further work to inform impact assessment
Lack of a comprehensive hydraulic model of the Tame, Trent and Humber river system	Further hydraulic modelling in specific targeted areas, as informed by baseline assessment, could be considered to inform the potential impacts identified in other topics.
Water quality modelling incomplete	Use software such as SAGIS-SIMCAT to predict potential changes in physico-chemical status as a result of potential changes in water quantity.
Hydro-ecological modelling/ecological impact modelling	Use hydro-ecological tools and ecological indices to predict potential changes in Ecological status/potential as a result of potential changes in water quantity.
2D hydraulic modelling and associated topographic and bathymetric surveys.	2D modelling, requiring recent topographic and bathymetric survey data, is recommended to identify the impacts of each scheme on essential supporting habitats in the study area.
Habitat surveys.	Habitat surveys are recommended for corroborating aerial imagery assessments and anecdotal information on essential supporting habitats.
Unknown sensitivity of aquatic species in study area to potential environmental changes	Undertake a detailed appraisal of WFD biotic indices and aquatic species data to better understand the aquatic ecological sensitivity to changes potentially resulting from the schemes.

- 4.2.14 The outline for the ACWG methodology used in this Gate 2 assessment for the Minworth SRO to assess potential WFD impact is detailed in Section 3.4 onward.

5. ACWG Level 1 Screening

5.1 Introduction

- 5.1.1 Level 1 screening within ACWG assessment was undertaken for each of the four flow scenarios for the Minworth SRO, these include:
- List of relevant water bodies, the WFD water bodies included within the assessment template as outlined in the methodology
 - Level 1 activities selected for construction and operational activities.
- 5.1.2 The result of the Level 1 assessment is a summary spreadsheet that is generated within the ACWG template. This template confirms which water bodies should be taken forward for a Level 2 assessment. The following assessment spreadsheets have been generated:
- The ACWG assessment for the 57MI/d option at Level 1 was generated in the file “WFD Annex 3 Minworth 57Mld.xlsm”.
 - The ACWG assessment for the 115MI/d option at Level 1 was generated in the file “WFD Annex 3 Minworth 115Mld.xlsm”.
 - The ACWG assessment for the 172MI/d option at Level 1 was generated in the file “WFD Annex 3 Minworth 172Mld.xlsm”.
 - The ACWG assessment for the 230MI/d option at Level 1 was generated in the file “WFD Annex 3 Minworth 230Mld.xlsm”.
- 5.1.3 At Gate 2 it is considered that there will be no WFD impacts at the water body scale downstream of the Trent from Dove to Derwent water body, as a result of the Minworth SRO alone. Specific impacts resulting from Minworth, and in combination with other plans and schemes (notably abstraction from the River Trent for the South Lincolnshire Reservoir), have been assessed in other topics at Gate 2 as presented in the EAR (AECOM 2022) and supporting reports for the Tame and Trent assessments. In-combination effects will be assessed in further detail at Gate 3.

5.2 Minworth 57MI/d scheme option

- 5.2.1 For the Minworth 57MI/d scheme the watercourses included within the Level 1 assessment were those with a flow pathway of influence within the River Trent catchment, extending from the outfall of Minworth WwTW on the River Tame to the confluence of the River Trent with the River Derwent.

Minworth 57MI/d scheme Level 1 water bodies within assessment

- 5.2.2 Water bodies included within the Level 1 assessment with the potential to be impacted by a “Decommissioning” activity stated as “Cessation of flow to a watercourse” resulting from a transfer of 57MI/d at Minworth WwTW were:
- GB104028046841, Tame - R Rea to R Blythe;
 - GB104028046440, Tame from R Blythe to River Anker;
 - GB104028047050, Tame from River Anker to River Trent;
 - GB104028047180, Trent - R Tame to R Dove; and
 - GB104028047420, Trent from Dove to Derwent.

Water bodies and activities not passed forward from Minworth 57MI/d Level 1 assessment

- 5.2.3 For the Minworth 57MI/d scheme option there were no water bodies that were not passed forward to the Level 2 assessment.

Water bodies and activities passed forward from Minworth 57MI/d Level 1 assessment

5.2.4 The water bodies included within the Level 1 assessment that would be impacted by a “Decommissioning” activity stated as “Cessation of flow to a watercourse” resulting from a transfer of 57MI/d were:

- GB104028046841, Tame - R Rea to R Blythe;
- GB104028046440, Tame from R Blythe to River Anker;
- GB104028047050, Tame from River Anker to River Trent;
- GB104028047180, Trent - R Tame to R Dove; and
- GB104028047420, Trent from Dove to Derwent.

5.3 Minworth 115MI/d scheme option

5.3.1 For the Minworth 115MI/d scheme the watercourses included within the Level 1 assessment were those with a flow pathway of influence within the River Trent catchment, extending from the outfall of Minworth WwTW on the River Tame to the confluence of the River Trent with the River Derwent.

Minworth 115MI/d scheme Level 1 water bodies within assessment

5.3.2 Water bodies included within the Level 1 assessment with the potential to be impacted by a “Decommissioning” activity stated as “Cessation of flow to a watercourse” resulting from a transfer of 115MI/d at Minworth WwTW were:

- GB104028046841, Tame - R Rea to R Blythe;
- GB104028046440, Tame from R Blythe to River Anker;
- GB104028047050, Tame from River Anker to River Trent;
- GB104028047180, Trent - R Tame to R Dove; and
- GB104028047420, Trent from Dove to Derwent.

STT Pipeline to River Avon

5.3.3 The SST pipeline route from Minworth WwTW to the River Avon was also assessed at Level 1. The proposed SST transfer pipeline route is currently planned to cross the following water bodies:

- GB104028042420, Cole from Hatchford-Kingshurst Brook to R Blythe water Body ([REDACTED]);
- GB104028042572, Blythe from Patrick Bridge to R Tame Water Body ([REDACTED]);
- GB109054044520, Canley Bk - source to conf with Finham Bk water Body ([REDACTED]); and
- GB109054044480, Finham Bk - conf Canley Bk to conf R Sowe water Body ([REDACTED]);

5.3.4 With the end of the pipeline culminating in a newly constructed outfall on the River Avon (Warks) - conf R Sowe to conf R Leam Water Body (SP 3229 7229, discharge destination).

Water bodies and activities not passed forward from Minworth 115MI/d Level 1 assessment

5.3.5 All proposed watercourse crossings for the STT transfer (pipeline to the River Avon) were assessed using the ACWG methodology, with none scoring greater than “1” during the Level 1 assessment. As a result, none of these crossings passed to Level 2. The following assumptions for the Level 1 assessment are applicable:

- It is assumed that bedding material for any pipelines will be constructed such that they do not form preferential pathways for groundwater flow;
- It is assumed that watercourse crossings will be carried out using directional drilling or if the watercourse needs to be temporarily diverted, appropriate measures will be in place to protect ecology and watercourse will be restored to its natural state; and,
- A flood risk assessment will be carried out to ensure that new in channel features will not adversely impact on flood risk.

Water bodies and activities passed forward from Minworth 115MI/d Level 1 assessment

5.3.6 The Level 1 assessment identified five WFD water bodies within the 115MI/d Minworth scheme that should be passed forward from Level 1 to Level 2 for further assessment, these were:

- GB104028046841, Tame - R Rea to R Blythe;
- GB104028046440, Tame from R Blythe to River Anker;
- GB104028047050, Tame from River Anker to River Trent;
- GB104028047180, Trent - R Tame to R Dove; and
- GB104028047420, Trent from Dove to Derwent.

5.4 Minworth 172MI/d scheme option

5.4.1 For the Minworth 172MI/d scheme the watercourses included within the Level 1 assessment were those with a flow pathway of influence within the River Trent catchment, extending from the outfall of Minworth WwTW on the River Tame to the confluence of the River Trent with the River Derwent.

Minworth 172MI/d scheme Level 1 water bodies within assessment

5.4.2 Water bodies included within the Level 1 assessment with the potential to be impacted by a “Decommissioning” activity stated as “Cessation of flow to a watercourse” resulting from a transfer of 172MI/d at Minworth WwTW were:

- GB104028046841, Tame - R Rea to R Blythe;
- GB104028046440, Tame from R Blythe to River Anker;
- GB104028047050, Tame from River Anker to River Trent;
- GB104028047180, Trent - R Tame to R Dove; and
- GB104028047420, Trent from Dove to Derwent.

Water bodies and activities not passed forward from Minworth 172MI/d Level 1 assessment

5.4.3 For the Minworth 172MI/d scheme option there were no water bodies that were not passed forward to the Level 2 assessment.

Water bodies and activities passed forward from Minworth 172MI/d Level 1 assessment

5.4.4 The water bodies included within the Level 1 assessment that would be impacted by a “Decommissioning” activity stated as “Cessation of flow to a watercourse” resulting from a transfer of 172MI/d were:

- GB104028046841, Tame - R Rea to R Blythe;
- GB104028046440, Tame from R Blythe to River Anker;
- GB104028047050, Tame from River Anker to River Trent;
- GB104028047180, Trent - R Tame to R Dove; and
- GB104028047420, Trent from Dove to Derwent.

5.5 Minworth 230MI/d scheme option

Minworth 230MI/d scheme Level 1 water bodies within assessment

5.5.1 Water bodies included within the Level 1 assessment with the potential to be impacted by a “Decommissioning” activity stated as “Cessation of flow to a watercourse” resulting from a transfer of 230MI/d at Minworth WwTW were:

- GB104028046841, Tame - R Rea to R Blythe;
- GB104028046440, Tame from R Blythe to River Anker;
- GB104028047050, Tame from River Anker to River Trent;
- GB104028047180, Trent - R Tame to R Dove; and
- GB104028047420, Trent from Dove to Derwent.

Water bodies and activities not passed forward from Minworth 230MI/d Level 1 assessment

5.5.2 For the Minworth 230MI/d scheme option there were no water bodies that were not passed forward to the Level 2 assessment.

Water bodies and activities passed forward from Minworth 230MI/d Level 1 assessment

5.5.3 The water bodies included within the Level 1 assessment that would be impacted by a “Decommissioning” activity stated as “Cessation of flow to a watercourse” resulting from a transfer of 230MI/d were:

- GB104028046841, Tame - R Rea to R Blythe;
- GB104028046440, Tame from R Blythe to River Anker;
- GB104028047050, Tame from River Anker to River Trent;
- GB104028047180, Trent - R Tame to R Dove; and
- GB104028047420, Trent from Dove to Derwent.

6. ACWG Level 2 Assessment

6.1 Introduction

- 6.1.1 A Level 2 assessment was undertaken for each of the four flow scenarios for the Minworth SRO. This including completing an assessment for each potentially impacted water body included within the flow scenario. Appendix C contains a comparison table of the Level 2 assessment outputs for each of the four flow scenarios.
- 6.1.2 Within each of the four flow scenarios, all five water bodies were assigned the “cessation of existing discharge to a watercourse” Level 2 activity, which is in the “decommissioning” category.
- 6.1.3 Following the assignment of the activity, the potential impacts of the activity were also identified, and these are referenced within the subsequent Level 2 assessment. With reference to the “cessation of existing discharge to a watercourse”, the following were identified as potential impacts:
- Changes to channel footprint;
 - Changes in flow velocity and volume (increase or decrease);
 - Changes in sedimentation deposition;
 - Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream; and
 - Change in water quality due to new or changes to existing discharge of surface water into surface water body.
- 6.1.4 Following on from this, a Level 2 template was completed for each water body included within the flow scenario. The purpose was to identify the potential impacts to WFD elements specific to each water body that may be caused by the activity.
- The ACWG assessment for the 57ML/d option at Level 2 was generated in the file “WFD Annex 3 Minworth 57Mld.xlsx”.
 - The ACWG assessment for the 115ML/d option at Level 2 was generated in the file “WFD Annex 3 Minworth 115Mld.xlsx”.
 - The ACWG assessment for the 172ML/d option at Level 2 was generated in the file “WFD Annex 3 Minworth 172Mld.xlsx”.
 - The ACWG assessment for the 230ML/d option at Level 2 was generated in the file “WFD Annex 3 Minworth 230Mld.xlsx”.

6.2 Hydro-Ecological Modelling Results

- 6.2.1 Flow data and macroinvertebrate community data was extracted from the EA Hydrology Data Explorer and EA Ecology & Fish Data Explorer respectively for use with the HEM tool. A total of six sites downstream of the Minworth discharge were used with the HEM tool to create site-specific hydroecological models. Three scenarios with flow reductions of 115 ML/d (scenario 1), 230 ML/d (scenario 2) and 417 ML/d (scenario 3) were modelled – the latter a hypothetical scenario based on the total Dry Weather Flow (DWF) from Minworth Wastewater Treatment Works (WwTW).
- 6.2.2 HEM model significance, the ecological classification, and the contributing biological elements' WFD status of the most recent publicly available WFD assessment, the 2019 status, for the WFD water bodies comprising the Rivers Tame and Trent within the study area (excluding the furthest downstream WFD water body) are presented in Table 6-1.

Table 6-1: EA 2019 biological WFD classification and site-specific HEM model significance

EA 2019 Classification Cycle									
WFD Water Body	Water Body ID	2019 Overall Ecological classification	Biological classification	Invertebrates	Macrophytes & Phytobenthos combined	Fish	AECOM Site ref.	EA site ref.	HEM model significance
Tame - R Rea to R Blythe	GB104028046841	Moderate ¹⁶	Poor	Moderate	-	Poor	TA2	47255	P<0.0001
Tame from R Blythe to River Anker	GB104028046440	Poor	Poor	Moderate	Poor	Good	TA3	50847	p>0.1
Tame from River Anker to River Trent	GB104028047050	Poor	Poor	Moderate	Poor	Good	TA5	51895	p>0.1
Tame from River Anker to River Trent	GB104028047050	Poor	Poor	Moderate	Poor	Good	TA6	52917	p>0.1
Trent from Soar to The Beck	GB104028053110	Moderate	Moderate	Moderate	Moderate	-	LT3	50916	p>0.1
Trent from Soar to The Beck	GB104028053110	Moderate	Moderate	Moderate	Moderate	-	LT4	51467	p<0.05

6.2.3 Whilst the model developed for site TA2 appears highly significant, the invertebrate data demonstrates substantial water quality pressures influencing the macroinvertebrate community and a strong correlation exists between LIFE and both WHPT-ASPT and WHPT-NTAXA OE values. Consequently, the model developed between LIFE O:E values and flow may be coincidental and spurious, and the model outcomes are considered unreliable.

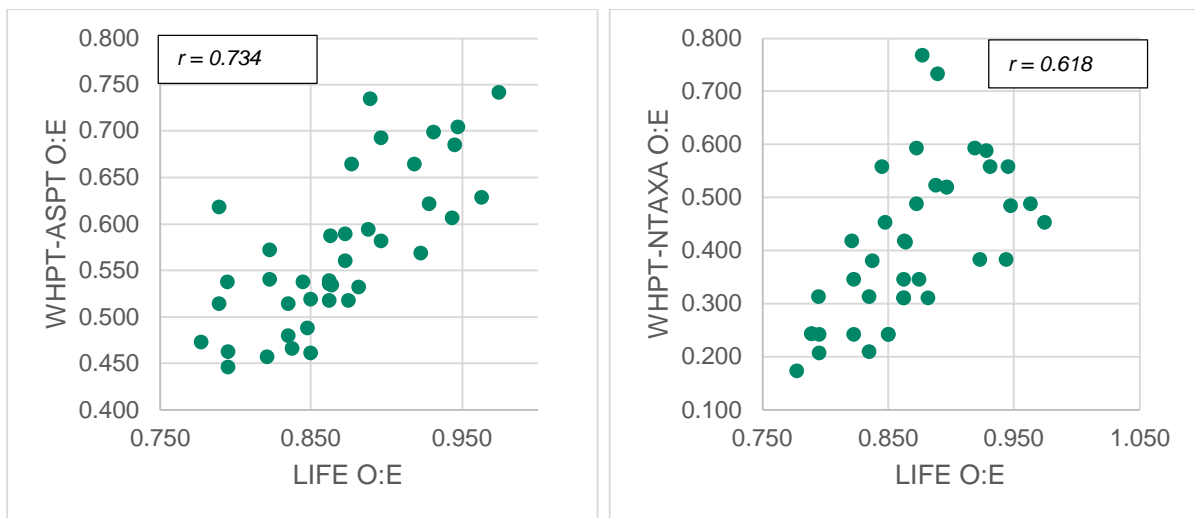


Figure 6-1: Correlations between LIFE O:E and both WHPT-Aspt O:E (Left) and WHPT-Ntaxa O:E (Right)

¹⁶ It is noted that the Tame - R Rea to R Blythe (GB104028046841) is classified “moderate” overall status in RBMP cycle 2 (2019), yet the WFD quality element for fish had a status of “poor”. Under HMWB classification rules, fish, macroinvertebrates, and macrophytes do not contribute to overall waterbody classification in HMWB with a passing hydrological regime.

- 6.2.4 The majority of the remaining models were found not to be significant (Table 6-1), and therefore macroinvertebrate LIFE scores could not be modelled from flow data. This indicates that other factors, such as water quality, river morphology and/or habitat quality, are significantly greater pressures and thus are substantially more influential on the resident macroinvertebrate community than flow – it is not possible in this case to identify one specific element as the cause of failure, rather it is a combination of elements. This is further reinforced by the reasons for not achieving good (RNAG) reported for the tabulated WFD water bodies on the EA Catchment Data Explorer website and detailed in the Environmental Assessment for the Trent Strategic Resource Options Appendix B(ii): Aquatic Ecology¹⁷.
- 6.2.5 Briefly, the RNAGs include, but are not limited to, urbanisation of the watercourse resulting in physical modification and diffuse pollution, point source intermittent sewage discharge and continuous sewage discharge from waste water treatment, poor livestock management resulting in diffuse pollution, and transport drainage resulting in diffuse pollution.
- 6.2.6 Consequently, any reduction in discharge from Minworth is unlikely to result in a decrease in WFD water body status for those sites with non-significant models given the overall ecological status is being driven by such factors and may actually benefit the resident aquatic ecological communities by reducing a source of nutrient input (pending the results of on-going water quality modelling).
- 6.2.7 The model resulting from HEM analysis of site LT4 was significant, and the scenarios modelled demonstrated minimal difference from the historic model, indicating any reduction in discharge from Minworth is unlikely to result in a decrease in WFD status in the River Trent at this point (WFD water body GB104028053110).
- 6.2.8 Three of the six WFD water bodies presented in Table 6-1 have overall WFD Ecological Classifications defined by the macrophyte & phytobenthos biological sub-element, which is in part derived using the River Macrophyte Nutrient Index (RMNI) - a metric designed to reflect the nutrient condition of the watercourse in which the surveyed macrophyte community grows – alongside measures of diversity and cover of green filamentous algae. A further metric designed to link aquatic macrophyte community data to antecedent flow conditions in UK waters is the River Macrophyte Hydraulic Index (RMHI). RMHI taxon scores range from 1 for rheophilic indicators to 9.82 for taxa adapted for lentic conditions.
- 6.2.9 Investigation of the EA Ecology & Fish Data Explorer revealed the EA monitoring location closest to the Minworth discharge with recent (i.e., within five years) macrophyte survey data was EA site 52917 (AECOM site TA6), located at grid reference [REDACTED] near Alrewas. The site was last surveyed in 2018, and the resulting taxa list with their associated RMNI and RMHI scores are presented in Table 6-2.

¹⁷ Environmental Assessment for the Trent Strategic Resource Options (SRO): Minworth SRO and South Lincolnshire Reservoir (SLR) SRO: Results and Recommendations. Report to Affinity Water, Anglian Water Services Ltd and Severn Trent Water Ltd. REP-003_Summary Report. April 2022 [And supporting Technical Appendices]

Table 6-2: Macrophyte taxa list for EA site 52917 2018 survey

Taxon name	Common name	Taxon RMNI	Taxon RMHI
<i>Helosciadium nodiflorum</i>	Fool's watercress	8.64	8.08
Blue-green algal scum / pelts	-	5.10	5.20
<i>Butomus umbellatus</i>	Flowering rush	-	-
<i>Callitriche stagnalis/platycarpa</i>	Starwort	6.21	6.14
<i>Cladophora glomerata/Rhizoclonium hieroglyphicum</i>	Blanket weed	8.66	7.18
<i>Elodea nuttallii</i>	Nuttall's waterweed	9.44	8.62
<i>Epilobium</i> sp.	Willowherb	-	-
<i>Fontinalis antipyretica</i>	Willow moss	5.40	5.95
<i>Lemna minor</i>	Common duckweed	8.80	8.59
<i>Leptodictyum riparium</i>	Kneiff's feathermoss	7.57	6.58
<i>Mentha aquatica</i>	Water mint	6.27	6.71
<i>Myosotis</i> sp.	Forget-me-not	7.00	7.06
<i>Myriophyllum spicatum</i>	Spiked water milfoil	8.26	7.91
<i>Phalaris arundinacea</i>	Reed canary grass	7.52	7.24
<i>Potamogeton crispus</i>	Curly-leaf pondweed	8.02	7.86
<i>Stuckenia pectinata</i>	Fennel pondweed	9.59	8.58
<i>Ranunculus</i> (Batrachian) spp.	Crow-foot	7.33	7.75
<i>Ranunculus repens</i>	Creeping buttercup	-	-
<i>Schoenoplectus lacustris</i>	Common club-rush	8.44	8.83
<i>Solanum dulcamara</i>	Bittersweet nightshade	-	-
<i>Sparganium emersum</i>	Unbranched bur-reed	8.32	8.58
<i>Sparganium erectum</i>	Branched bur-reed	8.34	8.26
<i>Stachys palustris</i>	Marsh woundwort	-	-

6.2.10 The results demonstrate that the macrophyte community is substantially adjusted towards lentic conditions, indicated by the majority of recorded taxa possessing RMHI scores greater than 7 and all taxa with RMHI scores more than 5. Consequently, any reduction in flow velocity due to a decrease in the Minworth discharge is highly unlikely to adversely affect the macrophyte community. In fact, a decrease in nutrient enrichment is likely to benefit the macrophyte community and allow a greater diversity of species to flourish, with subsequent improvements additionally benefitting both macroinvertebrates and fish by diversifying available habitat.

- 6.2.11 Analysis of AECOM macrophyte survey data on the River Tame (sites TA2 and TA4; see Annex B1: Trent Strategic Resource Options: Aquatic Ecology Monitoring Final Report V4) downstream of the Minworth discharge (Table 6-3) reveals a similar outcome. The surveyed macrophyte communities reflect generally slow-flowing conditions, indicated by the majority of recorded taxa possessing RMHI scores greater than 7 and all taxa with RMHI scores more than 5. Consequently, a decrease in flow velocity is also unlikely to result in an adverse effect on the macrophyte communities at these locations and may benefit the communities for the same reason explained above.

Table 6-3: Macrophyte taxa lists from 2021 surveys at AECOM sites TA2 and TA4

Taxon	Common name	Taxon RMNI	Taxon RMHI	TA2	TA4
<i>Ceratophyllum demersum</i>	Rigid hornwort	9.73	9.32		✓
<i>Cladophora glomerata/Rhizoclonium hieroglyphicum</i>	Blanketweed	8.66	7.18	✓	✓
<i>Elodea nuttallii</i>	Nuttall's waterweed	9.44	8.62	✓	✓
<i>Fontinalis antipyretica</i>	Willow moss	5.40	5.95		✓
<i>Impatiens glandulifera</i>	Himalayan balsam	-	-		✓
<i>Juncus inflexus</i>	Hard rush	-	-	✓	
<i>Lemanea</i> sp.(p.)	A red alga	4.53	5.17		✓
<i>Leptodictyon riparium</i>	Kneiff's feathermoss	7.57	6.58	✓	
<i>Myriophyllum spicatum</i>	Spiked water milfoil	8.26	7.91		✓
<i>Phalaris arundinacea</i>	Reed canary grass	7.52	7.24	✓	✓
<i>Stuckenia pectinata</i>	Fennel pondweed	9.59	8.58	✓	
<i>Rorippa nasturtium-aquaticum</i> agg.	Watercress	8.42	8.08	✓	
<i>Solanum dulcamara</i>	Bittersweet nightshade	-	-		✓
<i>Sparganium emersum</i>	Unbranched bur-reed	8.32	8.58		✓
<i>Sparganium erectum</i>	Branched bur-reed	8.34	8.26		✓
<i>Zannichellia palustris</i>	Horned pondweed	9.01	8.43	✓	✓

6.3 Minworth 57MI/d scheme option Level 2 output

- 6.3.1 The watercourses included within the Level 2 assessment for the 57MI/d scheme option were:

- GB104028046841, Tame - R Rea to R Blythe
- GB104028046440, Tame from R Blythe to River Anker
- GB104028047050, Tame from River Anker to River Trent
- GB104028047180, Trent - R Tame to R Dove
- GB104028047420, Trent from Dove to Derwent.

- 6.3.2 Output from the ACWG Level 2 assessment for the 57MI/d flow scenario from Minworth SRO is illustrated below in Figure 6-2.

Waterbody ID	Waterbody Name	Maximum Level 2 Impact score	Confidence in WFD data	Confidence in option design
GB104028046841	Tame - R Rea to R Blythe	0	High	Moderate
GB104028046440	Tame from R Blythe to River Anker	0	High	Moderate
GB104028047050	Tame from River Anker to River Trent	0	High	Moderate
GB104028047180	Trent - R Tame to R Dove	0	High	Moderate
GB104028047420	Trent from Dove to Derwent	0	High	Moderate

Figure 6-2. Output from the ACWG Level 2 assessment for the 57MI/d flow scenario from Minworth SRO

- 6.3.3 The assessment suggested that the transfer of 57MI/d flow from Minworth WwTW would have an impact score of “0” for all of the water bodies. Therefore, it is suggested that it would be compliant with WFD status and objectives for all water bodies.
- 6.3.4 Confidence in the 57MI/d flow option was suggested to be “moderate” for all watercourses.
- 6.3.5 Confidence in WFD quality element data (labelled WFD data) was “high” for all water bodies.
- 6.3.6 In the case of the Tame - R Rea to R Blythe water body, the Mitigation Measures Assessment element for the HMWB is classified as Moderate. Objectives for Mitigation Measures are deemed ‘Disproportionately expensive: Unfavourable balance of costs and benefits’. Therefore, it is considered that the SRO schemes would not prevent any future measures related to mitigating impacts associated with designated uses of the water body or compromise any existing measures. This is also taking into account the potential for implementing additional mitigation through seeking wider benefits, for example informed by the Biodiversity Net Gain (BNG) and ecological assessments. The assessment for this element for the R Rea to R Blythe water body is the same for all assessment scenarios and is not repeated.

6.4 Minworth 115MI/d scheme option Level 2 output

- 6.4.1 The watercourses included within the Level 2 assessment for the 115MI/d scheme option were:
- GB104028046841, Tame - R Rea to R Blythe
 - GB104028046440, Tame from R Blythe to River Anker
 - GB104028047050, Tame from River Anker to River Trent
 - GB104028047180, Trent - R Tame to R Dove
 - GB104028047420, Trent from Dove to Derwent.
- 6.4.2 The output of the Level 2 assessment for 115MI/d flow transfer from Minworth WwTW is illustrated in Figure 6-3 below.

Waterbody ID	Waterbody Name	Maximum Level 2 Impact score	Confidence in WFD data	Confidence in option design
GB104028046841	Tame - R Rea to R Blythe	1	Moderate	Moderate
GB104028046440	Tame from R Blythe to River Anker	1	Moderate	Moderate
GB104028047050	Tame from River Anker to River Trent	1	Moderate	Moderate
GB104028047180	Trent - R Tame to R Dove	0	High	Moderate
GB104028047420	Trent from Dove to Derwent	0	High	Moderate

Figure 6-3: Output from the ACWG Level 2 assessment for the 115MI/d flow scenario from Minworth SRO

6.4.3 The assessment suggested that the transfer of 115MI/d flow from Minworth WwTW had an impact score “1” on the Tame - R Rea to R Blythe (GB104028046841), Tame from R Blythe to River Anker (GB104028046440), and Tame from River Anker to River Trent (GB104028047050). The WFD quality elements responsible for an impact score of “1” are highlighted below:

- Tame - R Rea to R Blythe (GB104028046841) – Hydrological regime
- Tame from R Blythe to River Anker (GB104028046440) – Hydrological regime
- Tame from River Anker to River Trent (GB104028047050) - Hydrological regime

6.4.4 All WFD quality elements scoring “1” were uncertain for a deterioration in status class, possible impediment to GES or GEP, and possible compromise to water body objectives.

6.4.5 Confidence in the flow option was suggested to be “moderate” for all watercourses.

6.4.6 Confidence in WFD quality element data (labelled WFD data) was “high” for the Trent - R Tame to R Dove (GB104028047180) and the Trent from Dove to Derwent (GB104028047420). Most WFD quality elements in the Tame - R Rea to R Blythe (GB104028046841), the Tame from R Blythe to River Anker (GB104028046440), and the Tame from River Anker to River Trent (GB104028047050) attained “high” confidence, but all three waterbodies have “moderate” data confidence due to hydrological regime.

6.5 Minworth 172MI/d scheme option Level 2 output

6.5.1 The watercourses included within the Level 2 assessment for the 172MI/d scheme option were:

- GB104028046841, Tame - R Rea to R Blythe
- GB104028046440, Tame from R Blythe to River Anker
- GB104028047050, Tame from River Anker to River Trent
- GB104028047180, Trent - R Tame to R Dove
- GB104028047420, Trent from Dove to Derwent.

6.5.2 The output of the Level 2 assessment for 172MI/d flow transfer from Minworth WwTW is illustrated in Figure 6-4 below.

Waterbody ID	Waterbody Name	Maximum Level 2 Impact score	Confidence in WFD data	Confidence in option design
GB104028046841	Tame - R Rea to R Blythe	1	Moderate	Moderate
GB104028046440	Tame from R Blythe to River Anker	1	Moderate	Moderate
GB104028047050	Tame from River Anker to River Trent	1	Moderate	Moderate
GB104028047180	Trent - R Tame to R Dove	0	High	Moderate
GB104028047420	Trent from Dove to Derwent	0	High	Moderate

Figure 6-4: Output from the ACWG Level 2 assessment for the 172MI/d flow scenario from Minworth SRO

- 6.5.3 The assessment suggested that the transfer of 172MI/d flow from Minworth WwTW had an impact score “1” on the Tame - R Rea to R Blythe (GB104028046841), Tame from R Blythe to River Anker (GB104028046440), and Tame from River Anker to River Trent (GB104028047050). The WFD quality elements responsible for an impact score of “1” are highlighted below:
- Tame - R Rea to R Blythe (GB104028046841) – Hydrological regime
 - Tame from R Blythe to River Anker (GB104028046440) – Fish and Hydrological regime
 - Tame from River Anker to River Trent (GB104028047050) - Hydrological regime
- 6.5.4 All WFD quality elements scoring “1” were uncertain for a deterioration in status class, possible impediment to GES or GEP, and possible compromise to water body objectives.
- 6.5.5 Confidence in the 172MI/d flow option was suggested to be “moderate” for all watercourses.
- 6.5.6 Confidence in WFD quality element data (labelled WFD data) was “high” for the Trent - R Tame to R Dove (GB104028047180) and the Trent from Dove to Derwent (GB104028047420). Most WFD quality elements in the Tame - R Rea to R Blythe (GB104028046841), the Tame from R Blythe to River Anker (GB104028046440), and the Tame from River Anker to River Trent (GB104028047050) attained “high” confidence, but all three waterbodies have “moderate” data confidence due to hydrological regime.

6.6 Minworth 230MI/d scheme option Level 2 output

- 6.6.1 The watercourses included within the Level 2 assessment for the 230MI/d scheme option were:

- GB104028046841, Tame - R Rea to R Blythe
- GB104028046440, Tame from R Blythe to River Anker
- GB104028047050, Tame from River Anker to River Trent
- GB104028047180, Trent - R Tame to R Dove
- GB104028047420, Trent from Dove to Derwent.

- 6.6.2 The output of the Level 2 assessment for 230MI/d flow transfer from Minworth WwTW is illustrated in Figure 6-5 below.

Waterbody ID	Waterbody Name	Maximum Level 2 Impact score	Confidence in WFD data	Confidence in option design
GB104028046841	Tame - R Rea to R Blythe	1	Moderate	Moderate
GB104028046440	Tame from R Blythe to River Anker	1	Moderate	Moderate
GB104028047050	Tame from River Anker to River Trent	1	Moderate	Moderate
GB104028047180	Trent - R Tame to R Dove	0	High	Moderate
GB104028047420	Trent from Dove to Derwent	0	High	Moderate

Figure 6-5: Output from the ACWG Level 2 assessment for the 230MI/d flow scenario from Minworth SRO

- 6.6.3 The assessment suggested that the transfer of 230MI/d flow from Minworth WwTW had an impact score “1” on the Tame - R Rea to R Blythe (GB104028046841), Tame from R Blythe to River Anker (GB104028046440), and Tame from River Anker to River Trent (GB104028047050). The WFD quality elements responsible for an impact score of “1” are highlighted below:
- Tame - R Rea to R Blythe (GB104028046841) – Hydrological regime
 - Tame from R Blythe to River Anker (GB104028046440) – Hydrological regime
 - Tame from River Anker to River Trent (GB104028047050) - Hydrological regime
- 6.6.4 All WFD quality elements scoring “1” were uncertain for a deterioration in status class, possible impediment to GES or GEP, and possible compromise to water body objectives.

- 6.6.5 Confidence in the 230MI/d flow option was suggested to be “moderate” for all watercourses.
- 6.6.6 Confidence in WFD quality element data (labelled WFD data) was “high” for the Trent - R Tame to R Dove (GB104028047180) and the Trent from Dove to Derwent (GB104028047420). Most WFD quality elements in the Tame - R Rea to R Blythe (GB104028046841), the Tame from R Blythe to River Anker (GB104028046440), and the Tame from River Anker to River Trent (GB104028047050) attained “high” confidence, but all three waterbodies have “moderate” data confidence due to hydrological regime.

RNAG Assessment

- 6.6.7 The RNAG assessment has been completed for the 230 MI/d scenario only, on the basis that the full assessment will be completed at Gate 3 once further assessments of fish passage and water quality have been completed.
- 6.6.8 The RNAG assessment for WFD water bodies at the 230 MI/d scenario is as follows:

GB104028046841 Tame – R Rea to R Blythe

- 6.6.9 The only RNAG measure with the potential to be impacted by the scheme is the Zinc WFD quality element (other chemicals). Zinc is present in the Minworth effluent at an annual mean of 17.6 µg/l, which exceeds the EQS of 12.3 µg/l (bioavailable); however, zinc is present in the River Tame at a bioavailable mean of 30 µg/l. Therefore, a reduction in effluent discharge from Minworth would reduce zinc input into the River Tame, and this has the potential to assist the attainment of water body objectives. However, at the same time the level of dilution of existing zinc concentrations in the River Tame would reduce and there would be the potential for zinc concentrations to increase as a result – a maximum increase of 0.57% from baseline conditions as shown by water quality modelling.
- 6.6.10 It is recommended that the RNAG assessment is updated once further assessment of zinc has been completed at Gate 3; however, the assessment has been included in the WFD matrix for the 230 MI/d scenario.

GB104028046440 Tame from R Blythe to River Anker

- 6.6.11 Dissolved oxygen has the potential to be affected by the cumulative effects of reduced discharge and climate change. This represents an RNAG measure in relation to ‘industry’ and ‘urban and transport’ categories for pollution from towns, cities, and transport, and physical modifications.
- 6.6.12 Dissolved oxygen has not been assessed as a potential WFD deterioration following the results of current water quality modelling; however, there is a recommendation for this to be refined at Gate 3 to take into consideration the cumulative effects of climate change on temperature and reduced flows. There is uncertainty as to whether effects on dissolved oxygen would compromise water body objectives until the results of further assessment and modelling are available; therefore, this has been assessed in the RNAG assessment as a Low impact with Medium data confidence and will be refined further at Gate 3.

GB104028047050 Tame from River Anker to River Trent, GB104028047180 Trent – R Tame to R Dove, and GB104028047420 Trent from Dove to Derwent

- 6.6.13 The RNAG assessment for the remaining WFD water bodies concludes that no RNAG measures have the potential to be impacted by the SRO scheme.

7. Identified Non-compliances with WFD objectives

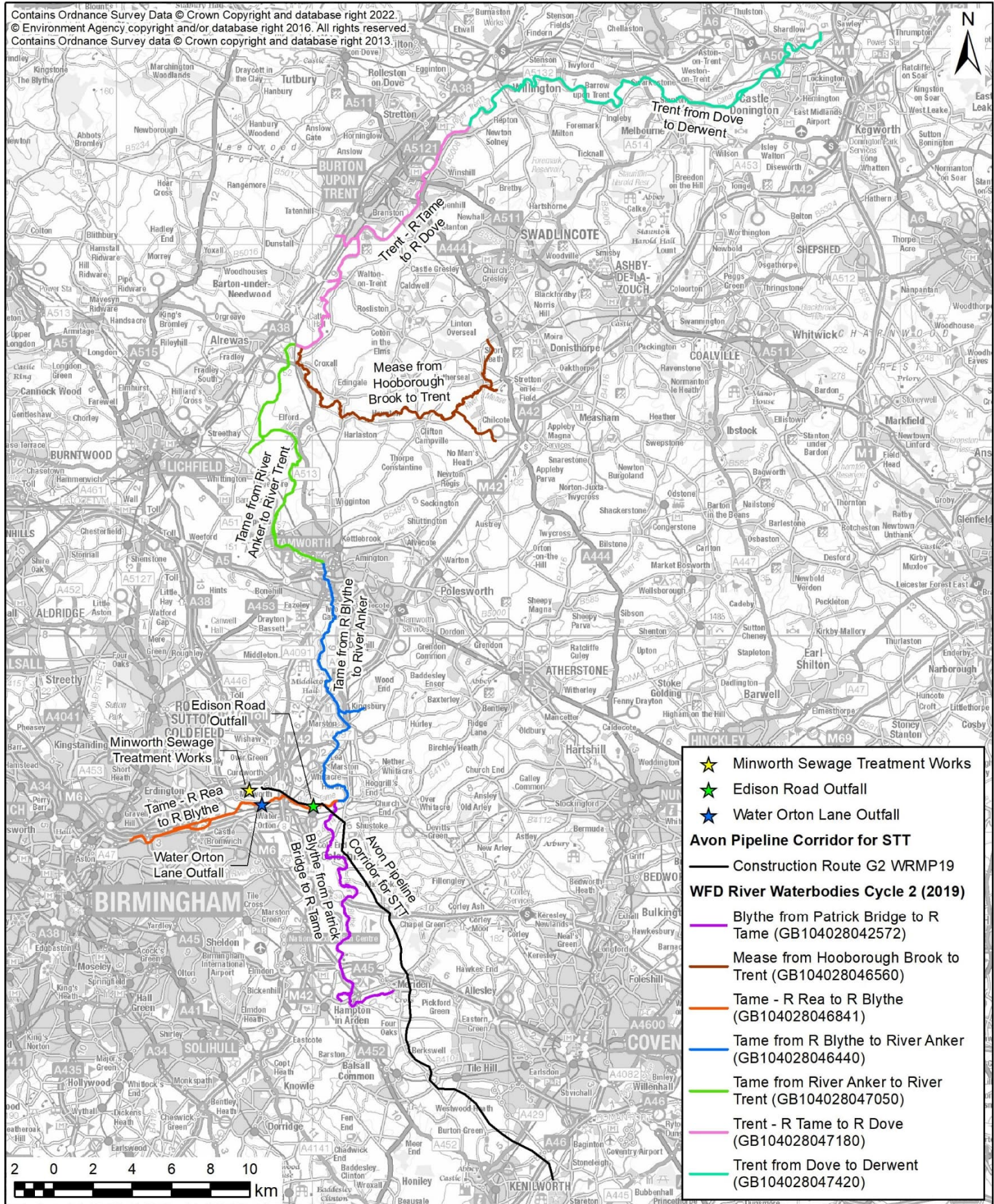
- 7.1.1 The outcome of the Level 2 assessment at Gate 2 suggests that three of the four flow reduction scenarios may have the potential to cause non-compliances with WFD objectives due to status (or within-status) deterioration or an introduction of impediments for target status within the three assessed water bodies of the Tame. This Gate 2 assessment suggests that the two water bodies in the Trent would not be impacted by any of the assessed flow reduction scenarios.
- 7.1.2 This assessment determined that hydrological regime was the WFD quality element that would potentially be impacted as a result of 115, 172, and 230 MI/d flow transfers on Tame - R Rea to R Blythe (GB104028046841), Tame from R Blythe to River Anker (GB104028046440), Tame from River Anker to River Trent (GB104028047050). Impacts upon hydrological regime for the 57 MI/d scenario are scoped out as a result of HEM assessment and that of other workstreams, where the reduction in river levels as a result of that flow scenario is considered to be not significant.
- 7.1.3 Hydrological regime is currently within "good" classification status on all three watercourses as per WFD cycle 2 assessment data, therefore a deterioration in the status of the quality element would be significant. These predicted changes in flow are potentially not large enough to affect the classification though there is uncertainty as to how the classification was determined by the EA, and as such we have conservatively assigned an impact score of 1 (uncertain):
- Impact score of 1: *Impacts that, when taken on their own, have the potential to lead to a minor localised, short-term, and fully reversible effects on one or more of the quality elements but would not result in the lowering of WFD status. Impacts would be very unlikely to prevent any target WFD objectives from being achieved (ACWG WFD framework).*
- 7.1.4 It is recommended that this is examined further during Gate 3 and the EA are consulted to advise on how the Hydrological Regime classification was made. Furthermore, a worst-case assessment of the scheme operating at all times has been undertaken and each would likely be more intermittently used (with smaller flow reductions occurring more often than larger ones).
- 7.1.5 While reductions in flow were found to be unlikely to impact upon macroinvertebrates and macrophytes within the River Tame and Trent for all of the flow scenarios (as per Hydro-Ecological Modelling output), it was noted that the WFD status for fish may also be impacted during 172 and 230 MI/d flows on the Tame from R Blythe to River Anker (GB104028046440). Flow is the main factor that is likely to drive the impact upon fish presence, migration, and habitats within the water body in addition to other migration barriers. The weir at Lea Marston can be considered a migration barrier as it does not have any fish passages currently installed to allow fish migration upstream. This water body was potentially considered more at risk than that immediately upstream and downstream, since it is currently at Good status for fish (with neighbouring waterbodies being at Poor).
- 7.1.6 The assessment of physico-chemical quality elements, specific pollutants, and chemical elements has been informed by detailed water quality monitoring and modelling as described in the Water Quality - Baseline Monitoring and Modelling report (AECOM 2022). Six determinands are modelled to increase by up to almost 80%, but these remain significantly below the EQS. This increase would be due to reduced dilution by Minworth effluent, as they are currently present in the Tame upstream of Minworth. Further monitoring for 'Benzo (ghi) perylene and indeno (123-cd) pyrene' and zinc is recommended due to lack of confidence in current monitoring and classification data. At least seven determinands are modelled to reduce in the Tame due to reduced effluent from Minworth.
- 7.1.7 For context, Atrazine (an herbicide) is not present in Minworth effluent, but is currently present in the Tame downstream of Minworth at 0.00005 µg/l. At the 230 MI/d scenario it will increase in the Tame to 0.00009 µg/l, but the EQS is 0.6 µg/l. Therefore, this does not represent a risk in terms of WFD status.
- 7.1.8 A flow reduction of 57 MI/d was assessed to be non-detrimental to the WFD status quality elements within each of the water bodies assessed. Modelled water quality data based on AECOMs long term modelling and Minworth effluent data inferred that a reduction in flow by 57 MI/d was unlikely to provide any additional benefit related to water quality within the Tame and Trent.

8. Summary and conclusions

- 8.1.1 The four proposed flow transfer scenarios for the Minworth SRO have been assessed using the ACWG guidance for WFD compliance assessment, and a ACWG template has been completed for each flow transfer scenario.
- 8.1.2 The assessment for the 57MI/d flow transfer determined that this is considered to be compliant with WFD objectives.
- 8.1.3 The assessment for the 115MI/d flow transfer inferred that there is uncertainty that it would be compliant with WFD waterbody objectives in the Tame - R Rea to R Blythe (GB104028046841), Tame from R Blythe to River Anker (GB104028046440), and Tame from River Anker to River Trent (GB104028047050). Further flow modelling and assessment that includes scheme operating procedures is suggested for Gate 3 to improve data confidence for hydrological regime in those water bodies.
- 8.1.4 This assessment suggested that the 172MI/d and 230MI/d flow transfers would likely not be compliant with WFD water body status and objectives related to hydrological regime on the Tame - R Rea to R Blythe (GB104028046841), the Tame from R Blythe to River Anker (GB104028046440), and the Tame from River Anker to River Trent (GB104028047050). Additionally, there is potential status deterioration in the Tame from R Blythe to River Anker (GB104028046440) related to fish. Further flow modelling related to flow scenarios combining operating conditions at Minworth WwTW are required at Gate 3. Further assessments related to the fish WFD quality element on the Tame from R Blythe to River Anker (GB104028046440) should be undertaken at Gate 3. The two flow schemes are considered to be compliant for other WFD quality element status and objectives. The medium data confidences related to hydrological regime within the Tame - R Rea to R Blythe (GB104028046841), the Tame from R Blythe to River Anker (GB104028046440), and the Tame from River Anker to River Trent (GB104028047050) should be mitigated by further monitoring and modelling to improve data confidence to "high" at Gate 3.
- 8.1.5 The assessed uncertain or possible WFD non-compliances detailed above do not take into account the frequency or seasonality of operation of the proposed transfers; refer to Section 2.3. The assessment of possible WFD non-compliance is dependent upon the outcome of further 2D hydraulic modelling, and subsequent fish passage assessment, which is on-going at the time of submission of this report. Where possible, the results of the on-going assessments will be incorporated into the work undertaken for Gate 2; otherwise, the assessments will be refined further at Gate 3.
- 8.1.6 Assessment of the potential impacts of scheme utilisation and seasonality on WFD receptors will also take into account such factors as fish migration seasons and associated effects on fish passage at those times, which can only be informed by on-going 2D hydraulic modelling. Likewise, it is recommended that consultation with the Environment Agency is undertaken to establish how to quantify assessment of the Hydrological Regime WFD element, and whether this is likely to represent a WFD non-compliance under the different scenarios.
- 8.1.7 The RNAG assessment for the 230 MI/d scenario has concluded that RNAG in relation to Zinc and Dissolved Oxygen have the potential to be impacted by the Minworth SRO in the two upstream water bodies. It is recommended that the RNAG assessment is updated once further assessment of zinc has been completed at Gate 3 - Further monitoring for 'Benzo (ghi) perylene and indeno (123-cd) pyrene' and zinc is recommended due to lack of confidence in current monitoring and classification data. Dissolved oxygen has not been assessed as a potential WFD deterioration following the results of current water quality modelling; however, there is a recommendation for this to be refined at Gate 3 to take into consideration the cumulative effects of climate change on temperature and reduced flows. The approach to the assessment of cumulative effects of the Minworth SRO scheme with climate change in relation to temperature and dissolved oxygen in the River Tame will be refined at Gate 3.

Appendix A **Figure 2-2: Tame and Trent water bodies included within the WFD assessment**

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Appendix B ACWG WFD Assessment Matrices

Refer to the attached WFD Assessment Matrix spreadsheets for the detailed WFD Assessment for each scenario for Minworth SRO including references for water quality modelling and use of Hydro-Ecological Modelling (HEM) analyses.

Summary of Level 1 assessment for 57MI/d from the ACWG sheet:

Impacted Waterbody ID	Impacted Waterbody Name	Waterbody type	Overall waterbody Classification	Overall waterbody Objective	Number of activities assessed	Count of activities scoring major benefit score (-2)	Count of activities scoring minor benefit score (-1)	Count of activities scoring minimal impact score (0)	Count of activities scoring minor/local impact score (1)	Count of activities scoring medium impact score (2)	Count of activities scoring high impact score (3)	Level 1 max score	Level 1 mean score	Carry through to level 2 assessment?
GB104028046841	Tame - R Rea to R Blythe	River	Moderate in 2016	Moderate by 2015	2	0	0	1	0	1	0	2	1.00	YES
GB104028046440	Tame from R Blythe to River Anker	River	Poor in 2016	Poor by 2015	1	0	0	0	0	1	0	2	2.00	YES
GB104028047050	Tame from River Anker to River Trent	River	Moderate in 2016	Moderate by 2015	1	0	0	0	0	1	0	2	2.00	YES
GB104028047180	Trent - R Tame to R Dove	River	Poor in 2016	Good by 2027	1	0	0	0	0	1	0	2	2.00	YES
GB104028047420	Trent from Dove to Derwent	River	Moderate in 2016	Moderate by 2015	1	0	0	0	0	1	0	2	2.00	YES

Full summary after Level 2 assessment for 57MI/d from the ACWG sheet:

Waterbody ID	Waterbody name	Waterbody type	Maximum Impact score level 1	Maximum Impact score level 2	Maximum post mitigation impact score level 2	Deterioration between status classes	Impediments to GES/GEP	Compromises water body objectives	Assists attainment of water body objectives
GB104028046841	Tame - R Rea to R Blythe	River	2	0	0	No	No	No	No
GB104028046440	Tame from R Blythe to River Anker	River	2	0	0	No	No	No	No
GB104028047050	Tame from River Anker to River Trent	River	2	0	0	No	No	No	No
GB104028047180	Trent - R Tame to R Dove	River	2	0	0	No	No	No	No
GB104028047420	Trent from Dove to Derwent	River	2	0	0	No	No	No	No

Summary of Level 1 assessment for 115MI/d from the ACWG sheet:

Impacted Waterbody ID	Impacted Waterbody Name	Waterbody type	Overall waterbody Classification	Overall waterbody Objective	Number of activities assessed	Count of activities scoring major benefit score (-2)	Count of activities scoring minor benefit score (-1)	Count of activities scoring minimal impact score (0)	Count of activities scoring minor/local impact score (1)	Count of activities scoring medium impact score (2)	Count of activities scoring high impact score (3)	Level 1 max score	Level 1 mean score	Carry through to level 2 assessment?
GB104028042420	Cole from Hatchford-Kingshurst Brook to R Blythe	River	Moderate in 2016	Moderate by 2015	2	0	0	1	1	0	0	1	0.50	NO
GB104028042572	Blythe from Patrick Bridge to R Tame	River	Poor in 2016	Moderate by 2027	2	0	0	1	1	0	0	1	0.50	NO
GB109054044520	Canley Bk - source to conf with Finham Bk	River	Moderate in 2016	Moderate by 2015	2	0	0	1	1	0	0	1	0.50	NO
GB109054044480	Finham Bk - conf Canley Bk to conf R Sowe	River	Moderate in 2016	Good by 2027	2	0	0	1	1	0	0	1	0.50	NO
GB109054043840	Avon (Warks) - conf R Sowe to conf R Leam	River	Moderate in 2016	Good by 2021	1	0	0	0	1	0	0	1	1.00	NO
GB104028046841	Tame - R Rea to R Blythe	River	Moderate in 2016	Moderate by 2015	2	0	0	1	0	1	0	2	1.00	YES
GB104028046440	Tame from R Blythe to River Anker	River	Poor in 2016	Poor by 2015	1	0	0	0	0	1	0	2	2.00	YES
GB104028047050	Tame from River Anker to River Trent	River	Moderate in 2016	Moderate by 2015	1	0	0	0	0	1	0	2	2.00	YES
GB104028047180	Trent - R Tame to R Dove	River	Poor in 2016	Good by 2027	1	0	0	0	0	1	0	2	2.00	YES
GB104028047420	Trent from Dove to Derwent	River	Moderate in 2016	Moderate by 2015	1	0	0	0	0	1	0	2	2.00	YES

Full summary after Level 2 assessment for 115MI/d from the ACWG sheet:

Waterbody ID	Waterbody name	Waterbody type	Maximum Impact score level 1	Maximum Impact score level 2	Maximum post mitigation impact score level 2	Deterioration between status classes	Impediments to GES/GEP	Compromises water body objectives	Assists attainment of water body objectives
GB104028042420	Cole from Hatchford-Kingshurst Brook to R Blythe	River	1	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required
GB104028042572	Blythe from Patrick Bridge to R Tame	River	1	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required
GB109054044520	Canley Bk - source to conf with Finham Bk	River	1	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required
GB109054044480	Finham Bk - conf Canley Bk to conf R Sowe	River	1	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required
GB109054043840	Avon (Warks) - conf R Sowe to conf R Leam	River	1	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required	Level 2 assessment not required
GB104028046841	Tame - R Rea to R Blythe	River	2	1	1	uncertain	Uncertain	uncertain	No
GB104028046440	Tame from R Blythe to River Anker	River	2	1	1	uncertain	Uncertain	uncertain	No
GB104028047050	Tame from River Anker to River Trent	River	2	1	1	uncertain	Uncertain	uncertain	No
GB104028047180	Trent - R Tame to R Dove	River	2	0	0	No	No	No	No
GB104028047420	Trent from Dove to Derwent	River	2	0	0	No	No	No	No

Summary of Level 1 assessment for 172MI/d from the ACWG sheet:

Impacted Waterbody ID	Impacted Waterbody Name	Waterbody type	Overall waterbody Classification	Overall waterbody Objective	Number of activities assessed	Count of activities scoring major benefit score (-2)	Count of activities scoring minor benefit score (-1)	Count of activities scoring minimal impact score (0)	Count of activities scoring minor/local impact score (1)	Count of activities scoring medium impact score (2)	Count of activities scoring high impact score (3)	Level 1 max score	Level 1 mean score	Carry through to level 2 assessment?
GB104028046841	Tame - R Rea to R Blythe	River	Moderate in 2016	Moderate by 2015	1	0	0	0	0	1	0	2	2.00	YES
GB104028046440	Tame from R Blythe to River Anker	River	Poor in 2016	Poor by 2015	1	0	0	0	0	1	0	2	2.00	YES
GB104028047050	Tame from River Anker to River Trent	River	Moderate in 2016	Moderate by 2015	1	0	0	0	0	1	0	2	2.00	YES
GB104028047180	Trent - R Tame to R Dove	River	Poor in 2016	Good by 2027	1	0	0	0	0	1	0	2	2.00	YES
GB104028047420	Trent from Dove to Derwent	River	Moderate in 2016	Moderate by 2015	1	0	0	0	0	1	0	2	2.00	YES

Full summary after Level 2 assessment for 172MI/d from the ACWG sheet:

Waterbody ID	Waterbody name	Waterbody type	Maximum Impact score level 1	Maximum Impact score level 2	Maximum post mitigation impact score level 2	Deterioration between status classes	Impediments to GES/GEP	Compromises water body objectives	Assists attainment of water body objectives
GB104028046841	Tame - R Rea to R Blythe	River	2	1	1	uncertain	Uncertain	uncertain	No
GB104028046440	Tame from R Blythe to River Anker	River	2	1	1	uncertain	Uncertain	uncertain	No
GB104028047050	Tame from River Anker to River Trent	River	2	1	1	uncertain	Uncertain	uncertain	No
GB104028047180	Trent - R Tame to R Dove	River	2	0	0	No	No	No	No
GB104028047420	Trent from Dove to Derwent	River	2	0	0	No	No	No	No

Summary of Level 1 assessment for 230MI/d from the ACWG sheet:

Impacted Waterbody ID	Impacted Waterbody Name	Waterbody type	Overall waterbody Classification	Overall waterbody Objective	Number of activities assessed	Count of activities scoring major benefit score (-2)	Count of activities scoring minor benefit score (-1)	Count of activities scoring minimal impact score (0)	Count of activities scoring local impact score (1)	Count of activities scoring medium impact score (2)	Count of activities scoring high impact score (3)	Level 1 max score	Level 1 mean score	Carry through to level 2 assessment?
GB104028046841	Tame - R Rea to R Blythe	River	Moderate in 2016	Moderate by 2015	1	0	0	0	0	1	0	2	2.00	YES
GB104028046440	Tame from R Blythe to River Anker	River	Poor in 2016	Poor by 2015	1	0	0	0	0	1	0	2	2.00	YES
GB104028047050	Tame from River Anker to River Trent	River	Moderate in 2016	Moderate by 2015	1	0	0	0	0	1	0	2	2.00	YES
GB104028047180	Trent - R Tame to R Dove	River	Poor in 2016	Good by 2017	1	0	0	0	0	1	0	2	2.00	YES
GB104028047420	Trent from Dove to Derwent	River	Moderate in 2016	Moderate by 2015	1	0	0	0	0	1	0	2	2.00	YES

Full summary after Level 2 assessment for 230MI/d from the ACWG sheet:

Waterbody ID	Waterbody name	Waterbody type	Maximum Impact score level 1	Maximum Impact score level 2	Maximum post mitigation impact score level 2	Deterioration between status classes	Impediments to GES/GEP	Compromises water body objectives	Assists attainment of water body objectives
GB104028046841	Tame - R Rea to R Blythe	River	2	1	1	uncertain	Uncertain	uncertain	Yes
GB104028046440	Tame from R Blythe to River Anker	River	2	1	1	uncertain	Uncertain	uncertain	No
GB104028047050	Tame from River Anker to River Trent	River	2	1	0	uncertain	Uncertain	uncertain	No
GB104028047180	Trent - R Tame to R Dove	River	2	0	0	No	No	No	No
GB104028047420	Trent from Dove to Derwent	River	2	0	0	No	No	No	No

References used for the ACWG assessment template

- Environmental Assessment for the Trent Strategic Resource Options (SRO): Minworth SRO and South Lincolnshire Reservoir (SLR) SRO: Results and Recommendations. Report to Affinity Water, Anglian Water Services Ltd and Severn Trent Water Ltd. REP-003_Summary Report. AECOM, April 2022 [And supporting Technical Appendices].
- Tame and Trent Hydraulic and Hydrological Modelling Report: Minworth SRO and South Lincolnshire Reservoir (SLR) SRO. Report to Affinity Water, Anglian Water Services Ltd and Severn Trent Water Ltd. AECOM, July 2022.
- Trent Strategic Resource Options Aquatic Ecology Monitoring. Report to Affinity Water and Severn Trent Water Ltd. AECOM, April 2022.
- Water Quality – Baseline Monitoring and Modelling: Minworth Strategic Resource Option. Report to Affinity Water and Severn Trent Water Ltd. AECOM, June 2022.
- HEM data output is included within this report.

Appendix C Output Comparison Table

Level 2 output comparison for the four scheme options:

Waterbodies		57 Ml/d Scheme Option			115 Ml/d Scheme Option			172 Ml/d Scheme Option			230 Ml/d Scheme Option		
Waterbody ID	Waterbody Name	Maximum Level 2 Impact score	Confidence in WFD data	Confidence in option design	Maximum Level 2 Impact score	Confidence in WFD data	Confidence in option design	Maximum Level 2 Impact Score	Confidence in WFD data	Confidence in option design	Maximum Level 2 Impact score	Confidence in WFD Data	Confidence in option design
GB104028046841	Tame - R Rea to R Blythe	0	High	Moderate	1	Moderate	Moderate	1	Moderate	Moderate	1	Moderate	Moderate
GB104028046440	Tame from R Blythe to River Anker	0	High	Moderate	1	Moderate	Moderate	1	Moderate	Moderate	1	Moderate	Moderate
GB104028047050	Tame from River Anker to River Trent	0	High	Moderate	1	Moderate	Moderate	1	Moderate	Moderate	1	Moderate	Moderate
GB104028047180	Trent - R Tame to R Dove	0	High	Moderate	0	High	Moderate	0	High	Moderate	0	High	Moderate
GB104028047420	Trent from Dove to Derwent	0	High	Moderate	0	High	Moderate	0	High	Moderate	0	High	Moderate

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