

Strategic Regional Water Resource Solutions: Annex B2.2 Water Quality Evidence Report

Standard Gate Two Submission for River Severn to River Thames Transfer (STT)

Date: November 2022



Severn to Thames Transfer

Water quality evidence report

STT-G2-S3-105

November 2022

Disclaimer

This document has been written in line with the requirements of the RAPID Gate 2 Guidance and to comply with the regulatory process pursuant to Thames Water's, Severn Trent Water's and United Utilities' statutory duties. The information presented relates to material or data which is still in the course of completion. Should the solution presented in this document be taken forward, Thames Water, Severn Trent Water and United Utilities will be subject to the statutory duties pursuant to the necessary consenting processes, including environmental assessment and consultation as required. This document should be read with those duties in mind.



SEVERN THAMES TRANSFER SOLUTION

Environmental Water Quality Evidence Report

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1. INTRODUCTION

1.1 BACKGROUND AND DESCRIPTION OF THE STT SCHEME

1.1.1 The River Severn to River Thames Transfer Description

The aim of the Severn Thames Transfer is to provide additional raw water resources of 300 to 500MI/d to the South East of England during drought, with 500MI/d preferred by the Water Resources in the South East (WRSE) group's emerging regional plan. The water would be provided from flows in the River Severn and transferred via an interconnector to the River Thames. For the completion of the Gate 2 assessment, a pipeline "Interconnector" has been selected as the preferred option to transfer water from the River Severn to the River Thames.

Due to the risk of concurrent low flow periods in both river catchments, additional sources of water, apart from those naturally occurring in the River Severn, have been identified to augment the baseline flows. These multiple diverse sources of additional water provide resilience in the provision of raw water transfer to the River Thames. A 'put and take' arrangement has been agreed in principle with the Environment Agency (EA) and Natural Resources Wales (NRW) which means that if additional source water is 'put' into the river, then the Interconnector can 'take' that volume, less catchment losses, regardless of the baseline flows in the River Severn itself.

The regional planning process will determine the volume, timing, and utilisation of water to be transferred. The diversity of sources means they can be developed in a phased manner to meet the ultimate demand profile as determined by the regional planning. These additional sources of water are being provided by United Utilities (UU) and Severn Trent Water (STW) who are working in collaboration with Thames Water (TW) to develop this solution. The additional sources are:

- **Vyrnwy Reservoir:** Release of 25MI/d water licensed to UU from Lake Vyrnwy directly into the River Vyrnwy;
- **Vyrnwy Reservoir:** Utilisation of 155MI/d water licensed to UU from Lake Vyrnwy and transferred via a bypass pipeline ("Vyrnwy Bypass") to the River Severn;
- **Shrewsbury:** Diversion of 25MI/d treated water from UU's Oswestry Water Treatment Works (WTW) via an existing emergency transfer (the Llanforda connection), thus enabling a reduction in abstraction from the River Severn at Shelton WTW to remain in the River Severn for abstraction at Deerhurst;
- **Mythe:** 15MI/d of the Severn Trent Water licensed abstraction at Mythe remaining in the River Severn for abstraction at Deerhurst;
- **Minworth:** The transfer of 115MI/d of treated wastewater discharge from Severn Trent Water's Minworth Wastewater Treatment Works (WwTW) via a pipeline, to the River Severn via the River Avon at Stoneleigh; and
- **Netheridge:** The transfer of 35MI/d of treated wastewater discharge at Severn Trent Water's Netheridge WwTW to the River Severn at Haw Bridge, via a pipeline, upstream of the current discharge to the River Severn.

The STT Gate 1 submission was assessed by the Regulators' Alliance for Progressing Infrastructure Development (RAPID) who concluded that it should progress to standard Gate 2. The recommendations and actions received from RAPID and feedback from stakeholders from the Gate 1 process have been reflected in the scheme development and environmental assessments.

1.1.2 Gate 1

The STT Solution was subject to a detailed assessment in Gate 1 with the objective of delivering regulatory assessments of potential environmental effects of the Solution in the context of the All Company Working Group (ACWG) guidance. This methodology is aligned to the Water Resources Planning Guideline: Working Version for Water Resource Management Plan 2024 (WRMP24) so that there is a consistent approach to evaluating potential effects on environmental aspects.

At Gate 1, using the information available, the environmental appraisals did not identify any 'material issues', i.e. any unsurmountable obstacles that mean the scheme is unfeasible due to environmental reasons, at this

stage. Both beneficial and adverse effects have been identified, which is to be expected given the scale of the scheme.

These conclusions were reached in the context of identified gaps in understanding, and the stated need for further data and evidence collection to support the Gate 2 investigations, further information on the operation of the scheme, and ongoing dialogue with regulators and other stakeholders.

1.1.2.1 Regulator feedback at Gate 1

Feedback from the regulators was sought before the submission of the Gate 1 submission and incorporated where possible. The environmental regulators also gave feedback as part of their formal Gate 1 review of the scheme. This feedback has informed the approach taken for Gate 2.

1.1.3 Gate 2

The ACWG guidelines set out that Gate 2 builds on Gate 1 activities to improve the detail and breadth of studies for a key decision point for strategic solutions. This will include concept solution designs with reduced uncertainty in costs and benefits and re-testing in revised regional and company models (to support updated decision making and filtering on outputs including those that are mutually exclusive).

At the end of Gate 2, the solution should be developed to a standard suitable for submitting into final regional plans and/or final WRMPs. In this context, this stage (Gate 2) of the programme aims to further enhance the funding portfolio, based on refined and consistent costs and benefits, with suboptimal solutions eliminated and viable solutions carried forward to the pre-planning stage.

To support the programme, the potential environmental effects associated with the STT Solution identified in Gate 1 will be considered in view of updated scheme design, changes in potential operational patterns, feedback on Gate 1 assessments from various regulators and stakeholders and further data gathering, modelling and assessment work completed since the publication of the Gate 1 assessment report¹.

RAPID issued a guidance document² in April 2022 to describe the Gate 2 process and set out the expectations for solutions at standard Gate 2.

The guidance stated the environmental assessment methodologies should be consistent with any relevant legislation and guidance, and follow best practice. This includes, where relevant, Water Resource Management Plan (WRMP) guidance for 2024, All Company Working Group (ACWG) guidance³ and the Environment Agency Invasive Non-native Species risk assessment tool.

1.1.3.1 Overview of the environment assessment approach for Gate 2

Figure 1.1 shows the investigations undertaken for Gate 2 and their interactions, in order to show the full scope of work across both environmental engineering disciplines. Reporting for the environmental investigations is undertaken a phased way. The Evidence reports (pale blue box in the figure below, and this report) are produced first, that set out the data and evidence to be used in the assessment. The Assessment Reports which use the evidence to determine the potential effect of the STT scheme on the different topics, is produced later (dark blue box in the figure below). Together with other inputs, these reports feed into the production of the statutory reports and summary reports (yellow boxes).

1.1.3.2 Regulator engagement for Gate 2

In order to engage with regulators over the approach, evidence collection, monitoring programmes, and data analysis for Gate 2, the environmental assessment team have held monthly meetings with the EA, NRW and NE, in addition to topic-specific sessions and workshops with technical specialists. The regulators are asked to provide insights and inputs on specific aspects where needed in order to ensure the work undertaken is as robust as possible.

In the monthly meetings, the programme, progress and deliverables are reviewed; issues are raised for clarification and resolution, and the regulators are asked for their views and advice on different topics or issues.

¹ [United Utilities - Water Transfers – RAPID Gate 1 Submission](#)

² RAPID (2022) Strategic regional water resource solutions guidance for Gate 2

³ All Companies Working Group (2020) WRMP environmental assessment guidance and applicability with SROs

In the sessions with technical specialists, each of the proposed approaches to the topics and statutory reports have been set out and explained. Drafts of the methodology documents have been issued, plus other technical notes, to the regulators to solicit feedback on the proposed approaches. Feedback on the drafts have been used to inform the wider environmental assessment for Gate 2 and finalise the approach and reporting.

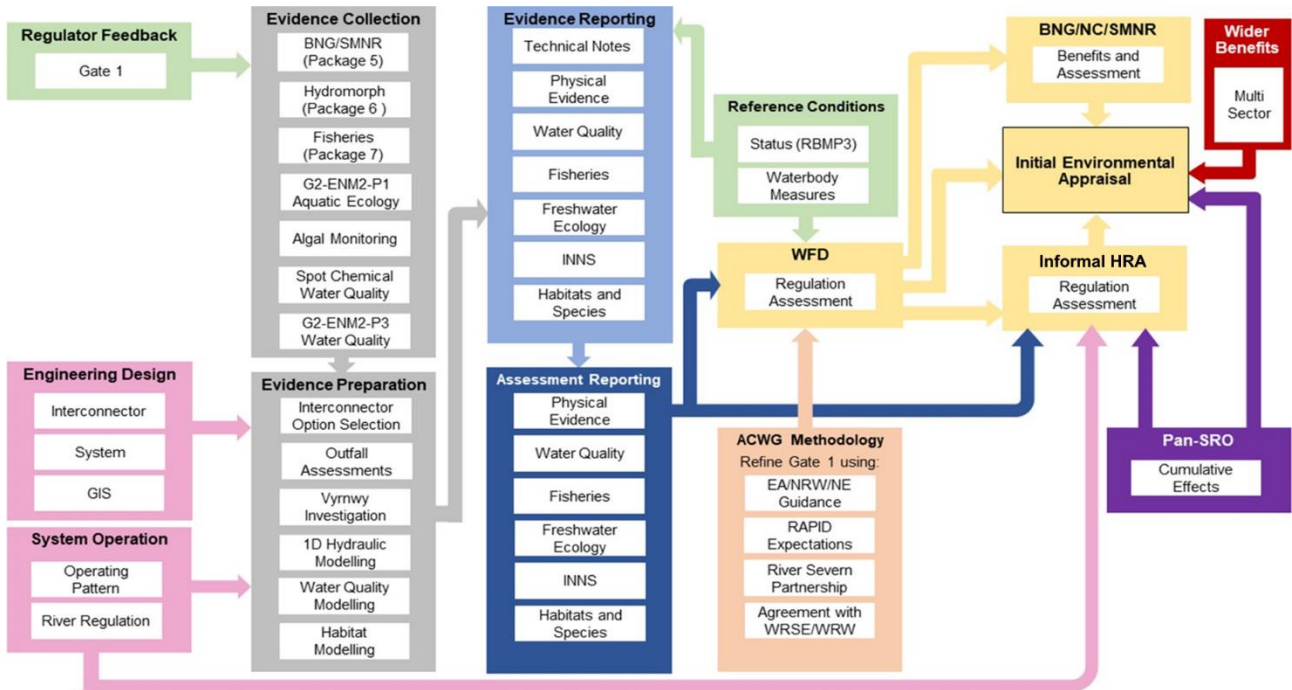


Figure 1.1 Flow chart showing the investigations undertaken for Gate 2 and their interactions

1.2 STUDY AREA

The study area for the Gate 2 assessment is limited to specific reaches, as shown in **Figure 1.2**:

1. The River Vyrnwy catchment (River Vyrnwy from Vyrnwy Reservoir to the confluence with the River Severn);
2. The River Severn catchment (River Severn from the confluence with the River Vyrnwy to the Severn Estuary), as well as those tributaries of the River Severn which could indirectly be affected by the operation of the STT solution;
3. The Warwickshire River Avon upstream of Warwick to the River Severn confluence; and
4. The River Thames catchment (River Thames from Culham to Teddington Weir).

It should be noted that the consideration of impacts in the River Tame and Trent, from the transfer of treated discharge from Minworth WwTW to the River Avon, is included in the ST Minworth Solution and therefore excluded from the STT scheme assessment.

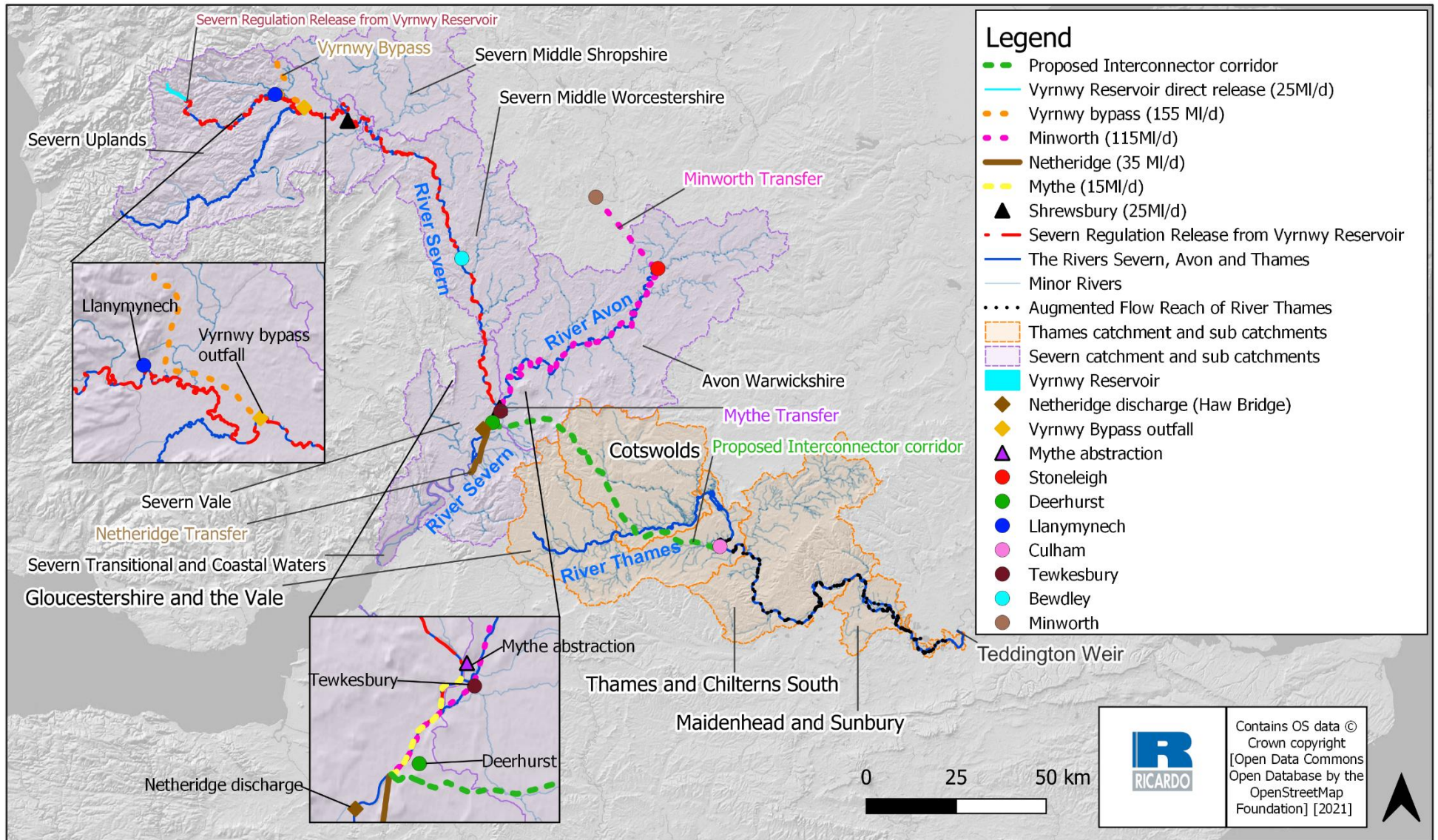


Figure 1.2 Map showing the proposed interconnector corridor

1.3 AIM OF THIS REPORT

The assessment of potential impacts on physical environment, as a result of the operation of the STT Solution, provides evidence to the assessment of water quality, aquatic ecological receptors, and the overarching assessment of environmental change as undertaken in the Water Framework Directive (WFD) Regulations compliance assessment, the informal Habitats Regulation Assessment (HRA, and the Initial Environmental Assessment (IEA). This report does not relate to drinking water quality, which is addressed separately, and is not part of the environmental assessment workstream.

This note provides the evidence and data catalogue that will be used to inform the baseline environmental water quality in the study area associated with the proposed STT Solution. Furthermore, this report identifies the remaining data and evidence gaps, and provides a summary of a proposed programme of work to address them as part of the RAPID's gated assessment process for the Solution.

2. EVIDENCE BASE FOR, AND APPROACH TO, THE GATE 2 ENVIRONMENTAL WATER QUALITY ASSESSMENT

Gate 1 of the STT Solution used several datasets and studies as the evidence base for the assessment of potential impacts on environmental water quality. The Gate 1 process also identified where additional data would be necessary to undertake the required assessments for Gate 2.

Further stakeholder consultation with the environmental regulators for England and Wales identified additional datasets and studies that would be required to improve the evidence base for the Gate 2 assessments.

This section:

1. Outlines the scope and approach to the environmental water quality assessment tasks that will be undertaken;
2. Summarises the additional data and evidence collection tasks that were completed for Gates 1 and 2 in respect of environmental water quality; and
3. Confirms the evidence base that will be used in the assessment of potential water quality impacts in Gate 2.

2.1 ADDITIONAL DATA COLLECTED DURING GATE 1 AND GATE 2

2.1.1 STT Water Quality surveys in the River Vyrnwy, River Severn and River Avon

At Gate 1, Thames Water commissioned the design of a pan-Solution water quality monitoring programme for the following Solution:

- STT;
- South East Strategic Reservoir Option (SESRO);
- Thames to Affinity Transfer (T2AT); and
- London Effluent Reuse.

The aim of the water quality monitoring programme is to compile a recent baseline dataset, in key reaches, to allow the characterisation of different study reaches in terms of WFD determinands, and Drinking Water Safety⁴. The monitoring programme was designed in consultation with partner water companies, including STT Group. In order to collect sufficient data, the monitoring programme includes both continuous monitoring (for dissolved oxygen and temperature), and monthly water quality spot sampling. Sonde installation and spot sampling commenced in December 2020 and has continued uninterrupted into Gate 2.

⁴ Note that this report does not pertain to drinking water quality risk assessment; this has been undertaken separately.

A recommendation of STT Group at Gate 1 was to undertake a literature review of olfactory cues and inhibitors for relevant migratory fish species using the Severn Estuary and River Severn. That review⁵ identified additional parameters for analysis and additional sites that have subsequently been incorporated into the monitoring programme.

The locations from water quality monitoring sondes are shown in **Table 2-1**, listed by the watercourses noted above and then ordered from upstream to downstream / landwards to seawards. Location maps for the Solution sonde locations presented in **Figures 2.1, 2.2, 2.3 and 2.4**.

The locations of spot sampling are shown in **Table 2-2**. The spot sampling analysis includes Thames Water’s pan-SRO water quality monitoring programme for the following analytical suites, as set out in Appendix 1:

- WFD suite: All chemicals listed in Schedule 3 of The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015;
- EQSD suite: All hazardous chemicals and elements listed by the EA as relevant to discharge permitting⁶; and
- Olfaction suite: A suite of potential fish olfaction inhibiting chemicals identified from literature review⁵.

It is noted, that the STT Group are keeping a watching brief on emerging substances to add to the monitoring programme, with a 6-month review period.

Table 2-1 Gate 2 Water Quality Evidence Base – Continuous Sonde Data

Data	Site Name	NGR	Parameter	Unit	Frequency	Range
Vyrnwy Reservoir						
STT Group	Vyrnwy Reservoir 3m depth	SJ0173819240	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	Vyrnwy Reservoir 6m depth	SJ0173819241	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	Vyrnwy Reservoir 9m depth	SJ0173819242	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
Freshwater River Vyrnwy						
STT Group	22 UU intake at Vyrnwy dam	SJ01955 19356	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2020-present
STT Group	23 River Vyrnwy downstream of Vyrnwy dam	SJ02121 19037	Temperature	°C	15-minute	2020-present
			Dissolved oxygen	mg/l	15-minute	2020-present
STT Group	STT-05 River Vyrnwy D/S River Banwy and U/S Meifod Valley	SJ1565112929	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	STT-05a River Vyrnwy U/S Llanymynech	SJ2537519608	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	STT-05b River Vyrnwy d/s Llanymynech	SJ2839319818	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	STT-6a River Vyrnwy U/S Confluence with River Severn	SJ3321916522	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	24 River Vyrnwy u/s Severn	SJ3322516495	Temperature	°C	15-minute	2020-present
			Dissolved oxygen	mg/l	15-minute	2020-present
Freshwater River Severn						
STT Group	25 River Severn (upper) downstream Option 4	SJ3454317148	Temperature	°C	15-minute	2020-present
			Dissolved oxygen	mg/l	15-minute	2020-present
STT Group	STT-06 River Severn d/s Confluence with River Vyrnwy	SJ3509917327	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	STT-River Severn d/s confluence with River Teme	SO8503551071	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	STT-10 River Severn at Deerhurst	SO8544628505	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	29 River Severn (lower) at Deerhurst	SO8446627793	Temperature	°C	15-minute	2020-present
			Dissolved oxygen	mg/l	15-minute	2020-present

⁵ Ricardo Energy & Environment (2021). Technical Note: Severn Thames Transfer SRO – Impact of determinands on olfaction and fish populations in the Severn Estuary. Report for United Utilities on behalf of the Severn Thames Transfer Programme. 01 December 2021.

⁶ <https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit>

Data	Site Name	NGR	Parameter	Unit	Frequency	Range
Freshwater River Avon						
STT Group	26 River Avon upstream Warwick	SP3226072275	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	27 River Avon d/s Warwick	SP26701 60954	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	STT-08 River Avon d/s Warwick	SP2687260974	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	STT-08a River Avon d/s Evesham	SP0332843105	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	STT-08b River Avon at Twyning (U/S confluence with Severn)	SO9172337063	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present

Severn Estuary

STT Group	31 Severn Estuary downstream Gloucester	SO80884 16390	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present

Wastewater Treatment Works

STT Group	28 ST Minworth STW Final Effluent	SP1716091942	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
STT Group	30 ST Netheridge STW Final Effluent	SO8096115947	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present

Freshwater River Thames

Thames Water	1 River Thames at discharge / intake location (Culham)	SU5016894387	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
Thames Water	38 River Thames at Mapledurham	SU6674776885	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
Thames Water	2 River Thames at Hambleden lock	SU7813785243	Temperature	°C	15-minute	2020-present
			Dissolved oxygen	mg/l	15-minute	2020-present
Thames Water	3 River Thames at Cookham Bridge	SU8978085651	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
Thames Water	4 River Thames at AfW Sunnymeads intake	SU9992575754	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
Thames Water	5b River Thames at Bell Lock	TQ0177272050	Temperature	°C	15-minute	2020-present
			Dissolved oxygen	mg/l	15-minute	2020-present
Thames Water	6 River Thames at AfW Chertsey intake	TQ0497167865	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
Thames Water	7 River Thames at AfW Walton intake	TQ0878166316	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
Thames Water	8 River Thames at Walton	TQ1144868782	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
Thames Water	9 River Thames at Hampton	TQ1337869216	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
Thames Water	10 River Thames at Surbiton	TQ1710367342	Temperature	°C	15-minute	2021-present
			Dissolved oxygen	mg/l	15-minute	2021-present
Thames Water	11b River Thames at Teddington Weir	TQ1702071370	Temperature	°C	15-minute	2017-2018 2020-present
			Dissolved oxygen	mg/l	15-minute	2017-2018 2020-present

Table 2-2 Gate 2 Water Quality Evidence Base – Spot Sampling Data

Data	Site Name	NGR	Parameter	Frequency	Range
Freshwater River Vyrnwy					
STT Group	22 UU intake at Vyrnwy dam	SJ 01955 19356	WFD suite (App 1)	Monthly	2020-present
STT Group	23 River Vyrnwy downstream of Vyrnwy dam	SJ 02121 19037	WFD suite (App 1)	Monthly	2020-present
STT Group	39 River Vyrnwy Meifod Valley	SJ 19590 15638	WFD suite (App 1)	Monthly	2021-present

Data	Site Name	NGR	Parameter	Frequency	Range
STT Group	40 River Vyrnwy downstream Llanymynech	SJ 27917 19884	WFD suite (App 1)	Monthly	2021-present
STT Group	24 River Vyrnwy	SJ 33225 16495	WFD suite (App 1)	Monthly	2020-present

Freshwater River Severn

STT Group	25 River Severn (upper) downstream Option 4	SJ 34543 17148	WFD suite (App 1)	Monthly	2020-present
STT Group	STT-Mythe River Severn at Mythe U/S confluence with River Avon	SO8885433808	Olfaction suite (App 1)	Monthly	2022-present
STT Group	29 River Severn (lower) at Deerhurst	SO 84466 27793	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
			Olfaction suite (App 1)	Monthly	2022-present

Freshwater River Avon

STT Group	26 River Avon upstream Warwick	SP 32260 72275	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
STT Group	27 River Avon downstream Warwick	SP 26701 60954	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
			Olfaction suite (App 1)	Monthly	2022-present
STT Group	41 River Avon downstream Evesham	SP 03328 43105	WFD suite (App 1)	Monthly	2021-present
			EQSD suite (App 1)	Monthly	2021-present
STT Group	42 River Avon at Twyning (u/s River Severn)	SO 90465 36525	WFD suite (App 1)	Monthly	2021-present
			EQSD suite (App 1)	Monthly	2021-present
			Olfaction suite (App 1)	Monthly	2022-present
STT Group	31 Severn Estuary downstream Gloucester	SO 80884 16390	Olfaction suite (App 1)	Monthly	2022-present

Wastewater Treatment Works

STT Group	28 ST Minworth STW Final Effluent	SP 17160 91942	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
			Olfaction suite (App 1)	Monthly	2022-present
STT Group	30 ST Netheridge STW Final Effluent	SO 80961 15947	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
			Olfaction suite (App 1)	Monthly	2022-present

Freshwater River Thames

Thames Water	1 River Thames at discharge / intake location (Culham)	SU 50168 94387	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
			Olfaction suite (App 1)	Monthly	2021-present
Thames Water	38 River Thames at Mapledurham	SU 66747 76885	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
Thames Water	2 River Thames at Hambleden lock	SU 78137 85243	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
Thames Water	3 River Thames at Cookham Bridge	SU 89780 85651	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
Thames Water	4 River Thames at AfW Sunnymeads intake	SU 99925 75754	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
Thames Water	5 River Thames at AfW Egham intake	TQ 01772 72050	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
Thames Water	6 River Thames at AfW Chertsey intake	TQ 04971 67865	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
Thames Water	7 River Thames at AfW Walton intake	TQ 08781 66316	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
Thames Water	8 River Thames at Walton	TQ 11448 68782	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
			Olfaction suite (App 1)	Monthly	2021-present
Thames Water	9 River Thames at Hampton	TQ 13378 69216	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
Thames Water	10 River Thames at Surbiton	TQ 17103 67342	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
Thames Water	11 River Thames at Teddington Weir	TQ 17020 71370	WFD suite (App 1)	Monthly	2020-present
			EQSD suite (App 1)	Monthly	2020-present
			Olfaction suite (App 1)	Monthly	2021-present

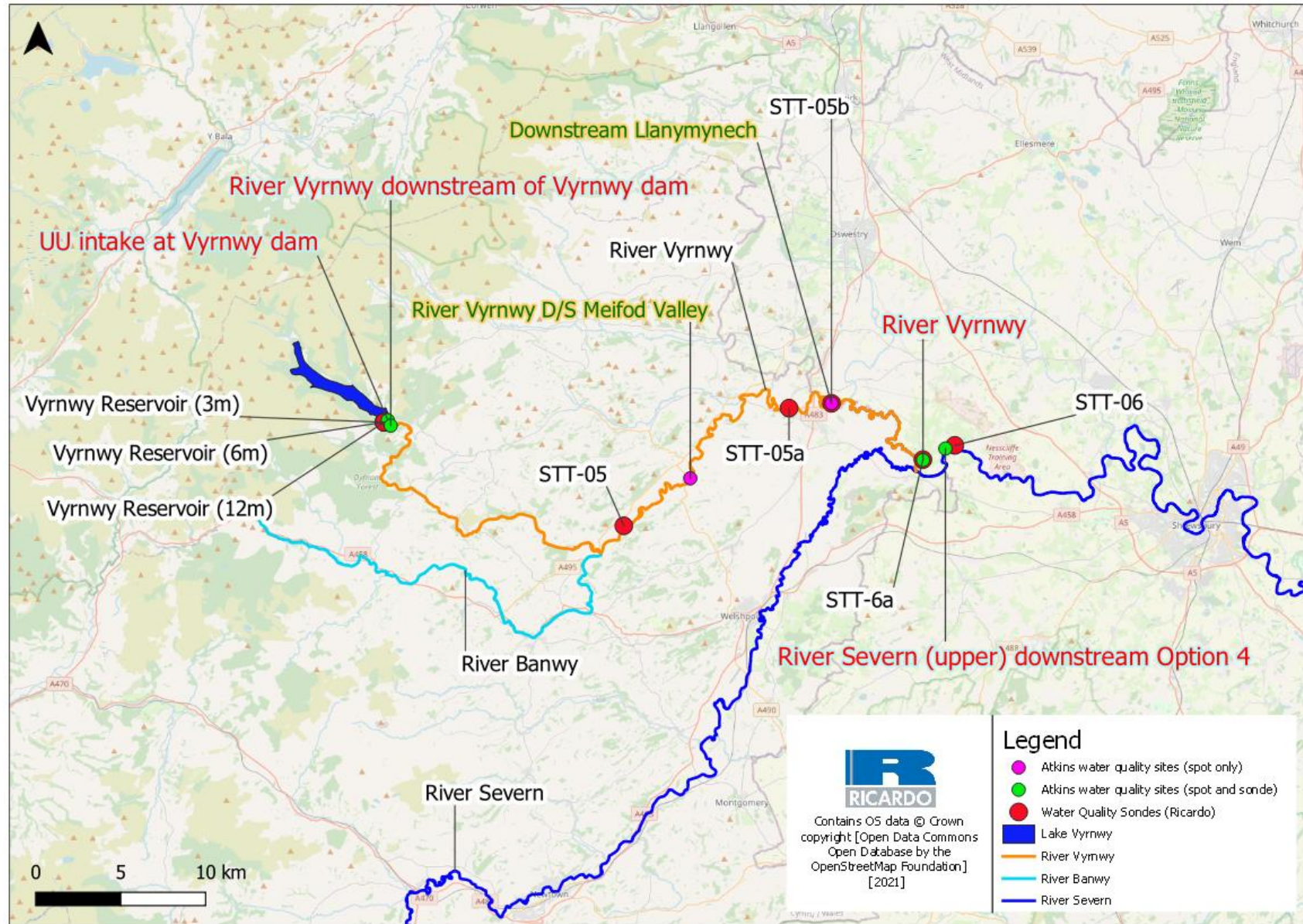


Figure 2.1: Site locations of the water quality sondes on the River Vyrnwy and River Severn from source until downstream of Shrewsbury

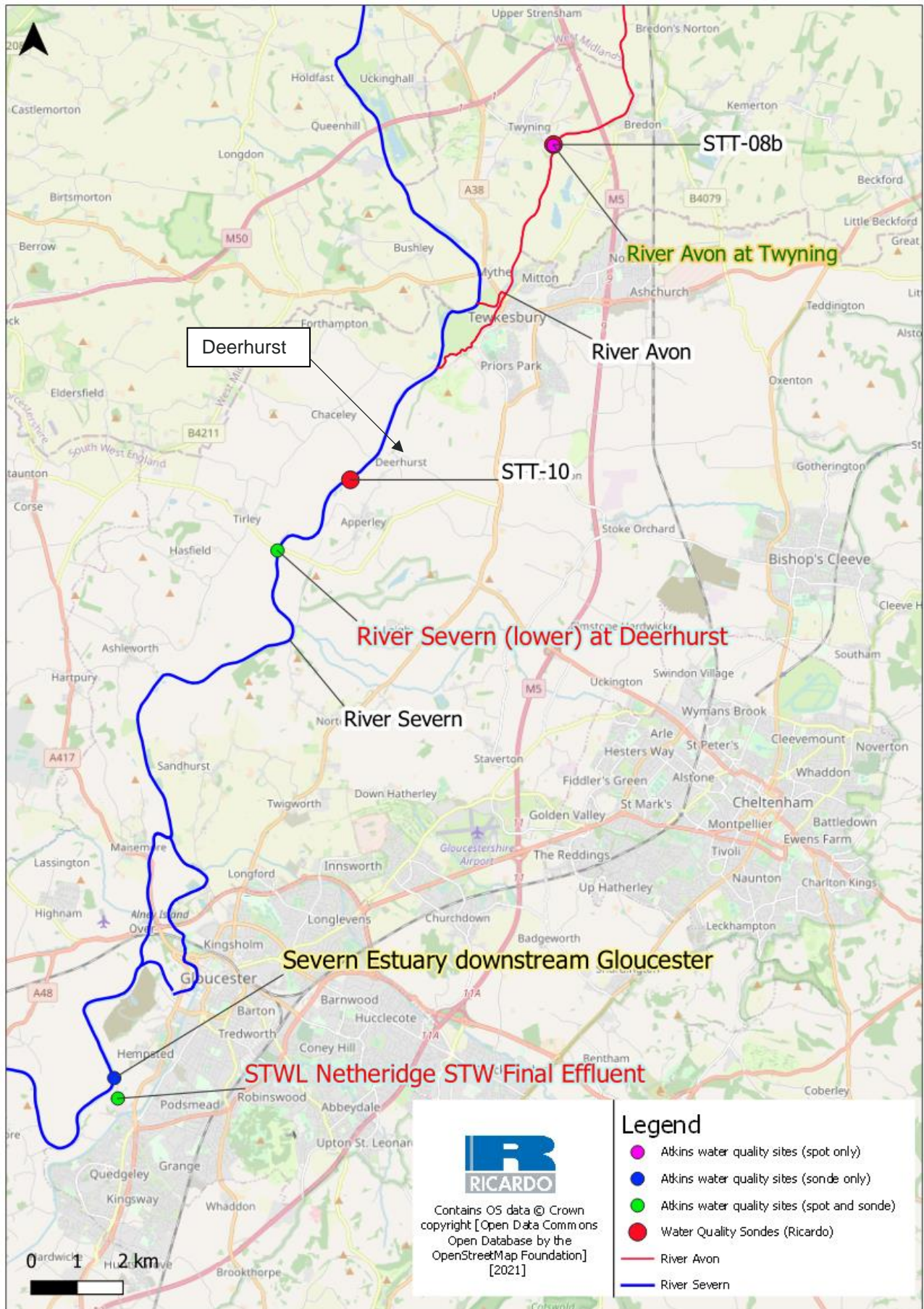


Figure 2.2: Site locations of water quality sondes on the River Sever downstream of the confluence with the River Avon



Figure 2.3: Site locations of the water quality sondes on the River Avon and River Severn upstream of the confluence with the River Avon

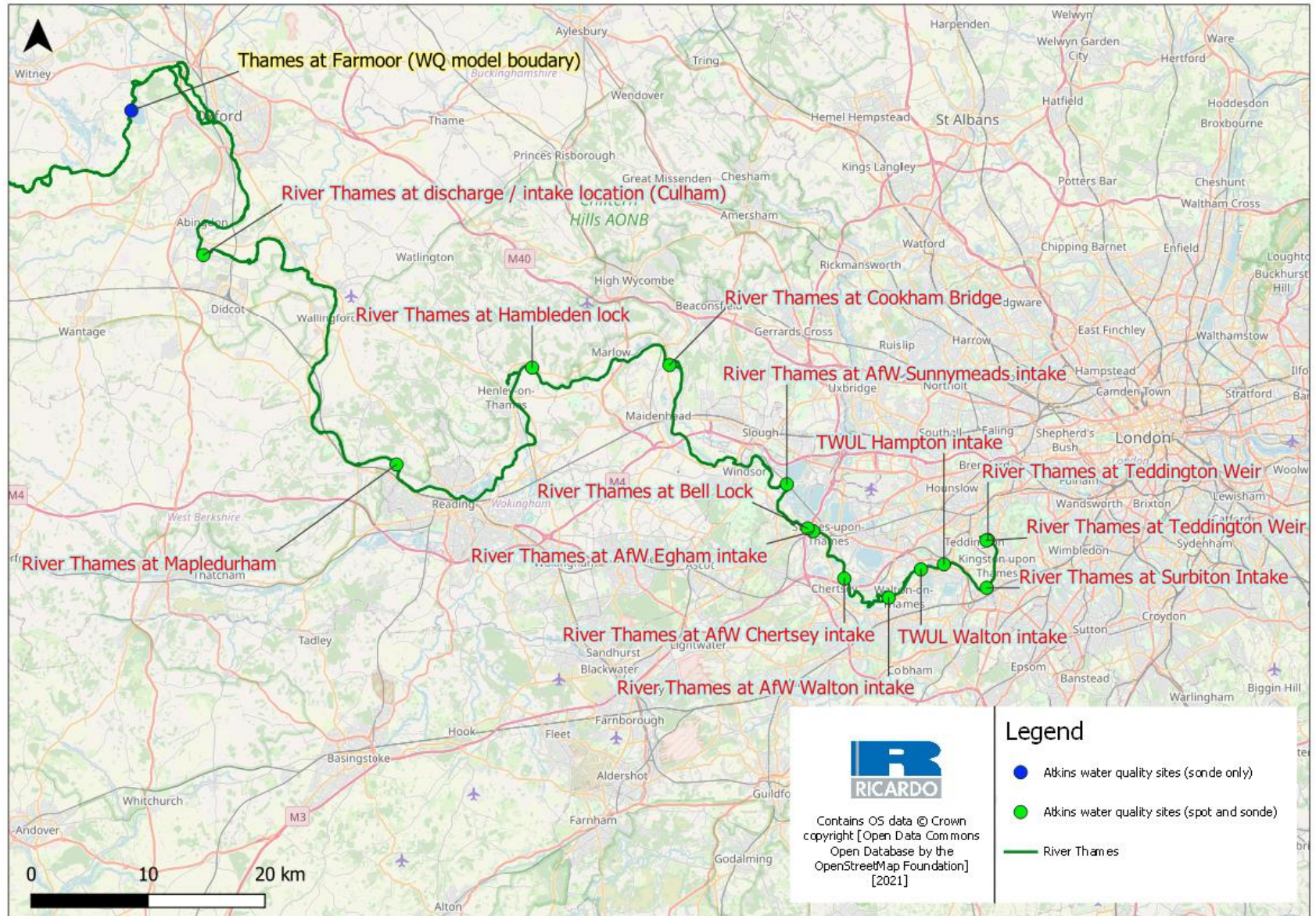


Figure 2.4: Site location of the water quality sondes on the River Thames

2.2 SCOPE AND APPROACH TO GATE 2 ASSESSMENT AND EVIDENCE BASE

The scope of the assessment of environmental water quality required for Gate 2 and the approach to undertaking the assessment is described in **Table 2.1**. This table also includes a summary of the evidence base that will be used to inform the environmental water quality elements that require assessment, in terms of how they may be altered as a result of the operation of the STT Solution.

Table 2.3 Evidence and approach to the Gate 2 environmental water quality assessment

Task item	Scope of assessment	Approach to assessment	Evidence Base for Task
a. General physico-chemical change	<ul style="list-style-type: none"> Assessment of modelled WFD water quality parameters throughout the study area for the range of reference conditions and scenarios with STT Solution 	<ul style="list-style-type: none"> Interrogate 1D river modelling outputs for freshwater River Avon, River Severn from River Avon to estuarine interface, River Thames study reaches Empirical modelling of water temperature and potential associated effects on dissolved oxygen saturation variation in River Vyrnwy 	<ul style="list-style-type: none"> EA Meteor sonde data (water temperature, dissolved oxygen) Spot sample data from pan-SRO WFD suite (pH, total ammonia, soluble reactive phosphate, total oxidised nitrogen)
b. WFD chemicals	<ul style="list-style-type: none"> Assessment of WFD and Environmental Quality Standards Directive (EQSD) chemical quality for the range of reference conditions and scenarios with STT Solution for study areas: <ul style="list-style-type: none"> From Minworth transfer outfall along flow pathway of the River Avon and River Severn to the estuarine interface; From Netheridge transfer outfall along flow pathway of the River Severn to the estuarine interface; From pipeline interconnector outfall along flow pathway of the freshwater River Thames 	<ul style="list-style-type: none"> Interrogate conservative tracer results from 1D river modelling fluvial models to inform dilution and zone of influence of discharged water 	<ul style="list-style-type: none"> Spot sample data from pan-SRO WFD and EQSD suites
c. Olfactory water quality assessment	<ul style="list-style-type: none"> Assessment of specific olfactory cues and inhibitors for the range of reference conditions and scenarios with reuse option for study areas: <ul style="list-style-type: none"> From Minworth transfer outfall along flow pathway of the River Avon and River Severn to the estuarine interface 	<ul style="list-style-type: none"> Interrogate conservative tracer results from 1D river modelling fluvial model for River Avon and downstream River Severn freshwater study reaches to inform concentrations of olfactory cues and inhibitors in freshwater reaches and concentration and load change at Severn Estuary interface 	<ul style="list-style-type: none"> Spot sample data from pan-SRO olfaction analytical suite

2.3 WATER QUALITY MODELS: DEVELOPMENT DATA

The environmental water quality assessment of the STT Solution for Gate 2 is reliant on outputs from the hydraulic and water quality modelling undertaken to assess the scheme. This 1D hydraulic and water quality model has been prepared by Ricardo and HR Wallingford for the River Avon and River Severn reaches of the study area. A 1D hydraulic and water quality model has been prepared by Atkins for the River Thames reach of the study area. These models have been developed in Gate 2 in consultation with environmental regulators and have been subject to calibration and validation procedures which will be documented in separate reports.

In addition to the channel hydraulics and flow data for the 1D hydraulic model build described in the Physical Environment Evidence Report, extensive water quality data for river water quality and permitted discharges

have been sourced from the environmental regulators and relevant water companies for the purposes of model build, calibration, and validation. These are documented in the model build, calibration and validation reports.

2.4 HYDRAULIC MODELS: SCENARIO PARAMETERISATION

The in-river environmental modelling assessments have explored a range of different scenarios representing (a) appropriate reference conditions without STT, and (b) with the inclusion of the Gate 2 STT scheme components based on an understanding of the likely operational pattern. The scenarios, reference conditions and purpose of the modelling work is summarised in **Table 2-4**.

The water quality model output, available throughout the modelled reaches, includes location-specific daily values for water temperature, dissolved oxygen concentration, biochemical oxygen demand, total ammonia, nitrite, nitrate (addable as dissolved available inorganic nitrogen), soluble reactive phosphate and suspended solids. The River Avon / Severn water quality model also includes a conservative tracer for the Minworth discharge transfer, to represent the likely dilution of discharge and which can be attributed to any of the chemicals not directly modelled. The River Thames water quality model also includes a conservative tracer for the pipeline interconnector transfer, to represent the likely dilution of discharge which can be attributed to any of the chemicals not directly modelled.

Model output locations are throughout the study area of the River Avon and continuation River Severn, River Thames and River Severn water quality contribution to the Severn Estuary. A list of the files containing model outputs and charts is presented in the supporting Excel workbook called “*STT_Physical Environment_Workbook*”.

Table 2-4 Scenarios considered for the Gate 2 assessments

Note: all scenarios modelled as a pair: without STT operation (reference condition) and separately with the STT operation for 365 day period.

Scenario		Flow (baseline without Solution)	Water quality (baseline without Solution)	Purpose
1	Moderate-low flow (1:5-1:10 return period)	Represents current meteorological patterns, current demands and abstractions, current sewage returns and representative Severn Regulation pattern (to be determined using the agreed water resources modelling conditions)	Based on the last 5 years measured data and also AMP7 sewage improvements	Central to Gate 2 environmental assessments, WFD etc
2	Very low flow (1:20 return period)			Central to Gate 2 environmental assessments, WFD etc
3	Extremely low flow (1:50-1:100 return period)			Assists understanding of resilience
4	Future (2070s) version of “very low flow”	Represents a selected version of 2070s meteorological patterns, abstraction reductions in line with Environmental Destination; future forecast sewage returns and representative Severn Regulation pattern	As Scenario 2	Assists understanding of resilience
5	Future (2070s) version of “extremely low flow”			As Scenario 3
6	Natural version of “Moderate-low flow”	Represents current meteorological patterns, without abstractions or discharges	As Scenario 1	Assists discussions of environmental significance with regulators

The hydraulic/water quality models scenarios are parameterised using representations of the discharge quality as provided by the Solution project engineers. For the Minworth transfer, the post-SRO treatment discharge water quality into the River Avon near Warwick has been provided by the Minworth Solution project engineers, Jacobs. For the Netheridge transfer, the post-SRO treatment discharge water quality into the River Severn near Deerhurst has been provided by the Sever Trent Sources Solution project engineers, WSP. For the pipeline interconnector transfer, the post-SRO treatment discharge water quality into the River Thames at Culham has been provided by the STT Solution interconnector engineers, Mott MacDonald.

3. CONCLUSIONS

3.1 ENVIRONMENTAL WATER QUALITY

3.1.1 Summary of baseline data, uncertainty and data gaps

The potential impacts of the STT Solution should be considered in the context of the current environmental water quality and how that may alter with changes in flows and dilution in the future. Outputs from the linked 1D hydraulic / water quality models, developed for use in Gate 2 and which cover the zone of influence of transfer discharges, provide a robust evidence base appropriate for Gate 2.

At the time of preparing the Gate 2 assessments, the pan-SRO water quality monitoring programme at most sites have yielded 16 samples and over a full 12 month period. This is considered a good platform from which to understand chemical risk from the flow augmentation sources, and to design appropriate treatment processes to the level required for Gate 2.

However, it is recognised that to capture a fuller pattern of water quality risk at time of permit application⁷, further evidence will be required, and this is recommended as the Environment Agency's permitting guidance states that 36 samples are preferred. It is recognised that STT Solution is not applying for discharge permits at Gate 2 and there remains time within the Gated process to collect further water quality data to inform treatment process design and permitting.

The environmental water quality monitoring programme will continue for the remainder of Gate 2, at its current monthly sampling interval, analysing for WFD and EQSD suites at all sites relevant to permitting (i.e. Minworth STW / River Avon near Warwick; Netheridge STW / River Severn at Deerhurst; and the River Severn at Deerhurst / River Thames at Culham). The environmental water quality monitoring programme will also continue in Gate 2 to analyse for olfactory inhibitors at the recommended sites. A watching brief is being undertaken for emerging substances, with a 6-month review period. The assessment of the Gate 2 monitoring and modelling work will inform the Gate 3 approach, including emerging substances and will be discussed with the regulators as part of the planning approach for Gate 3.

⁷ NB Latest WRSE projections are STT Solution not operational within the next 10 years.

APPENDIX: SUMMARY OF ANALYSIS SUITES AND PARAMETERS

1 WFD ANALYSIS SUITE

Group	Parameter	Unit	WFD EQS ²²	LOD ²³	RPS accreditation
General physico-chemical parameters	Acid neutralising capacity	mg/l	N/A	5	UKAS (sub)
	Dissolved oxygen	mg/l	75	0.1	YSI handheld
	Temperature	oC	23	-	YSI handheld
	Reactive phosphorus	mg/l	Site specific	0.01	UKAS (sub) UKWIR Validated
	Total phosphorus	mg/l		0.01	UKAS (sub) UKWIR Validated
	Salinity (Conductivity)	uS/cm		1	UKAS (sub)
	Ammonia (as N)	mg/l	0.3	0.1	UKAS (sub) UKWIR Validated
	Nitrate (as NO ₃)	mg/l		0.1	UKAS (sub) UKWIR Validated
	Nitrite (as NO ₂)	mg/l		0.1	UKAS (sub) UKWIR Validated
	Total nitrogen (oxidised as N)	mg/l		5	UKAS (sub) UKWIR Validated
	Organic nitrogen	mg/l		calc	Commercial calculation using NO ₂ and NO ₃
	pH	pH	6 to 9	0.1 pH unit	in house
	Alkalinity as CaCO ₃	mg/l	N/A	5	UKAS (sub)
	Hardness as CaCO ₃	mg/l	N/A	0.1	UKAS (sub)
	Dissolved organic carbon	mg/l	N/A	0.5	UKAS (sub) UKWIR Validated
	Total organic carbon	mg/l	N/A	0.5	UKAS (sub) UKWIR Validated
	BOD 5	mg/l	4	1	UKAS (sub) UKWIR Validated
	Specific pollutants	Arsenic dissolved	ug/l	50	0.16
Arsenic total		ug/l		0.16	UKAS (sub) UKWIR Validated
Benzyl butyl phthalate		ug/l	7.5	0.2	in house
Carbendazim		ug/l	0.15	0.1	in house
Chlorine (ORP)		ug/l	2	0.1	in house
Chlorothalonil		ug/l	0.035	0.035	in house
Chromium(III) dissolved		ug/l	4.7	0.25	UKAS (sub) UKWIR Validated
Chromium(VI) dissolved		ug/l	3.4	3.4	UKAS (sub)
Chromium(III) Total		ug/l		0.25	UKAS (sub) UKWIR Validated
Chromium(VI) Total		ug/l		3.4	UKAS (sub)
Copper dissolved		ug/l	1	0.4	UKAS (sub) UKWIR Validated
Copper total		ug/l		0.4	UKAS (sub) UKWIR Validated
Cyanide Total		ug/l	1	40	UKAS (sub)
Cypermethrin		ug/l	0.0001	0.000001	UKAS and UKWIR validated

²² These are not the WFD EQS proposed for assessment, but the EQS displayed are used to compare laboratory LOD against. It is noted that some WFD EQS are different for different river types e.g. upland, lowland, salmonid, cyprinid. Each SRO assessment will use different EQS depending on the local context. Most Specific Pollutants and Priority Substances have both an Annual Average (AA) and a Maximum Allowable Concentration (MAC) EQS. Where this applies, the lowest EQS (more often than not the AA-EQS) has been shown.

²³ Red numbers indicate where LOD>EQS

Group	Parameter	Unit	WFD EQS ²²	LOD ²³	RPS accreditation	
	Diazinon	ug/l	0.01	0.01	in house	
	2, 4 Dichlorophenol	ug/l	4.2	0.02	in house	
	2, 4 Dichlorophenoxyacetic acid (2, 4 D)	ug/l	0.3	0.02	UKAS	
	3, 4 Dichloroaniline	ug/l	0.2	1	in house	
	Dimethoate	ug/l	0.48	0.02	in house	
	Glyphosate	ug/l	196	0.1	UKAS (sub) UKWIR Validated	
	Iron dissolved	ug/l		5.5	UKAS (sub) UKWIR Validated	
	Iron total	ug/l	1000	5.5	UKAS (sub) UKWIR Validated	
	Linuron	ug/l	0.5	0.01	in house	
	Manganese dissolved	ug/l	123	0.22	UKAS (sub) UKWIR Validated	
	Manganese total	ug/l		10	UKAS (sub) UKWIR Validated	
	Mecoprop	ug/l	18	0.02	UKAS	
	Methiocarb	ug/l	0.01	0	in house	
	Pendimethalin	ug/l	0.3	0.02	in house	
	Permethrin	ug/l	0.001	0.001	in house	
	Phenol	ug/l	7.7	1	UKWIR Validated	
	Tetrachloroethane	ug/l	140	0.1	in house	
	Triclosan	ug/l	0.1	0.01	UKAS (sub) UKWIR Validated	
	Toluene	ug/l	74	0.1	in house	
	Zinc dissolved	ug/l	10.9	0.5	UKAS (sub) UKWIR Validated	
	Zinc Total	ug/l		0.5	UKAS (sub) UKWIR Validated	
	Priority substances	Alachor	ug/l	0.3	0.02	in house
		Anthracene	ug/l	0.1	0.02	in house
Atrazine		ug/l	0.6	0.02	in house	
Benzene		ug/l	10	0.1	in house	
Brominated diphenylethers		ug/l	0.14	0.0005	UKWIR Validated	
Cadmium dissolved		ug/l		0.02	UKAS (sub) UKWIR Validated	
Cadmium total		ug/l		0.02	UKAS (sub) UKWIR Validated	
Carbon-tetrachloride		ug/l	12	1	in house	
C10-13 Chloroalkanes (total)		ug/l	0.4	0.4	UKWIR Validated	
Chlorfenvinphos		ug/l	0.1	0.02	in house	
Chlorpyrifos (Chlorpyrifosethyl)		ug/l	0.03	0.02	in house	
Aldrin		ug/l	0.01	0.02	in house	
Dieldrin		ug/l		0.02	in house	
Endrin		ug/l		0.02	in house	
Isodrin		ug/l		0.02	in house	
DDT total		ug/l	0.025	0.025	in house	
1,1,1-trichloro-2,2 bis (p-chlorophenyl) ethane		ug/l		0.02	in house	
1,1,1-trichloro-2 (ochlorophenyl)-2-(p-chlorophenyl) ethane		ug/l		0.02	in house	
1,1-dichloro-2,2 bis (p-chlorophenyl) ethylene		ug/l		0.02	in house	

Group	Parameter	Unit	WFD EQS ²²	LOD ²³	RPS accreditation
	1,1-dichloro-2,2 bis (p-chlorophenyl) ethane	ug/l		0.02	in house
	para-para-DDT	ug/l	0.01	0.01	in house
	1,2-Dichloroethane	ug/l	10	1	in house
	Dichloromethane	ug/l	20	1	in house
	Di(2-ethylhexyl)-phthalate (DEHP)	ug/l	1.3	0.15	UKWIR Validated
	Diuron	ug/l	0.2	0.05	UKWIR Validated
	Endosulfan	ug/l	0.005	0.02	in house
	Fluoranthene	ug/l	0.0063	0.0009	UKWIR Validated
	Hexachloro-benzene	ug/l	0.05	0.02	in house
	Hexachloro-butadiene	ug/l	0.6	0.02	in house
	Hexachloro-cyclohexane	ug/l	0.02	0.02	in house
	Isoproturon	ug/l	0.3	0.002	in house
	Lead dissolved	ug/l	1.2	0.09	UKAS (sub) UKWIR Validated
	Lead total	ug/l	1.2	0.09	UKAS (sub) UKWIR Validated
	Mercury dissolved	ug/l	0.07	0.001	UKAS (sub) UKWIR Validated
	Mercury total	ug/l	0.07	0.001	UKAS (sub) UKWIR Validated
	Naphthalene	ug/l	2	0.02	in house
	Nickel dissolved	ug/l	4	0.5	UKAS (sub) UKWIR Validated
	Nickel total	ug/l	4	0.5	UKAS (sub) UKWIR Validated
	Nonylphenols. (4-Nonylphenol)	ug/l	0.3	0.04	UKWIR Validated submitted to UKAS
	Octylphenols ((4-(1,1', 3,3'-tetramethylbutyl)-phenol))	ug/l	0.1	0.01	UKWIR Validated
	Pentachloro-benzene	ug/l	0.007	0.007	in house
	Pentachloro-phenol	ug/l	0.4	0.02	UKAS
	PAH ²⁴ : Benzo(a)pyrene	ug/l	0.00017	0.00017	UKWIR Validated
	PAH: Benzo(b)fluoranthene	ug/l	-	0.0001	UKWIR Validated
	PAH: Benzo(k)fluoranthene	ug/l	-	0.0001	UKWIR Validated
	PAH: Benzo(g,h,i)-perylene	ug/l	-	0.0003	UKWIR Validated
	PAH: Indeno(1,2,3-cd)-pyrene	ug/l	-	0.0003	UKWIR Validated
	Simazine	ug/l	1	0.02	in house
	Tetrachloroethylene	ug/l	10	1	in house
	Trichloroethylene	ug/l	10	1	in house
	Tributyltin compounds	ug/l	0.0002	0.00002 as cation	UKAS and UKWIR validated
	Trichlorobenzenes	ug/l		0.4	in house
	Trichloromethane	ug/l	0.4	1	in house
	Trifluralin	ug/l	2.5	0.02	in house

Group	Parameter	Unit	WFD EQS ²²	LOD ²³	RPS accreditation
	Dicofol	ug/l	0.03	0.0013	in house
	Perfluorooctane sulfonic acid and its derivatives (PFOS)	ug/l	0.0013	0.0002	UKAS and UKWIR validated
	Quinoxifen	ug/l	0.00065	0.1	in house
	Dioxins and dioxin-like compounds	pg/l	0.15	1	NOT proposed due to elevated LOD.
	Aclonifen	ug/l		0.1	in house
	Bifenox	ug/l	0.12	0.012	in house
	Cybutryne	ug/l	0.012	0.0025	in house
	Cypermethrin	ug/l	0.0025	0.000001	UKAS and UKWIR validated
	Dichlorvos	ug/l	0.00008	0.001	in house
	Hexabromocyclododecane (HBCDD)	ug/l	0.0006	0.00014 total and 0.00004 individual isomers	UKAS and UKWIR validated
	Heptachlor and heptachlor epoxide	ug/l	0.0016	0.001	in house
	Terbutryn	ug/l	0.0000002	0.02	in house

2 ADDITIONAL HAZARDOUS CHEMICALS AND ELEMENTS RELEVANT TO DISCHARGE PERMITTING NOT LISTED IN THE WFD SUITE ABOVE

Group	Specific substance	Limit of detection
Acid herbicides	Bentazone	0.02 ug/l
	Bromoxynil	0.02 ug/l
	loxynil	0.02 ug/l
	MCPA	0.02ug/l
	Propyzamide	0.01 ug/l
BTEX	Xylene	1.0 ug/l
DTCs	Mancozeb	0.1 ug/l
	Maneb	0.1 ug/l
Mectins	Abamectin	5 ug/l
	Doramectin	5 ug/l
	Ivermectin	5 ug/l
Metals	Boron	12 ug/l
	Cobalt - dissolved	0.16 ug/l
	Silver - dissolved	1.0 ug/l
	Tin (inorganic) - total	0.4 ug/l
	Vanadium	10 ug/l
Mitins	Flucofuron	0.05 ug/l
	Sulcofuron	0.05 ug/l
OCL insecticides	Tecnazene - total	0.02 ug/l
	Triallate	0.02 ug/l
Organophosphate pesticides	Azinphos-methyl - dissolved	Not specified
	Coumaphos	0.02 ug/l
	Demetons	0.02 ug/l
	Dichlorvos	0.001 ug/l
	Fenclorphos	0.02 ug/l
	Fenitrothion	0.01 ug/l
	Malathion	0.02 ug/l
	Mevinphos	0.02 ug/l
	Omethoate	0.01 ug/l
	Pirimiphos-methyl	0.01 ug/l
	Propetamphos	0.02 ug/l
	Tributyl phosphate	0.02 ug/l
Phenols	2-chlorophenol	0.02 ug/l
	3-chlorophenol 4-chlorophenol	0.02 ug/l
	4-chloro-3-methylphenol	0.02 ug/l
Phthalates	Dibutyl phthalate	0.02 ug/l

Group	Specific substance	Limit of detection
	Diethyl phthalate	0.02 ug/l
	Dimethyl phthalate	0.02 ug/l
	Diocetyl phthalate	0.02 ug/l
Pyrethroid insecticide	Cyfluthrin	0.1 ug/l
THMs	1,1,1-trichloroethane	1 ug/l
	1,1,2-trichloroethane	1 ug/l
Uron herbicide	Diflubenzuron	0.001 ug/l
VOCs	Dichlorobenzene - total dichlorobenzene isomers	0.1 ug/l
	Styrene	0.1 ug/l
	Biphenyl	0.02 ug/l
	Bromine - total residual oxidant	50 ug/l
	Chloride	100 ug/l
	Chloronitro toluenes	0.02 ug/l
	Chlorotoluron	0.05 ug/l
	EDTA	100 ug/l
	Fluoride - dissolved	10 ug/l
	Formaldehyde	50 ug/l
	Hydrogen sulphide	10 ug/l
Other	Malachite green	1.0 ug/l
	Nitritotriacetic acid (NTA)	100 ug/l
	PCSDs	0.2 ug/l
	Pirimicarb	1.0 ug/l
	Prochloraz	0.1 ug/l
	Sulphate	100 ug/l
	Thiabendazole	0.1 ug/l
	Total anions	N/A
	Total suspended solids	5 mg/l
	Triazaphos	0.02 ug/l
	Triphenyltin and derivatives	0.002 ug/l

3 OLFACTION INHIBITING CHEMICALS IDENTIFIED FROM LITERATURE REVIEW

Group	Specific substance	Limit of detection
pH	pH	N/A
	Aluminium (dissolved and total)	10 ug/l
	Cadmium (dissolved and total)	0.02 ug/l
	Chromium(III) (dissolved)	1 ug/l
	Chromium(VI) (dissolved)	7 ug/l
	Chromium (total)	0.25 ug/l
	Cobalt (dissolved and total)	0.16ug/l
Metals	Copper (dissolved and total)	0.4 ug/l
	Iron (dissolved and total)	5.5 ug/l
	Mercury (dissolved and total)	0.001 ug/l
	Nickel (dissolved and total)	0.5 ug/l
	Selenium (dissolved and total)	0.25 ug/l
	Silver (dissolved and total)	1.0 ug/l
	Zinc (dissolved and total)	0.5 ug/l
	Methiocarb	0.1 ug/l
Carbamate pesticides	Oxamyl	0.05 ug/l
	Pirimicarb	0.1 ug/l
	Carbophenothion	0.02 ug/l
Organophosphate pesticides	Chlorpyrifos	0.02 ug/l
	Diazinon	0.01 ug/l
	Dichlorvos	0.01 ug/l
	Fenitrothion	0.01 ug/l
	Malathion	0.02 ug/l
	Parathion	0.02 ug/l
	Chlorotoluron	0.05 ug/l
	Diuron	0.05 ug/l
Phenylurea pesticides	Fluocofuron	0.05 ug/l
	Isoproturon	0.002 ug/l
	Linuron	0.01 ug/l
	Monuron	0.05 ug/l
	Sulcofuron	0.05 ug/l
Pyrethroid pesticides	Cyfluthrin	0.1 ug/l
	Cypermethrin	0.001 ug/l
	Permethrin	0.00008 ug/l
	C10-C14 alkyl benzene sulphonic acids	100 ug/l (sum)
Alkylbenzene-sulfonates	Branched sodium Dodecylbenzene sulfonate	20 ug/l
	Calcium Dodecylbenzene sulfonate	20 ug/l
	Linear sodium Dodecylbenzene sulfonate	20 ug/l

Group	Specific substance	Limit of detection
	Sodium tridecylbenzene sulfonate	20 ug/l
	Triethanolammonium dodecylbenzene sulfonate	20 ug/l
Diamines	1,6-hexanediamine	10 ug/l
Quaternary Ammonium Salts	Benzalkonium chlorides	10 ug/l
	Di(hydrogenated tallow)dimethylammonium chloride	TBC
	Dodecylammonium chloride	10 ug/l
	Lauryldimethylbenzyl ammonium chloride	TBC
	Stearyldimethylbenzyl ammonium chloride	10 ug/l
Endocrine disrupting chemicals, including pharmaceuticals	Triclosan	0.01 ug/l
	17 α – ethinylestradiol (EE2)	Currently under review with analytical laboratory to confirm analysis and limit of detection
	17 β -estradiol (E2)	
	4-nonylphenol	
	Trenbolone (TB)	
	Chlorophene	
	Hydroxymetabolites of vinclozolin (VZ)	
	Dibutylbenzyle phthalate (DBP)	
	Flutamide	
	19-norethindrone	
	Norgestrel	
	Bisphenol A, S and F	
	Ibuprofen	
	Ethinylestradiol	
	Raloxifene	
Bifenthrin		
Levonorgestrel		

