



ANNEX B3.1.3

Environmental
Assessment: Minworth
and SLR
River Mease SAC

Environmental Assessment for the Trent Strategic Resource Options (SRO)

Minworth SRO and South Lincolnshire Reservoir (SLR)
SRO

Appendix C: River Mease SAC

Affinity Water, Anglian Water Services Ltd and Severn
Trent Water Ltd

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1. Introduction

1.1 Background

- 1.1.1 AECOM previously completed the Hydrology, Environment and Ecological (HEE) gap analysis of the River Tame, River Trent and Humber (TTH) system for Gate 1, carried out jointly for Minworth and the South Lincolnshire Reservoir (SLR). Subsequent investigations completed for Gate 2 include baseline Aquatic Ecological Monitoring (July 2022), water quality monitoring in the River Tame (July 2022), and Hydrological, Aquator and Hydraulic Modelling of the rivers Tame and Trent (July 2022). The latter has been completed in parallel with these assessments and has provided modelling outputs to inform the assessment of potential environmental impacts.
- 1.1.2 The Hydrology, Ecology and Environmental baseline study for the Tame, Trent and Humber in support of Minworth and SLR for Gate 1 encompassed 19 in-depth topic reports and an overall summary report to inform further environmental assessment for the Minworth and SLR Strategic Resource Options (SRO).
- 1.1.3 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. Also 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 have been carried forward for further detailed assessment at Gate 2, as presented here and in the overall Environmental Assessment report (60669746_REP_003_Env-Ass_Trent_SRO_V5¹, Annex B3.1), to which this report forms an appendix.
- 1.1.4 In addition, as part of the Gate 1 engagement with the regulators (Environment Agency and Natural England), the River Mease Special Area of Conservation (SAC) was flagged as being a potential area of interest and following an assessment, this was ruled out. However, the Regulators have requested a more detailed assessment to reaching this conclusion for the River Mease SAC at Gate 2.
- 1.1.5 This report presents the assessment of interaction of the SRO schemes (in particular Minworth) with the River Mease SAC to provide an audit trail and evidence to identify whether further work be deemed necessary.

1.2 Assessment Rationale

- 1.2.1 This report details the assessment of the River Mease SAC, including any links and interdependencies with other topics, any gaps, or limitations to the assessment (e.g., the availability of supporting information, which would have been established and flagged at an early stage), and any recommendations for further work required to incorporate into further assessment for Gate 3. This will inform the next stage of environmental assessment of the Trent SROs in support of the two related SRO schemes.
- 1.2.2 The Services to be delivered are for Affinity Water, Anglian Water Services Limited and Severn Trent Water Limited.
- 1.2.3 The purpose of the 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 per Concept Design Report CDR, Jacobs 2022), separately and in-combination with the potential abstraction of up to 300 MI/d (as an absolute maximum) for the SLR SRO. This assessment is critical to supporting concept design and scheme environmental assessment for key SROs at Gate 2.

¹ AECOM (April, 2022). Environmental Assessment for the Trent Strategic Resource Options (SRO): Minworth SRO and South Lincolnshire Reservoir (SLR) SRO. Results and Recommendations.

1.2.4 A key element of the related SROs, Minworth and SLR, is to investigate the environmental risks and opportunities associated with delivery of the schemes.

1.3 Objectives

1.3.1 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 in to the Tame, Trent, and Humber (TTH) system and surrounding environment and assess the impact the proposed transfer could have on the River Mease SAC.
- Define what mitigation measures need to be implemented to satisfy regulators that the SROs are viable. Any mitigation measures that require engineering solutions such as modification to fish passes or weirs, should be fed back into the Engineering workstream.
- Support engagement with key stakeholders including the Environment Agency, Natural England, Canal and River Trust, Water Resources East, and the River Trent Working Group. This has taken the form of monthly workshops to present findings and/or discuss key themes, risks, or mitigations, and site visits to inform the assessment of specific features.
- Produce an environmental scoping checklist (Section 4) to ensure identification of the likely significant environmental effects of the proposed projects and ensure all assessments and data collection are completed to support further environmental assessment during Gate 3.

1.3.2 This report sets out the preliminary findings of field surveys, monitoring, and desk-based environmental assessments; to drive engagement with relevant regulators and other decision-makers; to agree the survey specifications and locations for any data collection or studies.

1.3.3 This report covers the key theme of the River Mease Special Area of Conservation (SAC).

1.4 Environmental Assessment

1.4.1 The outcome of the environmental assessments supports an assessment of the potential impact and changes to the environment and ecology within the River Tame and Trent and associated water bodies and habitats as a result of activity associated with the SROs. This technical appendix and other supporting reports detail the assessment and demonstrate a clear line of sight to further environmental assessment at Gate 3, identifying potential significant effects, and informing the scope for future detailed assessments as set out in the Strategic regional water resource solutions guidance for gate two (RAPID, April 2022²), including:

- Water Framework Directive (WFD) Compliance Assessment;
- Informal Habitats Regulations Assessment (HRA);
- Environmental Appraisal (including Strategic Environmental Assessment (SEA)); and
- Other Environmental Considerations including Biodiversity Net Gain (BNG) and Natural Capital Assessment (NCA).

1.4.2 The results of the environmental assessments are collated into the single overall report, supported by technical appendices, informed by regular liaison with the project teams and stakeholder engagement, for incorporation into the Gate 2 submission. This includes the results and recommendations from each topic within the environmental assessment.

1.4.3 The overall approach to the assessment and monitoring specification includes, but is not limited to, the extent of designated sites and Priority Habitats for ground truthing and walkover surveys, the extent of fluvial walkover surveys, and the range of data and supporting information required to support the assessment.

² Regulators' Alliance for Progressing Infrastructure Development (RAPID) (April 2022). Strategic regional water resource solutions guidance for gate two.

1.4.4 This technical appendix supports the overall environmental assessment report, the focus of which is as follows:

- i. Results and recommendations of the topic assessment;
- ii. A detailed assessment of the potential impacts and changes to the environment and ecology within the Rivers Tame and Trent, and associated water bodies, habitats, and species, as a result of activities associated with the SROs;
- iii. The overall environmental assessment report and technical appendices will support subsequent assessment for RAPID Gate 2;
- iv. Ensure a clear line of sight toward future environmental assessments and any additional planning requirements, e.g., HRA, SEA, WFD compliance assessment, etc. This will include identifying receptors to potential impacts, the likely extent, scale, and significance of impacts according to industry standards, and preliminary recommendations for appropriate mitigation;
- v. A key component of the final report will be an environmental scoping checklist to identify and grade likely significant environmental effects, to form the basis of and inform future environmental assessment at Gate 3;
- vi. Clear identification of any gaps and limitations in the assessment, which would have been identified and discussed with the Clients and stakeholders at an early stage.

1.5 Assessment Scenarios

1.5.1 Assessment of different scenarios for operation of the Minworth SRO scheme will be undertaken. This is based on the likely seasonal operation and operational regime requirements for the Minworth transfers, as described in detail in the overall assessment report (60669746_REP_003_Env-Ass_Trent_SRO_V5³, Annex B3.1), and briefly summarised as follows:

Minworth SRO

1.5.2 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 following volume options:

- 57 MI/d (Megalitres per day) discharge to GUC SRO;
- 115 MI/d discharge to GUC SRO;
- 57 MI/d discharge to River Avon for STT SRO;
- 115 MI/d discharge to River Avon for STT SRO; or
- Combined 230 MI/d transfer to both River Avon and GUC (115 MI/d to each).

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

³ AECOM (April, 2022). Environmental Assessment for the Trent Strategic Resource Options (SRO): Minworth SRO and South Lincolnshire Reservoir (SLR) SRO. Results and Recommendations.

2. Scope and Approach

2.1 Introduction

2.1.1 This section sets out the approach to Environmental Assessment of the Minworth SRO scheme, informed by RAPID guidance for Gate 2 and on-going stakeholder engagement.

2.2 Projects and Work Completed to Date

2.2.1 Key findings and recommendations from the Tame, Trent and Humber baseline assessment for Gate 1 included:

- Identification of ecologically sensitive designated sites, Priority Habitats, protected/notable species, hydro-geomorphological features, WFD statuses.
- Recommendations to complete and maintain the baseline assessment, inform subsequent impact assessment, and data refresh.
- AECOM is now undertaking follow-on work to inform Gate 2, including macroinvertebrate, macrophyte, River Habitat Surveys (RHS), Invasive Non-Native Species (INNS) surveys, Water Quality monitoring, and Hydrological, Aquator and Hydraulic Modelling of the rivers Tame and Trent.

2.2.2 The literature search involved contacting statutory and local bodies, scientific literature databases, with data sources listed.

2.2.3 Reports set out the literature review and baseline information for each topic, including data gaps/recommendations, links to the consistent methodology (including SEA framework) currently being developed for the environmental assessment of SROs. This helped to demonstrate to regulators and stakeholders that the evidence effectively informed the strategic assessments.

2.2.4 These reports critically evaluated the information gathered and identified gaps in knowledge, reviewed areas of uncertainty or conflicting opinion, and formed the basis for further environmental investigation and impact assessment, including recommendations for the next stages (Gate 2) of the assessment process.

2.3 Desk-Based Review

2.3.1 A comprehensive international desk-based review of available data and literature has been undertaken, to establish whether there is any precedent in the UK or abroad for the redirection of discharge from a Wastewater Treatment Works (WwTW) such as Minworth, if there were any associated effects (technically, socially, politically, environmental) on the depleted reach of the receiving watercourse and what criteria had to be met to allow this diversion.

2.3.2 A key part of this study is to identify the potential effects of the proposed reduction in discharge from Minworth on this watercourse and surrounding environment. This will allow potential significant effects to be scoped in for further assessment post-Gate 2, e.g., for HRA consideration.

2.3.3 There are likely to be relevant examples both within and outside the water industry, for example large abstractions for the power industry, agriculture, or for renewable energy. Only examples that are relevant to inform the specific assessment for the Minworth SRO have been used, to identify specific scenarios where robust environmental assessment has been completed to satisfy regulatory and legislative requirements.

2.3.4 It is worth noting that the regulatory regime internationally is very different, and potentially less stringent, than that in the UK. Therefore, the level of environmental assessment for similar schemes internationally may not be representative of the requirements in the UK, and this will be borne in mind throughout our assessment process.

2.3.5 Refer to the overall assessment report for the findings of the industry precedent search.

2.4 Scope of Assessment

2.4.1 Critical to the assessment is the requirement to liaise with stakeholders and decision makers to agree the monitoring specification and purpose for discussion with the Regulators. This will be an on-going and iterative process through on-going engagement, and consideration of each stage of the assessment as it progresses.

2.4.2 Through the assessments for the Tame, Trent and Humber baseline study, it was noted that constraints and limitations may be encountered, for example due to the availability and completeness of available data, and therefore it has been critical to engage stakeholders at each stage to resolve potential issues, and tailor the assessment methodology to maximise the benefits of available data and information. This is critical to ensure the success of the assessment through Gate 2.

2.4.3 The outcomes of the Gate 1 baseline assessment and outputs of parallel monitoring and modelling work also underway have been used to support the large-scale environmental assessment.

2.5 River Mease SAC

Objectives

2.5.1 The objectives of the assessment of the River Mease SAC, as set out by the Client, are as follows:

- *As part of Gate 1 engagement with the EA and Natural England, the River Mease SAC was flagged as being a potential area of interest. Although Gate 1 work ruled it out, the regulators have requested a more detailed assessment to reaching a conclusion with this SAC. We propose to assess the relevance of this site and produce an audit trail for requiring further work or not.*
- *Should further work be deemed necessary, we will carry out investigations to increase the certainty that the River Mease SAC will not be impacted by the Minworth SRO e.g., groundwater interaction, movement of designated species- working with EA who are undertaking a hydrological study of the River Mease due to complex groundwater interactions throughout the catchment.*
- *The EA are currently undertaking a hydrological study of the River Mease due to:*

“Complex groundwater interactions throughout the catchment and the potential to relocate the discharge from Packington WTW on Gilwiskaw Brook (Mease) out of the SAC catchment although to restore natural flows within this protected site. Depending on the destination of water removed from the Mease catchment, this ‘pump out’ solution to restore natural flows could have in-combination effects on flows in the Trent once combined with the Minworth proposal.” <https://www.rivermease.co.uk/activity/projects/>

2.5.2 The assessment has been designed to meet these objectives, as set out in detail below.

Hydrological Assessment

2.5.3 The TTH Gate 1 assessment concluded that the River Mease SAC/SSSI is of Medium Ecological Sensitivity in relation to the SRO proposals, due to its connectivity to the Trent and its reasons for designation – diverse macrophyte community, and populations of both spined loach *Cobitis taenia* and bullhead *Cottus gobio*. Therefore, the River Mease SAC was considered unlikely to be significantly impacted by changes in flow in the Trent.

2.5.4 A staged approach has been undertaken to assess the relevance of the River Mease SAC and interactions with the SROs (as described in Section 1.2.3), as follows:

1. Liaised with the Environment Agency to understand the scope of the hydrological assessment that they are undertaking for the River Mease SAC, in relation to proposals for Packington WwTW.

2. Identified and requested reports/outputs of the hydrological assessment from the Environment Agency and review in the context of the Minworth SRO.
3. Reviewed the 'pump out' options associated with Packington WwTW on the Gilwiskaw Brook (tributary of the River Mease). Identified where the 'relocation' of discharge from Packington WwTW is proposed and assessed if this will remove flows from the wider River Trent catchment or enters the Tame or Trent at a different location.
4. Reviewed the reduction of flows at the confluence of the River Mease with the River Trent, where feasible, based on the outputs of the Environment Agency hydrological assessment and the Gate 1 and Gate 2 work undertaken assessing low flows on the River Tame/Trent.
5. Summarised the findings of Stage 1-4 to provide an audit trail of evidence reviewed, assumptions, limitations, and uncertainties. The outcome has provided an indication of whether further work is required and recommendations for required work.

2.5.5 It has been critical to liaise with the Environment Agency from the outset to identify constraints/limitations with access to the River Mease hydrological assessment and associated outputs. In addition, regular updates have been provided on progress and the likelihood for the requirement of additional work to allow appropriate planning for investigations.

Habitats Regulations Assessment (HRA)

2.5.6 As a precursor to the detailed assessment that may follow, a screening exercise has been undertaken to determine the likelihood of impacts to the River Mease Special Area of Conservation (SAC), a European designated site. This includes, in close liaison with the EA and NE, an assessment of groundwater interaction with the Tame and Trent catchment, the degree of movement of designated species between the Tame and Trent and the River Mease SAC, and hydrological connectivity between the SRO study area and the SAC.

2.5.7 The approach to the assessment of the River Mease SAC has been closely informed by liaison with the EA, NE, and other relevant stakeholders. This has established the concerns regarding potential cumulative and 'in-combination' effects (the latter of which will be assessed in further detail at Gate 3), the scope and extent of the assessment, any further work required to undertake the assessment, and allowed for discussion with stakeholders at all stages of the assessment process to obtain their input and agreement.

2.5.8 Regulation 63⁴ states that '*A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which... is likely to have a significant effect on a European site [a Special Area of Conservation, Special Protection Area or, as a matter of Government policy, a Ramsar site] or a European offshore marine site (either alone or in combination with other plans or projects) ... must make an appropriate assessment of the implications of the plan or project for that site in view of that site's conservation objectives*'. This entire process is called Habitats Regulations Assessment (HRA). The HRA process follows available guidance including that published by UKWIR⁵, that published by the government in July 2019⁶ and that in the Habitats Regulations Assessment Handbook⁷.

2.5.9 An 'informal HRA report' (as per RAPID Gate 2 Guidance) is being produced to accompany the environmental outputs of the Gate 2 process, specifically in relation to Minworth SRO; this Appendix C report contains the key excerpts of that HRA relevant to the River Mease SAC.

HRA Screening

2.5.10 HRA commences with a simple Test of Likely Significant Effects (also dubbed 'HRA Screening') which considers the interest features of the SAC, relevance being determined by the impact pathways likely to arise from the scheme and either professional judgment or available guidance on the distance such

⁴ The Conservation of Habitats and Species Regulations 2017. UK Statutory Instruments 2017 No. 1012.

⁵ UK Water Industry Research (UKWIR), 2012. Strategic Environmental Assessment and Habitats Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans.

⁶ <https://www.gov.uk/guidance/appropriate-assessment>

⁷ The Habitats Regulations Assessment Handbook [Online] <https://www.dtapublications.co.uk/>

impacts are likely to affect European sites, including any water resource modelling information regarding drawdown or effects on water levels and flow for European sites that may be connected to the Tame/Trent catchment.

- 2.5.11 The HRA builds on the assessment undertaken for Gate 1. Using this approach, it has been determined whether the risk of an adverse effect exists (beyond reasonable scientific doubt) and thus whether an appropriate assessment is required. If not, the assessment can stop at the HRA screening stage. It is understood that three possible impact 'corridors' have been identified – 1) the fluvial Trent and direct linkages via watercourses and riparian habitats, 2) groundwater linkage to the Tame/Trent corridor; and 3) the discharge from Packington WwTW on Gilwiskaw Brook out of the SAC catchment.
- 2.5.12 The preliminary Gate 1 assessment did not identify any significant transmission pathways by which a Likely Significant Effect could reasonably occur. This has been determined and verified for Gate 2.
- 2.5.13 The primary information utilised in the HRA are the outputs of the other ecological and hydrological studies for Gate 2 assessment, specifically regarding groundwater interaction with the Tame and Trent catchment, the degree of movement of designated species between the Tame and Trent and the River Mease SAC, and hydrological connectivity between the SRO study area and the SAC (demonstrated by hydrological modelling and interpretation of interaction at the confluence of the River Mease with the River Trent).
- 2.5.14 Information has also been obtained from the Environment Agency and Severn Trent Water regarding proposals for Packington WwTW.
- 2.5.15 Other data relevant to the HRA is available online and has been used in the assessment, including the Natura 2000 data form, the Conservation Objectives for the SAC, the Supplementary Advice on the Conservation Objectives (SACO) and the Site Improvement Plan (although in some areas this will have been superseded by the SACO). There is also useful information on the River Mease Partnership website⁸.

2.6 Limitations

River Mease SAC Assessment

- 2.6.1 The following limitations have been identified in terms of the River Mease SAC assessment.
- 2.6.2 The full report of the Environment Agency River Mease hydrological assessment study of the River Mease in relation to proposals for Packington WwTW has not yet been available. However, the results have been presented by the EA and have informed this assessment. When the full report of the hydrological study of the River Mease becomes available, this assessment can be updated.

⁸ <https://www.rivermease.co.uk/>

3. Results

3.1.1 This section summarises the results of the environmental assessment to date. Refer to the overall Environmental Assessment report for a summary of results and recommendations.

3.2 Hydrological Assessment

3.2.1 Liaison with the Environment Agency, Natural England, and Severn Trent Water (STW) has been undertaken, along with data requests for key information and hydrological data. The River Mease hydrological assessment being undertaken by the EA has focused on assessing existing flows within the Mease SSSI/SAC against the Common Standards Monitoring Guidance (CSMG) to identify if removal of wastewater discharge at Packington WwTW and Measham WwTW can aid the return of flows in the River Mease to a 'natural' state.

3.2.2 STW have provided daily discharges from Packington WwTW and Measham WwTW for the period 2015 – 2018. A summary of these data is provided in Table 3-1.

Table 3-1: STW daily discharge summary statistics for Packington WwTW and Measham WwTW (2015-2018).

Total Daily Volume (TDV) (m ³ /d)	Packington WwTW				Measham WwTW			
	2015	2016	2017	2018	2015	2016	2017	2018
Average	5303	5739	6222	6467	1425	1446	1350	1580
Min	2918	3338	3521	3041	722	909	880	1036
Max	12042	13833	13357	13571	3650	3754	3148	3977

3.2.3 Whilst the full report of the River Mease hydrological assessment study referred to within the scope has not yet been available at the time of reporting, the Environment Agency presented the initial findings of the study, including the main outcomes, and the associated spot flow gauging data used within the study. This has informed a better understanding of the potential impacts of the removal of WwTW discharges and how these may interact with the wider objectives of the Minworth SRO scheme.

3.2.4 Liaison with Severn Trent Water identified three 'pump out' options for the future destination of WwTW flow removal; only general details were provided for potential destinations for diverted discharges, these being:

- River Tame – upstream of the confluence with the River Trent and the discharge of the River Mease into the River Trent.
- River Trent – in the vicinity of the River Mease discharge into the River Trent.
- Staunton Harold Reservoir – provided that there are no drinking water issues (i.e., the effluent is treated to a high enough standard).

3.2.5 The delivery of the agreed option (to be confirmed) will be by March 2027. The impacts of the removal of wastewater effluent have been shown to have a greater impact on flows within the Gilwiskaw Brook (a tributary of the River Mease) and will reduce as contributing catchment area increases in a downstream direction. In addition, the CSMG target flow standard deviation from naturalised flow increases from 5% at <Q95 between Packington and Snarestone to 10% at <Q95 between Snarestone and the confluence with the River Trent.

3.2.6 Based on information provided by the EA, existing flows are outside of the CSMG target flows. The removal of wastewater effluent from Packington WwTW and Measham WwTW will return flows to a natural state that fall within the CSMG target flows.

- 3.2.7 As per the SSSI Interaction assessment⁹, it has been established that the River Mease does not gain flow from the River Tame across the superficial deposits aquifer. The flows and levels in the lower River Mease are not anticipated to be influenced by changes in River Tame levels via hydraulic continuity with the river terrace gravels secondary aquifer, and therefore are not expected to be affected by reduction in discharge at Minworth. River flows are dependent on local recharge to the superficial aquifer and the sandstone principal aquifer in its upper reaches and upstream discharges.
- 3.2.8 Based on contour mapping, there is a reduction in elevation between SK 2040 1996 (55 m contour) and SK1929 1440 (50 m contour) over a 4 km distance on the River Mease. The effects of a reduction in water level in the River Trent associated with a reduction in discharge at Minworth are unlikely to propagate significantly upstream on the River Mease.
- 3.2.9 Hydraulic modelling has been used to assess the impact of in-combination effects on water levels at the confluence of the River Mease and River Trent. Modelling outputs indicate a fall in River Trent levels of no more than 8.2 cm at the confluence with the River Mease (with a 230 Ml/d flow reduction at Minworth WwTW, equivalent to both GUC and STT operating at their maximum – i.e., a worst-case scenario), which is not considered significant compared to seasonal variation in river levels, aquifer recharge, and the influence of discharges and evaporative losses from former quarry lakes on river levels.
- 3.2.10 With respect to variation in river levels on the River Mease, the lowest level recorded at Clifton Hall (12 km upstream of confluence with River Trent) is 0.086 m Above Stage Datum (mASD). The highest recorded level is 2.353 mASD. Stage typically varies annually up to 1.2 mASD based on flows up to circa 5 cumecs, during flood events, this stage will be exceeded.

3.3 Habitats Regulations Assessment

- 3.3.1 The Natural England standing advice for the River Mease SAC describes the river as containing a diverse range of physical in-channel features including riffles, pools, slacks, vegetated channel margins and bankside tree cover, providing the conditions necessary to sustain populations of spined loach (*Cobitis taenia*) and bullhead (*Cottus gobio*). The river is also considered to support a significant presence of water-crowfoot (*Ranunculus* spp.) and water-starwort (*Callitriche* sp.).
- 3.3.2 The River Mease is primarily designated as a SAC due to its population of spined loach, for which the SAC is one of only four known outstanding localities in the UK, as well as for its population of bullhead. Although not primary reasons for site selection the SAC also qualifies due to its floating vegetation often dominated by water-crowfoot and because it has a significant presence of both otter (*Lutra lutra*), and historically white-clawed crayfish (*Austropotamobius pallipes*).
- 3.3.3 The conservation objectives of the SAC are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the favourable conservation status of its qualifying features, by maintaining or restoring:
- the extent and distribution of qualifying natural habitats and habitats of qualifying species;
 - the structure and function (including typical species) of qualifying natural habitats;
 - the structure and function of the habitats of qualifying species;
 - the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
 - the populations of qualifying species; and
 - the distributions of qualifying species within the site.
- 3.3.4 The principal risks to the integrity of River Mease SAC¹⁰ are:
- water pollution;

⁹ AECOM (2022). Environmental Assessment for the Trent Strategic Resource Options (SRO) – Minworth SRO and South Lincolnshire Reservoir SRO – Appendix A: SSSI Interaction (REP-003A).

¹⁰ Natural England Site Improvement Plan: River Mease SAC
<http://publications.naturalengland.org.uk/publication/6640857448972288>

- drainage discharges;
- inappropriate weirs and dams and other structures within, and adjacent to, the river corridor, thus blocking movement of fish or otter;
- invasive species;
- siltation; and
- water abstraction.

- 3.3.5 The River Mease is vulnerable to deterioration of water quality from agricultural runoff, direct pollution, and discharge of treated sewage effluent. According to the Environment Agency, the current water quality status of the river is either poor or moderate with a target to be good by 2027¹¹. The river is not currently achieving its target due to 'rural diffuse pollution and water company point source pollution'. The river is also subject to abstraction for public water supply, including at times of summer low flows.
- 3.3.6 For the Gate 2 study, an investigation has been undertaken into potential hydrological linkages between the River Tame and the River Mease SAC. The underlying geology for the River Mease consists of superficial river terrace deposits overlying the Gunthorpe Member (comprising mudstone). The river terrace deposits allow for more groundwater movement and infiltration of surface water due to their high permeability, whereas the Gunthorpe member has very low permeability. It therefore allows limited amounts of groundwater movement and there is limited infiltration from surface water. Due to the high permeability of the river terrace deposits, it is expected that these deposits will have relatively high hydraulic conductivity and interact with the River Mease, providing baseflow.
- 3.3.7 The accretion data indicate that the Mease does not gain additional baseflow from the superficial aquifer in the Tame surface water catchment at the expense of the River Tame but continues to accrete from baseflow from the superficial aquifer within the Mease surface water catchment. The flows and levels in lower River Mease will therefore not be influenced by changes in River Tame levels via hydraulic continuity with the river terrace gravels secondary aquifer and are therefore not expected to be affected by reduction in discharge at Minworth. Rather river flows are dependent on local recharge to the superficial aquifer and the sandstone principal aquifer in its upper reaches, and upstream discharges.
- 3.3.8 Moreover, even under the scenario with a 230 Ml/d flow reduction at Minworth (equivalent to both GUC and STT operating at their maximum) the predicted fall in River Trent levels (8.2 cm at Q95 and 5.2 cm at Q50) is not considered likely to lower groundwater levels¹² in the lower Mease area sufficiently to result in loss of flow to the superficial secondary aquifer, compared to seasonal variation in river levels, aquifer recharge, and the influence of discharges and evaporative losses from former quarry lakes on river levels.
- 3.3.9 Water levels are recorded on the River Trent near the confluence with the River Mease at Croxall. Water levels show a seasonal variation in excess of 1 m. Water levels are recorded on the River Tame at Tamworth, upstream of where River Tame water levels may interact with the superficial aquifer considered to be in hydraulic continuity with the lower River Mease. The gauge shows a typical seasonal variation of approximately 0.3 m, with occasional brief peaks in excess of 1m higher than the typical range.
- 3.3.10 Abstractions and discharges local to the site may influence flow and river levels. The Gate 1 assessment identified that there are no significant surface water abstractions near the mouth of the River Mease as it flows into the River Trent. There are five discharge points close to the mouth of the River Mease which are associated with Barton quarry and Alrewas quarry, discharging to the River Tame and River Trent. However, these locally augment flow near the River Mease and may support local groundwater levels in the superficial aquifer and are therefore not expected to reduce flows in the Mease in combination with the Minworth SRO.

3.4 Conclusions

- 3.4.1 The following conclusions can be drawn:

¹¹ <http://environment.data.gov.uk/catchment-planning/OperationalCatchment/3303/Summary> [Accessed 17 September 2018]

¹² For further information, refer to River Mease section within: Environmental Assessment for the Trent Strategic Resource Options (SRO) – Minworth SRO and South Lincolnshire Reservoir SRO – Appendix A: SSSU Interaction (REP-003A).

- Levels and flows in the River Tame will not affect levels and flows in the River Mease SAC;
- At maximum reduction in flow at Minworth SRO (230 MI/d), this would not result in a significant reduction in River Trent levels to materially affect the superficial aquifer linked to the lower River Mease.
- Based on the above Minworth SRO **will not result in a likely [adverse] significant effect** on the River Mease SAC or its qualifying interest features either alone or in combination with other plans and projects

4. Scoping Checklist – Recommendations and Mitigation Options

4.1.1 This section summarises the requirements for further assessment and mitigation beyond Gate 2.

Table 4-1: Tame and Trent Strategic Resource Options – Scoping Checklist for post-Gate 2 assessment and mitigation

Receptor or Feature under Assessment	Significance	Impact Pathway and Source (in relation to Minworth SRO)	Scale of Impact (Positive / Neutral / Negative)	Red/Amber/Green rating of Risk to SRO (High / Medium / Low)	Recommendations for Further Assessment	Mitigation Options
River Mease SAC						
River Levels	National	Impact from Minworth SRO. Reduction in river levels within the River Trent at confluence with River Mease may reduce river levels within lower reaches of River Mease. In combination with proposed diversion of discharge from Packington and/or Measham WwTW.	Neutral	Low	Review full report of the River Mease hydrological assessment study when available.	Focussed hydraulic model on the lower reaches of River Mease and interaction with River Trent. Refinement of scenarios for Minworth SRO reduction in flows.
River Mease (HRA)	National	Impact from Minworth SRO. Reduction in river levels within the River Trent at confluence with River Mease may reduce river levels within lower reaches of River Mease. In combination with proposed diversion of discharge from Packington and/or Measham WwTW.	Neutral	Low	Review full report of the River Mease hydrological assessment study when available. Confirm the conclusion that Appropriate Assessment is not required and agree with Regulators.	At Gate 2 no likely significant effects have been identified, either alone or in combination with other plans and projects; therefore, no appropriate assessment or mitigation is required.

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