Shropshire Council Water Cycle Study Addendum: Water Quality Impact Assessment

Final Report

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Revision History

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Contract

This report describes a water quality impact assessment conducted as an addendum to the Shropshire Council Water Cycle Study in 2020. Richard Pardoe of JBA Consulting carried out this work.

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Purpose

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Executive summary

In 2019, JBA Consulting was commissioned by Shropshire Council to undertake a Water Cycle Study (WCS) to inform the Shropshire Local Plan Review. This study assessed the potential issues relating to future development within Shropshire and the impacts on water supply, wastewater collection and treatment and water quality.

The original Water Cycle Study (WCS) report, completed in July 2020, identified several instances where there was a pathway from a pollutant source in the form of a wastewater treatment works (WwTW) serving growth, to a receptor such as a Site of Special Scientific Interest (SSSI). These sites were marked as "water quality deterioration possible" and a further water quality assessment was recommended.

This report describes that additional assessment and provides the evidence to inform the Habitats Regulations Assessment for the Local Plan Review.

The following protected sites were considered in this assessment:

- Sites of Special Scientific Interest (SSSI)
- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)
- Ramsar Sites

An updated screening exercise was performed in order to identify protected sites, and the original water quality modelling results were used to predict the deterioration in water quality in waterbodies adjacent to these sites.

The results showed that a deterioration in phosphate concentration could be expected at many of the protected sites. However, in every case, this deterioration could be prevented by improvements in upstream treatment processes.

It is therefore recommended that Shropshire Council continue to work with Severn Trent Water and Welsh Water in order to ensure that delivery of upgrades at wastewater treatment works is aligned with delivery of development sites.

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1 Introduction

1.1 Purpose of the water quality impact assessment

The original Water Cycle Study (WCS) report, completed in July 2020, identified several instances where there was a pathway from a pollutant source in form of a wastewater treatment works (WwTW) serving growth, to a receptor such as a Site of Special Scientific Interest (SSSI). These sites were marked as "water quality deterioration possible" and a further water quality assessment was recommended.

This report describes that additional assessment and provides the evidence to inform the Habitats Regulations Assessment for the Local Plan Review.

1.2 General approach

The impact on protected sites was assessed using the original water quality modelling results published in the July 2020 WCS. A further screening exercise of protected sites was also performed extending the study area down to the River Severn Estuary.

Sites that were adjacent to a waterbody with a WwTW upstream were taken forward for further assessment. The water quality modelling results were then analysed to provide a prediction of the deterioration in water quality immediately adjacent to the protected site. A further test was applied to ascertain if this deterioration could be prevented by improvements in upstream treatment processes.

The following protected sites were considered in this assessment:

- Sites of Special Scientific Interest (SSSI)
- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)
- Ramsar Sites

2 Detailed methodology

2.1 Screening of sites

The July 2020 WCS identified protected sites that may be at risk following a source-pathway-receptor approach. Sites within a 20km drainage range of each WwTW serving growth were noted. This water quality impact assessment has taken a different approach, extending the study down to the River Severn Estuary.

In order to identify which of the identified protected sites may be at risk, Flood Zone 2 from the Risk of Flooding from Rivers and the Sea mapping was used to define an area that was either by a river or could be reasonable expected to receive surface water from a river during times of flood. Where a WwTW serving growth in the plan period was present in the catchment upstream of the protected site, this site was taken forward for further assessment.

Where there were no WwTW serving growth upstream, these sites were discounted as no deterioration would be predicted by the model, and the impact would be expected to be minimal. However, in these cases the overall catchment water quality should be considered where for example they are designated for migratory fish species that may spend part of their lifecycle elsewhere in the catchment.

2.2 Impact assessment

Where a designated site was identified for further study, the SIMCAT water quality model was investigated to provide the nearest point in the model where a prediction of water quality could be obtained in the adjacent watercourse.

Where possible this was taken as close as possible to the upstream end of the protected site, but where a tributary joined the watercourse along the length of the protected site, a further assessment point was taken to ensure this additional pathway was accounted for.

Protected sites within or close to the Severn Estuary are in transitional waters that are outside the SIMCAT model. The nearest upstream modelled watercourse was therefore used as a proxy for downstream water quality.

At each point, the predicted concentration of phosphate, ammonia and biochemical oxygen demand (BOD) in the adjacent waterbody was taken from the results of the water quality model. The future scenario (taking into account growth during the plan period) was compared to the baseline results to provide a predicted deterioration. A further test was then applied to ascertain whether deterioration could be prevented by improvements in upstream treatment processes. This version of the model assumes that every WwTW is treating at the technically achievable limit (TAL).

At the WwTWs in the north of Shropshire that lie within the River Dee catchment, it was decided in the WCS to use the EA's River quality Planning (RQP) tool to assess the impact of these WwTW as the use of SIMCAT would be disproportionate. A prediction of water quality adjacent to protected sites downstream, was therefore not possible. Instead, the aim was to prevent deterioration at the point of mixing immediately downstream of the WwTW. On this basis, there should be no deterioration at the downstream protected site, and it was this principle that was applied.

3 Results

3.1 Screening

Table 3.1 contains a list of the protected sites (SSSIs, SACs, SPAs and Ramsar sites) that are within or downstream of Shropshire, and adjacent to a watercourse. The final column in the table indicates if there is a WwTW serving growth during the plan period upstream of the site. Where the answer is no, they are not considered further. Where the answer is yes, the deterioration in water quality is predicted in section 3.2.

Table 3.1 Screening of protected sites within and downstream of Shropshire

Type of receptor	Name	Reference	WwTW Upstream – further assessment required (YES/NO)
SSSI	Aileshurst Coppice	SO773502	NO
SSSI	Allscott Settling Ponds	SJ601129	YES
SSSI	Aqualate Mere	SJ773204	YES
SSSI	Areley Wood	SO787711	NO
SSSI	Ashleworth Ham	SO832262	YES
SSSI	Ashmoor Common	SO852466	YES
SSSI	Astridge Wood	SO546087	NO
SSSI	Attingham Park	SJ551095	YES
SSSI	Aust Cliff	ST568898	YES
SSSI	Brotheridge Green Disused Railway Line	SO814412	NO
SSSI	Buildwas River Section	SJ640045	YES
SSSI	Bullhill Brook	SJ555015	NO
SSSI	Burley Dene Meadows	SO813323	NO

Type of receptor	Name	Reference	WwTW Upstream – further assessment required (YES / NO)
SSSI	Burrington Meadow	SO445716	NO
SSSI	Burrington Sections	SO442725	YES
SSSI	Bush Wood and High Wood	SO706824	NO
SSSI	Chaceley Meadow	SO857305	YES
SSSI	Chermes Dingle	SJ614061	NO
SSSI	Chorley Covert and Deserts Wood	SO704839	NO
SSSI	Coombe Hill Canal	SO867268	YES
SSSI	Coundmoor Brook	SJ558035	NO
SSSI	Crofts Mill Pasture	SJ304246	YES
SSSI	Downton Gorge	SO445742	YES
SSSI	Earl's Hill & Habberley Valley	SJ410047	NO
SSSI	Fenemere	SJ445228	NO
SSSI	Fenn's, Whixall, Bettisfield, Wem & Cadney Mosses	SJ488355	NO
SSSI	Fernhill Pastures	SJ322329	NO
SSSI	Flat Coppice	SO394868	NO
SSSI	Frampton Pools	SO753073	NO
SSSI	Garden Cliff	SO718127	NO
SSSI	Grange Meadow	SO805481	NO
SSSI	Grimley Brick Pits	SO838616	YES
SSSI	Hartlebury Common and Hillditch Coppice	SO823707	YES
SSSI	Hencott Pool	SJ489160	NO
SSSI	Hope Valley	SJ354020	NO
SSSI	Hughley Brook	SJ591001	NO
SSSI	Innsworth Meadow	SO850215	NO
SSSI	Lazy Meadow	SP016415	NO
SSSI	Leigh Brook Valley	SO745516	NO
SSSI	Lincoln Hill	SJ669038	NO
SSSI	Long Mynd	SO424938	NO
SSSI	Lord's Wood Meadows	SO732552	YES
SSSI	Lydebrook Dingle	SJ659062	NO
SSSI	Lydney Cliff	SO653017	YES
SSSI	Malthouse Farm Meadows	SO805389	NO
SSSI	Marton Pool, Chirbury	SJ295027	NO
SSSI	Meezy Hurst	SO642086	NO
SSSI	Montgomery Canal, Aston Locks - Keeper's Bridge	SJ348274	NO
SSSI	Muxton Marsh	SJ715134	NO
SSSI	Nagshead	SO607092	NO

Type of receptor	Name	Reference	WwTW Upstream – further assessment required (YES / NO)
SSSI	Newport Canal	SJ736193	NO
SSSI	Nine Holes Meadows	SO610670	NO
SSSI	Northwick Marsh	SO835579	YES
SSSI	Oak Dingle	SO565872	NO
SSSI	Old River Bed, Shrewsbury	SJ496147	NO
SSSI	Old River Severn, Upper Lode	SO880330	YES
SSSI	Onny River Section	SO424853	NO
SSSI	Osebury Rock	SO737555	YES
SSSI	Purton Passage	SO686044	YES
SSSI	Ranters Bank Pastures	SO722749	NO
SSSI	Rectory Farm Meadows	SO921382	NO
SSSI	River Severn at Montford	SJ414144	YES
SSSI	River Teme	SO507745	YES
SSSI	River Wye	SO519384	NO
SSSI	Ruewood Pastures	SJ495279	YES
SSSI	Severn Estuary	ST529870	YES
SSSI	Severn Ham, Tewkesbury	SO885325	YES
SSSI	Sheinton Brook	SJ607038	YES
SSSI	Shrawley Wood	SO808659	YES
SSSI	Soudley Ponds	SO662112	NO
SSSI	Sweat Mere and Crose Mere	SJ433305	NO
SSSI	Teme Bank	SO507742	YES
SSSI	Temeside	SO518742	NO
SSSI	Thatchers Wood and Westwood Covert	SO702904	YES
SSSI	Tick Wood and Benthall Edge	SJ663033	YES
SSSI	Tiddesley Wood	SO929452	NO
SSSI	Upham Meadow and Summer Leasow	SO915375	NO
SSSI	Upper Severn Estuary	SO716063	YES
SSSI	Upton Ham	SO859400	YES
SSSI	Wainlode Cliff	SO845257	YES
SSSI	Walmore Common	SO744151	YES
SSSI	Whitwell Coppice	SJ618021	YES
SSSI	Wyre Forest	SO745766	YES
SAC	Downton Gorge	UK0012735	YES
SAC	Fenn's, Whixall, Bettisfield, Wem & Cadney Mosses	UK0012912	NO
SAC	River Clun	UK0030250	YES
SAC	River Wye	UK0012642	NO
SAC	Severn Estuary	UK0013030	YES
SAC	Wye Valley Woodlands	UK0012642	YES

Type of receptor	Name	Reference	WwTW Upstream – further assessment required (YES/NO)
SPA	Severn Estuary	UK9015022	YES
SPA	Walmore Common	UK9007051	YES
Ramsar	Midland Meres & Mosses Phase 1	UK11043	NO
Ramsar	Midland Meres & Mosses Phase 2	UK11080	YES
Ramsar	Severn Estuary	UK11081	YES
Ramsar	Walmore Common	UK11076	YES

In the original WCS the screening exercise concluded that there may be a water quality impact at a further five SSSIs and a SAC. This was because they were downstream of WwTW serving growth. By using flood zone 2 to indicate their proximity to the watercourse, it is considered unlikely that those sites would receive water from the adjacent waterbody, and so the risk of a significant environmental impact from a deterioration in water quality is low. The following protected sites were therefore removed from the original screening table in the WCS:

- Eaton Track SSSI (SO501900)
- Lincoln Hill SSSI (SJ669038)
- Marsh Wood Quarry SSSI (SO444890)
- Stiperstones and the Hollies SSSI and SAC
- Wolverton Wood and Alcaston Coppice SSSI (SO470872),

3.2 Environmental Impact

At the protected sites indicated as requiring further assessment in Table 3.1, the water quality parameters in the adjacent waterbody were obtained for the baseline and future scenarios of the water quality model to predict the deterioration due to growth, and a further test was applied to ascertain if this deterioration could be prevented by improvements in upstream treatment processes.

It was found that a deterioration in phosphate was possible in the watercourse adjacent to the protected sites in 48 out 62 locations. However, at every location, an improvement in upstream treatment processes could prevent this deterioration from occurring. No deterioration was predicted in ammonia or BOD at any of the sites investigated.

Detailed results can be found in Appendix A.

There are three WwTWs that serve growth in the north of Shropshire that discharge into the River Dee catchment. Growth at Pentre Coed and Eastwick WwTWs is expected to be one property in each case, however growth at Whitchurch WwTW is significant.

The Water Cycle Study noted the presence of the River Dee SSSI, and the River Dee and Bala Lake SAC downstream that may be affected by a deterioration in water quality. RQP predicted this deterioration to be 5% for phosphate immediately downstream of the WwTW. Whilst it is not possible using RQP to predict the water quality further downstream, the RQP results indicate that treatment at the technically achievable limit at Whitchurch WwTW could prevent a deterioration in water quality. No deterioration in BOD or ammonia was predicted.

4 Conclusions and recommendations

The growth proposed in the Shropshire Local Plan Review has the potential to cause a significant impact on protected sites such as SSSIs, SACs and Ramsar Sites through a deterioration in water quality from increased discharge of treated wastewater. This assessment has screened all such protected sites within or downstream of Shropshire and adjacent to a watercourse for this potential impact. For those sites where an impact was deemed possible, the assessment shows that improvements in treatment processes at the upstream WwTW (see also the Shropshire Water Cycle Study 2020) can prevent a deterioration in water quality in waterbodies adjacent to all these designated sites. Thus, provided the necessary improvements are made to the relevant WwTW, the water quality of those protected sites will not be adversely affected by the housing and employment growth proposed by the Shropshire Local Plan Review.

Shropshire Council should work with Severn Trent Water and Welsh Water to ensure that the delivery of improvements in treatment technology at these WwTW are aligned with delivery of development sites during the plan period.

Table 4.1 Table of recommendations

Action	Responsibility	Timescale
Provide annual monitoring reports to STW and WW detailing projected housing growth in the Local Authority	SC	Ongoing
Take into account the full volume of growth (from SC and neighbouring authorities) within the catchment when considering WINEP schemes or upgrades at WwTW	STW, WW	Ongoing
SC and STW to work together to ensure delivery of improvements in treatment technology are aligned with delivery of development sites during the plan period	STW, SC	Aligned with projected growth plan

A Appendix A – Detailed water quality results

Table A1.1 Assessment results for protected sites likely to be affected by changes in water quality.

Protected site	Ref.	Adjacent watercourse ID	Adjacent watercourse name	Pollutant	Baseline Conc. (mg/l)	Future Conc. (mg/l)	% Det.	Conc. After treatment at TAL (mg/l)	Can deterioration be prevented?
Allscott Settling Ponds SSSI	SJ601129	GB109054049190	Roden - conf Sleap Bk to conf R Tern	Phosphate	0.30	0.31	3%	0.15	Y
				Ammonia	0.11	0.11	0%	0.1	Y
				BOD	5.42	5.42	0%	5.42	Y
		GB109054050170	Tern - conf R Meese to conf R Roden	Phosphate	0.31	0.32	3%	0.12	Y
				Ammonia	0.15	0.15	0%	0.15	Y
				BOD	2.54	2.53	0%	2.45	Y
Aqualate Mere SSSI Midland Meres & Mosses Phase 2 Ramsar	SJ773204 UK11080	GB109054050190	Meese - Aqualate Mere tributaries	Phosphate	0.23	0.23	0%	0.17	Y
				Ammonia	0.09	0.09	0%	0.09	Y
				BOD	5.05	5.05	0%	5.05	Y
Ashleworth Ham SSSI	SO832262	GB109054044404	Severn - conf R Avon to conf Upper Parting	Phosphate	0.32	0.33	3%	0.1	Y
				Ammonia	0.05	0.05	0%	0.03	Y
				BOD	1.67	1.66	-1%	1.65	Y
Ashmoor Common SSSI	SO852466	GB109054039760	Severn - conf R Teme to conf R Avon	Phosphate	0.31	0.32	3%	0.1	Y
				Ammonia	0.05	0.05	0%	0.04	Y
				BOD	1.69	1.69	0%	1.66	Y
Attingham Park SSSI	SJ551095	GB109054049680	Tern - conf R Roden to conf R Severn	Phosphate	0.28	0.29	4%	0.12	Y
				Ammonia	0.11	0.11	0%	0.11	Y
				BOD	2.88	2.86	-1%	2.85	Y

Protected site	Ref.	Adjacent watercourse ID	Adjacent watercourse name	Pollutant	Baseline Conc. (mg/l)	Future Conc. (mg/l)	% Det.	Conc. After treatment at TAL (mg/l)	Can deterioration be prevented?
Buildwas River Section SSSI	SJ640045	GB109054049141	Severn - Sundorne Bk to conf M Wenlock-Farley Bk	Phosphate	0.19	0.2	5%	0.1	Y
				Ammonia	0.04	0.04	0%	0.04	Y
				BOD	1.73	1.73	0%	1.72	Y
		GB109054049390	Much Wenlock-Farley Bk - source to conf R Severn	Phosphate	1.08	1.16	7%	0.38	Y
				Ammonia	0.06	0.06	0%	0.06	Y
				BOD	2.58	2.56	-1%	2.56	Y
Burrington Sections SSSI	SO442725	GB109054044500	Teme - conf R Clun to conf R Onny	Phosphate	0.13	0.13	0%	0.11	Y
				Ammonia	0.04	0.04	0%	0.04	Y
				BOD	2.09	2.09	0%	2.09	Y
Chaceley Meadow SSSI	SO857305	GB109054044404	Severn - conf R Avon to conf Upper Parting	Phosphate	0.33	0.34	3%	0.1	Y
				Ammonia	0.06	0.06	0%	0.03	Y
				BOD	1.60	1.59	-1%	1.58	Y
Coombe Hill Canal SSSI	SO867268	GB109054044404	Severn - conf R Avon to conf Upper Parting	Phosphate	0.32	0.33	3%	0.1	Y
				Ammonia	0.06	0.06	0%	0.03	Y
				BOD	1.64	1.64	0%	1.61	Y
Crofts Mill Pasture SSSI	SJ304246	GB109054055070	Morda - source to conf unnamed trib	Phosphate	1.15	1.23	7%	0.23	Y
				Ammonia	0.08	0.08	0%	0.08	Y
				BOD	2.77	2.78	0%	2.78	Y
Downton Gorge (SSSI and SAC)	SO445742 UK0012735	GB109054044500	Teme - conf R Clun to conf R Onny	Phosphate	0.13	0.13	0%	0.11	Y
				Ammonia	0.04	0.04	0%	0.04	Y
				BOD	2.07	2.07	0%	2.07	Y
Grimley Brick Pits	SO838616	GB109054049144	Severn - conf R Stour to conf RIver Teme	Phosphate	0.30	0.32	7%	0.1	Y
				Ammonia	0.05	0.05	0%	0.03	Y

Protected site	Ref.	Adjacent watercourse ID	Adjacent watercourse name	Pollutant	Baseline Conc. (mg/l)	Future Conc. (mg/l)	% Det.	Conc. After treatment at TAL (mg/l)	Can deterioration be prevented?
				BOD	1.47	1.47	0%	1.46	Y
				Phosphate	0.30	0.32	7%	0.09	Y
				Ammonia	0.05	0.05	0%	0.03	Y
				BOD	1.50	1.5	0%	1.49	Y
Hartlebury Common and Hilldditch Coppice	SO823707	GB109054049144	Severn - conf R Stour to conf RIver Teme	Phosphate	0.33	0.35	6%	0.1	Y
				Ammonia	0.06	0.06	0%	0.03	Y
				BOD	1.54	1.54	0%	1.53	Y
Lord's Wood Meadows	SO732552	GB109054044510	Teme - conf R Onny to conf R Severn	Phosphate	0.15	0.15	0%	0.13	Y
				Ammonia	0.04	0.04	0%	0.04	Y
				BOD	2.36	2.36	0%	2.36	Y
Northwick Marsh	SO835579	GB109054049144	Severn - conf R Stour to conf RIver Teme	Phosphate	0.31	0.33	6%	0.09	Y
				Ammonia	0.05	0.05	0%	0.03	Y
				BOD	1.50	1.5	0%	1.48	Y
Old River Severn, Upper Lode	SO880330	GB109054044404	Severn - conf R Avon to conf Upper Parting	Phosphate	0.32	0.33	3%	0.1	Y
				Ammonia	0.06	0.06	0%	0.04	Y
				BOD	1.61	1.61	0%	1.59	Y
Osebury Rock	SO737555	GB109054044510	Teme - conf R Onny to conf R Severn	Phosphate	0.15	0.15	0%	0.13	Y
				Ammonia	0.04	0.04	0%	0.04	Y
				BOD	0.04	0.04	0%	0.04	Y
River Clun SAC (Includes part	UK0030250	GB109054043990	Clun - conf R Unk to conf R Teme	Phosphate	0.14	0.15	7%	0.13	Y
				Ammonia	0.04	0.04	0%	0.04	Y
				BOD	2.11	2.11	0%	2.1	Y

Protected site	Ref.	Adjacent watercourse ID	Adjacent watercourse name	Pollutant	Baseline Conc. (mg/l)	Future Conc. (mg/l)	% Det.	Conc. After treatment at TAL (mg/l)	Can deterioration be prevented?
of River Teme SSSI)				Phosphate	0.14	0.15	7%	0.12	Y
				Ammonia	0.04	0.04	0%	0.04	Y
				BOD	2.13	2.13	0%	2.13	Y
				Phosphate	0.15	0.16	7%	0.12	Y
				Ammonia	0.04	0.04	0%	0.04	Y
				BOD	2.17	2.17	0%	2.17	Y
River Severn at Montford	SJ414144	GB109054049142	Severn - conf Bele Bk to conf Sundorne Bk	Phosphate	0.13	0.13	0%	0.09	Y
				Ammonia	0.04	0.04	0%	0.04	Y
				BOD	1.99	1.99	0%	1.98	Y
Ruewood Pastures	SJ495279	GB109054049180	Roden - conf unnamed trib to conf Sleap Bk	Phosphate	0.25	0.25	0%	0.22	Y
				Ammonia	0.18	0.18	0%	0.18	Y
				BOD	6.86	6.85	0%	6.85	Y
Severn Ham, Tewkesbury	SO885325	GB109054044404	Severn - conf R Avon to conf Upper Parting	Phosphate	0.32	0.33	3%	0.1	Y
				Ammonia	0.06	0.06	0%	0.04	Y
				BOD	1.61	1.61	0%	1.59	Y
Sheinton Brook	SJ607038	GB109054049360	Sheinton Bk - source to conf R Severn	Phosphate	0.22	0.22	0%	0.2	Y
				Ammonia	0.03	0.03	0%	0.03	Y
				BOD	0.28	0.28	0%	0.28	Y
Shrawley Wood	SO808659	GB109054049144	Severn - conf R Stour to conf RIver Teme	Phosphate	0.31	0.33	6%	0.1	Y
				Ammonia	0.05	0.05	0%	0.03	Y
				BOD	1.50	1.5	0%	1.48	Y
Teme Bank	SO507742	GB109054044510		Phosphate	0.16	0.16	0%	0.15	Y

Protected site	Ref.	Adjacent watercourse ID	Adjacent watercourse name	Pollutant	Baseline Conc. (mg/l)	Future Conc. (mg/l)	% Det.	Conc. After treatment at TAL (mg/l)	Can deterioration be prevented?
			Teme - conf R Onny to conf R Severn	Ammonia	0.04	0.04	0%	0.04	Y
				BOD	1.86	1.86	0%	1.86	Y
Thatchers Wood and Westwood Covert	SO702904	GB109054049240	Mor Bk - conf Beaconhill Bk to conf R Severn	Phosphate	0.59	0.59	0%	0.53	Y
				Ammonia	0.05	0.05	0%	0.05	Y
				BOD	9.04	9.04	0%	9.04	Y
Tick Wood and Benthall Edge	SJ663033	GB109054049143	Severn conf M Wenlock-Farley Bk to conf R Worfe	Phosphate	0.20	0.21	5%	0.1	Y
				Ammonia	0.04	0.04	0%	0.04	Y
				BOD	1.71	1.71	0%	1.71	Y
Upton Ham	SO859400	GB109054039760	Severn - conf R Teme to conf R Avon	Phosphate	0.32	0.33	3%	0.1	Y
				Ammonia	0.06	0.06	0%	0.04	Y
				BOD	1.68	1.68	0%	1.65	Y
Wainlode Cliff	SO845257	GB109054044404	Severn - conf R Avon to conf Upper Parting	Phosphate	0.32	0.33	3%	0.1	Y
				Ammonia	0.05	0.05	0%	0.03	Y
				BOD	1.67	1.66	-1%	1.65	Y
Whitwell Coppice	SJ618021	GB109054049360	Sheinton Bk - source to conf R Severn	Phosphate	0.18	0.18	0%	0.16	Y
				Ammonia	0.04	0.04	0%	0.04	Y
				BOD	0.30	0.3	0%	0.3	Y
Wyre Forest	SO745766	GB109054049145	Severn - conf R Worfe to conf R Stour	Phosphate	0.22	0.25	14%	0.1	Y
				Ammonia	0.10	0.1	0%	0.03	Y
				BOD	1.53	1.53	0%	1.52	Y
The following protected sites are adjacent to the River Severn estuary and are not within the bounds of the SIMCAT model. Water quality at the downstream extent of the model (two tributaries) is used as a proxy for water quality adjacent to these sites.									

Protected site	Ref.	Adjacent watercourse ID	Adjacent watercourse name	Pollutant	Baseline Conc. (mg/l)	Future Conc. (mg/l)	% Det.	Conc. After treatment at TAL (mg/l)	Can deterioration be prevented?
Severn Estuary (SSSI, SAC, SPA and Ramsar) Upper Severn Estuary SSSI	ST529870 UK0013030 UK9015022 UK11081 SO716063	Transitional waterbody	River Severn Estuary	Phosphate	0.31	0.32	3%	0.1	Y
Aust Cliff SSSI	ST568898			Ammonia	0.05	0.05	0%	0.03	Y
Lydney Cliff	SO653017			BOD	1.68	1.68	0%	1.66	Y
Purton Passage	SO686044			Phosphate	0.31	0.32	3%	0.1	Y
River Wye SSSI and SAC	SO519384 UK0012642			Ammonia	0.05	0.05	0%	0.03	Y
Walmore Common (SPA, Ramsar)	UK9007051 UK11076			BOD	1.65	1.65	0%	1.63	Y
The River Teme has been designated as a SSSI along its entire length. Water quality was checked at all points (399) along its length, and the point with the largest deterioration in Phosphate is shown below. In every case, deterioration could be prevented by improvements in upstream treatment processes.									
River Teme SSSI	SO507745	GB109054044510	Teme - conf R Onny to conf R Severn	Phosphate	0.08	0.09	13%	0.08	Y
				Ammonia	0.05	0.05	0%	0.04	Y
				BOD	2.40	2.4	0%	2.4	Y

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