

## Compliance Assessment of River Wye SACs against Phosphorus Targets.

The Wye is the largest Welsh SAC river, with a catchment covering much of southern Powys and part of the Brecon Beacons National Park before crossing the border into England near Hay-on-Wye. It is divided into 43 water bodies in Wales, with two water bodies straddling the border. There are an additional four water bodies entirely in England.

Targets for the river were incorporated into the SAC management plan in 2017 (NRW 2017c), and range from  $10 \mu\text{g l}^{-1}$  in headwater areas increasing progressively downstream to  $50 \mu\text{g l}^{-1}$  in the more nutrient-enriched English sections (Figure 1; Table 1).

The management plan update erroneously omitted the 'Wye - conf Afon Tarenig to conf Afon Bidno' water body target. This water body has been assessed here using the Near Natural target for its type. Additionally, an assessment has been carried out for Welsh parts of the cross-border water body 'Wye - Scithwen Bk to Bredwardine Br' as approximately 22km of this lies within Wales. The near natural target has been applied here in line with CSM guidance. Targets for these two water bodies should be viewed as draft, and the Wye Core Management Plan updated accordingly.

Much of the Upper Wye catchment is rural and until recently has been predominantly farmed for sheep and beef cattle. More recently there has been a rapid expansion of chicken farms, which has been the source of considerable public concern.

Comparison of phosphorus concentrations in the Wye against targets indicate widespread failures, some of them large in magnitude (Table 1; Figure 3). Fourteen water bodies passed their targets, 27 failed and three were unknown (Table 1). Water bodies achieving their orthophosphate targets were in the Upper Wye above Rhayader, about half of the Ithon, and two water bodies in the Irfon. All of the middle Wye tributaries, the remaining Irfon and Ithon and the Llynfi failed their targets (Figure 3). The largest failures were the Wye near Newbridge, the Cammarch, Clettwr Brook, Mithil Brook, lower Irfon, Garth Dulas and the three water bodies in the Llynfi catchment.

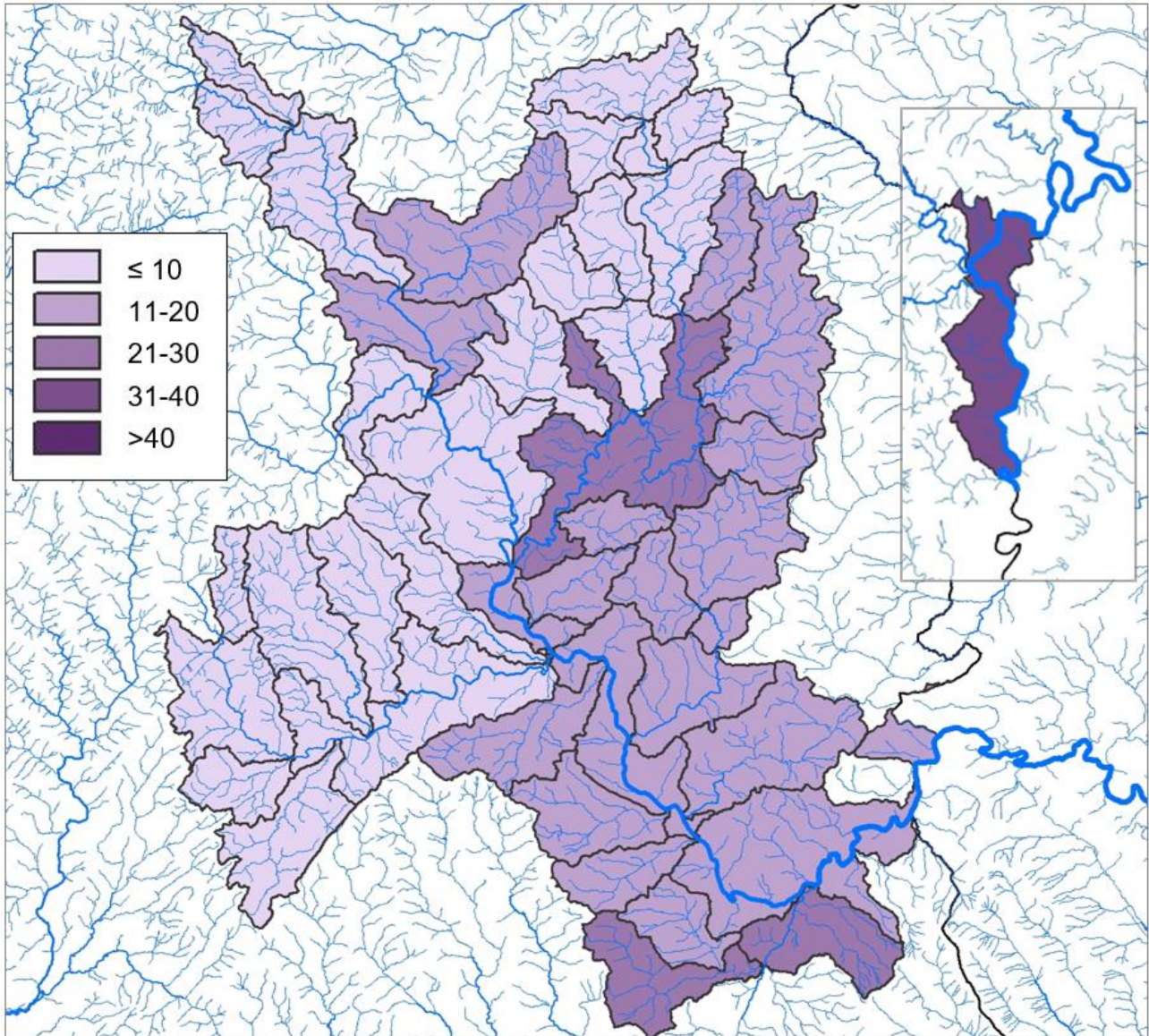


Figure 1. Map of phosphorus targets for the River Wye SAC. All concentrations are annual means and growing season means in  $\mu\text{g l}^{-1}$ . Inset shows the Wye – Walford Brook to Bigsweir water body in the lower Wye. Cross-border water bodies have been cropped to the Welsh border.

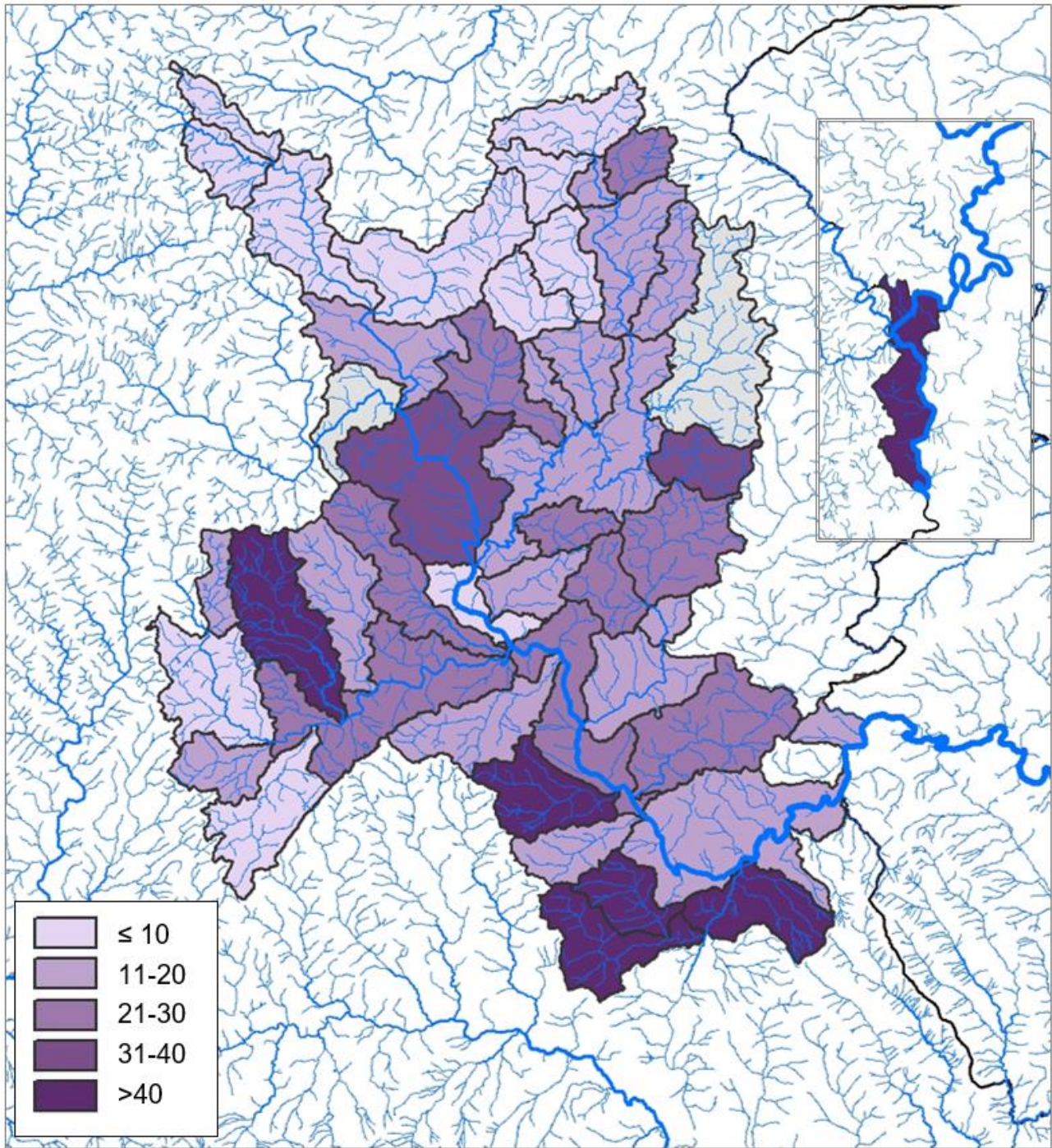


Figure 2. Map of annual mean phosphorus concentrations ( $\mu\text{g l}^{-1}$ ) in the Upper Wye. Inset shows the Wye – Walford Brook to Bigsweir water body in the lower Wye. Cross-border water bodies have been cropped to the Welsh border. Greyed out water bodies could not be assessed due to lack of data.

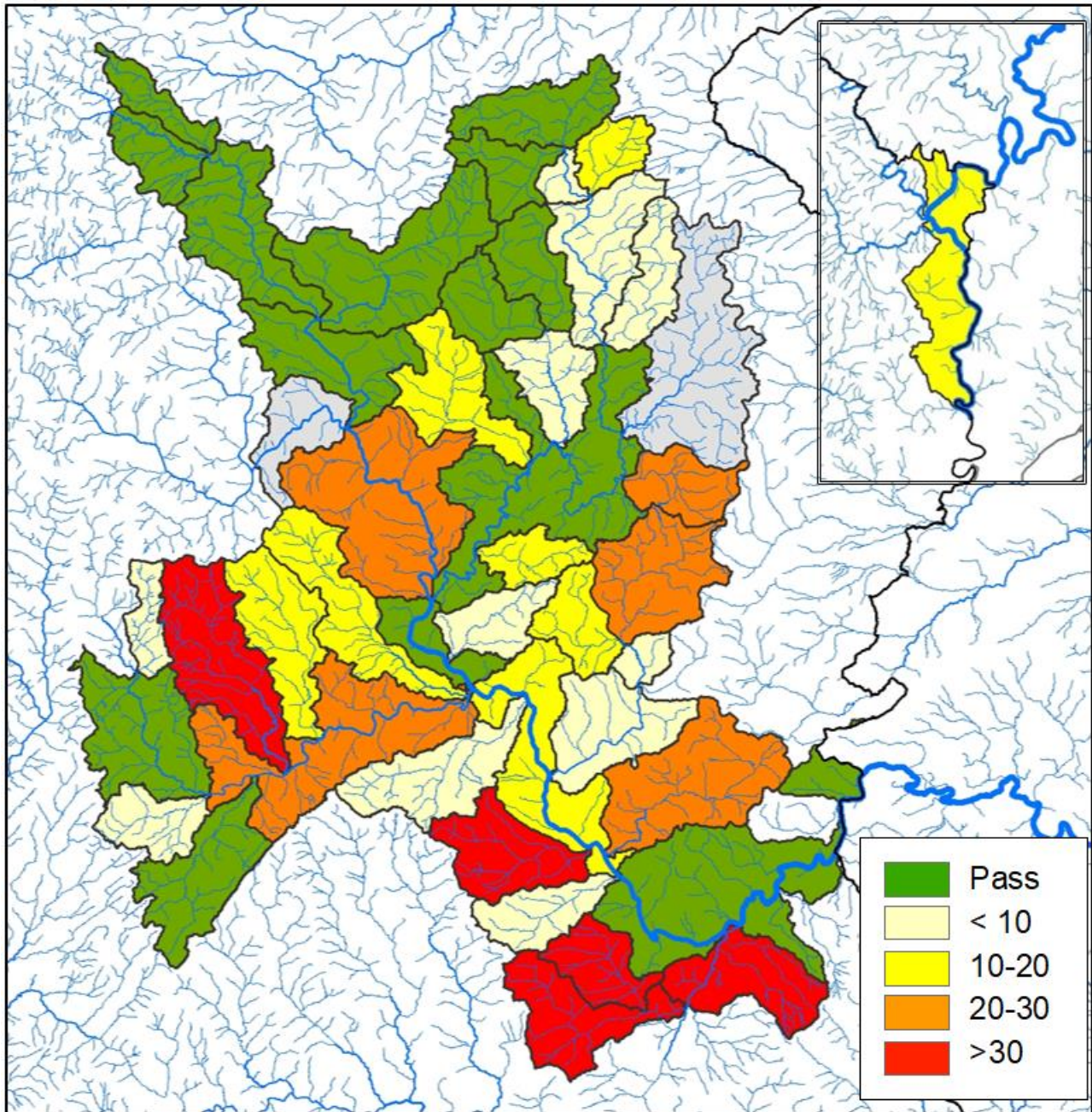


Figure 3. Map of phosphorus compliance for Welsh sections of the Wye SAC. Water bodies shaded green pass their target. Other colours fail the target with different colours representing the magnitude of failures in  $\mu\text{g l}^{-1}$ , expressed as the larger of annual means and growing season means. Inset shows the Wye – Walford Brook to Bigsweir water body in the lower Wye. Cross-border water bodies have been cropped to the Welsh border. Greyed out water bodies could not be assessed due to lack of data.



Waterbody ID	Waterbody Name	Sample Point	Target ( $\mu\text{g l}^{-1}$ )	N Samples	Annual Mean ( $\mu\text{g l}^{-1}$ )	Growing Season Mean ( $\mu\text{g l}^{-1}$ )	Assessment	Status
GB109055042320	Wye - conf Afon Tarenig to conf Afon Bidno	50361	10*	29	2	2	Pass	-
GB109055042320	Wye - conf Afon Bidno to conf Afon Marteg	50004	10	33	2	2	Pass	-
GB109055042340	Afon Bidno - source to conf R Wye	50003	10	29	1	1	Pass	-
GB109055042280	Wye - conf Afon Marteg to conf Afon Elan	50177	20	34	11	14	Pass	-
GB109055042310	Afon Marteg - source to conf R Wye	50005	13	33	7	6	Pass	-
GB109055042260	Afon Elan - Caban-coch Rsvr to conf R Wye	50008	10	-	-	-	Not Assessed	-
GB109055042250	Wye - conf Afon Elan to conf R Ithon	50010	10	29	37	38	Fail	Confirmed
GB109055042180	Ithon - source to conf Llaethdy Bk	51354	10	29	8	8	Pass	-
GB109055042160	Llaethdy Bk - source to conf R Ithon	51352	10	16	7	6	Pass	-
GB109055042170	Gwenlas Bk - source to conf R Ithon	51353	10	23	24	22	Fail	Confirmed

Waterbody ID	Waterbody Name	Sample Point	Target ( $\mu\text{g l}^{-1}$ )	N Samples	Annual Mean ( $\mu\text{g l}^{-1}$ )	Growing Season Mean ( $\mu\text{g l}^{-1}$ )	Assessment	Status
GB109055042150	Ithon - conf Llaethdy Bk to conf Gwenlas Bk	50086	10	29	13	13	Fail	Confirmed
GB109055042130	Camddwr Bk - source to conf R Ithon	50820	13	17	20	17	Fail	Confirmed
GB109055042140	Ithon - conf Gwenlas Bk to conf Camddwr Bk	50086	10	29	13	13	Fail	Confirmed
GB109055042110	Aran - source to conf R Ithon	50084	15	-	-	-	Not Assessed	-
GB109055041960	Mithil Bk - source to conf R Ithon	50825	15	18	40	37	Fail	Confirmed
GB109055041900	Howey Bk - source to conf R Ithon	50089	15	16	25	23	Fail	Confirmed
GB109055042080	Nantmel Dulas - source to conf R Ithon	50821	10	17	21	17	Fail	Confirmed
GB109055042270	Ithon - conf Camddwr Bk to conf R Wye	50085, 50090	25	31	17	16	Pass	-
GB109055042090	Clywedog Bk - source to conf Bachell Bk	50823	10	17	9	8	Pass	-
GB109055042120	Bachell Bk - source to conf Clywedog Bk	50824	10	8	4	-	Pass	-

Waterbody ID	Waterbody Name	Sample Point	Target ( $\mu\text{g l}^{-1}$ )	N Samples	Annual Mean ( $\mu\text{g l}^{-1}$ )	Growing Season Mean ( $\mu\text{g l}^{-1}$ )	Assessment	Status
GB109055042070	Clywedog Bk - conf Bachell Bk to conf R Ithon	50087	10	26	15	16	Fail	Confirmed
GB109055037150	Wye - conf R Ithon to conf R Irfon	50813	15	29	8	8	Pass	-
GB109055041870	Afon Gwesyn - source to conf R Irfon	57103	10	15	12	10	Fail	Probable
GB109055036760	Irfon - conf Afon Gwesyn to conf Cledan	57712	10	27	8	7	Pass	-
GB109055036680	Cledan - source to conf R Irfon	50818	10	21	18	11	Fail	Confirmed
GB109055036690	Tirabad Dulas - source to conf R Irfon	50077	10	19	8	8	Pass	-
GB109055041880	Afon Cammarch - source to conf R Irfon	50078	10	27	46	13	Fail	Confirmed
GB109055041890	Garth Dulas - source to conf R Irfon	50079	10	28	15	22	Fail	Probable
GB109055042190	Chwefru - source to conf R Irfon	50081	10	29	22	26	Fail	Confirmed
GB109055037090	Irfon - conf Cledan to conf R Wye	50080	10	27	24	38	Fail	Confirmed



Waterbody ID	Waterbody Name	Sample Point	Target ( $\mu\text{g l}^{-1}$ )	N Samples	Annual Mean ( $\mu\text{g l}^{-1}$ )	Growing Season Mean ( $\mu\text{g l}^{-1}$ )	Assessment	Status
GB109055037160	Builth Dulas Bk - source to conf R Wye	50501	15	16	16	19	Fail	Confirmed
GB109055037050	Duhonw - source to conf R Wye	50012	15	29	15 <sup>x</sup>	15 <sup>x</sup>	Fail	Probable
GB109055042200	Edw - source to conf Colwyn Bk	51355	15	28	30	39	Fail	Confirmed
GB109055042370	Camnant Brook - source to confluence R Edw	50510	15	24	24	32	Fail	Confirmed
GB109055037130	Edw - conf Camnant Bk to conf Clas Bk	50815	15				Not Assessed	-
GB109055037080	Edw - conf Clas Bk to conf R Wye	51305	15	28	20	23	Fail	Confirmed
GB109055037030	Clettwr Bk - source to conf R Wye	50015	15	21	41	50	Fail	Confirmed
GB109055037060	Bach Howey Bk - source to conf R Wye	50016	15	22	29	36	Fail	Confirmed
GB109055036990	Scithwen Bk - source to conf R Wye	50017	15	21	19	21	Fail	Confirmed
GB109055037115	Wye - conf R Irfon to Scithwen Bk	50440	16	29	23	29	Fail	Confirmed

Waterbody ID	Waterbody Name	Sample Point	Target ( $\mu\text{g l}^{-1}$ )	N Samples	Annual Mean ( $\mu\text{g l}^{-1}$ )	Growing Season Mean ( $\mu\text{g l}^{-1}$ )	Assessment	Status
GB109055036970	Triffrwd - source to Dulas	50811	15	14	70	40	Fail	Confirmed
GB109055036920	Dulas Bk - source to conf Afon Llynfi	50094	25	9	74	-	Fail	Confirmed
GB109055036950	Afon Llynfi - conf Dulas Bk to conf R Wye	50098	25	26	77	90	Fail	Confirmed
GB109055037116	Wye - Scithwen Bk to Bredwardine Br (Wales)	50018 <sup>1</sup>	30	34	<21 <sup>2</sup>	<23	Pass	-
GB109055037111	Wye - conf Walford Bk to Bigsweir Br	50032	39	34	52	55	Fail	Confirmed

Table 1. Compliance for the River Wye SAC.

Waterbody ID	Waterbody Name	Sample Point	Target ( $\mu\text{g l}^{-1}$ )	Median ( $\mu\text{g l}^{-1}$ )	Annual Mean ( $\mu\text{g l}^{-1}$ )	Outlier ( $\mu\text{g l}^{-1}$ )	Mean Excluding Outlier ( $\mu\text{g l}^{-1}$ )	BOD / N / NH <sub>3</sub> confirm outlier	Failure Type
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<sup>1</sup> This is a cross-border unit.

<sup>2</sup> Most of the data for this sample point was collected using the 'Low' method. The mean concentration for 2019, when sampling switched to 'Very Low' was 9  $\mu\text{g l}^{-1}$ .

GB109055042250	Wye - conf Afon Elan to conf R Ithon	50010	10	29	37	-	-	-	Consistent
GB109055042170	Gwenlas Bk - source to conf R Ithon	51353	10	23	24	57	-	-	Consistent
GB109055042150	Ithon - conf Llaethdy Bk to conf Gwenlas Bk	50086	10	10	13	58	-	-	Consistent
GB109055042130	Camddwr Bk - source to conf R Ithon	50820	13	12	20	95	15	-	Episodic
GB109055042140	Ithon - conf Gwenlas Bk to conf Camddwr Bk	50086	10	10	13	58	-	-	Consistent
GB109055041960	Mithil Bk - source to conf R Ithon	50825	15	22	40	188	-	-	Consistent
GB109055041900	Howey Bk - source to conf R Ithon	50089	15	24	25	77	-	-	Consistent
GB109055042080	Nantmel Dulas - source to conf R Ithon	50821	10	10	21	112	-	-	Consistent
GB109055042070	Clywedog Bk - conf Bachell Bk to conf R Ithon	50087	10	7	15	100	12	-	Episodic
GB109055041870	Afon Gwesyn - source to conf R Irfon	57103	10	6	12	61	9	>Q3 (N)	Episodic
GB109055036680	Cledan - source to conf R Irfon	50818	10	12	18	152	-	-	Consistent
GB109055041880	Afon Cammarch - source to conf R Irfon	50078	10	8	46	747	19	-	Episodic
GB109055041890	Garth Dulas - source to conf R Irfon	50079	10	5	15	239	6	>Q3 (BOD, NH <sub>3</sub> )	Episodic

GB109055042190	Chwefru - source to conf R Irfon	50081	10	17	22	-	-	-	Consistent
GB109055037090	Irfon - conf Cledan to conf R Wye	50080	10	7	24	355	12	-	Episodic
GB109055037160	Builth Dulas Bk - source to conf R Wye	50501	15	15	16	35	15	-	Episodic
GB109055037050	Duhonw - source to conf R Wye	50012	15	14	15	70	13	>Q3 (All)	Episodic
GB109055042200	Edw - source to conf Colwyn Bk	51355	15	15	30	369	17	-	Episodic
GB109055042370	Camnant Brook - source to confluence R Edw	50510	15	16	24	183	-	-	Consistent
GB109055037080	Edw - conf Clas Bk to conf R Wye	51305	15	14	20	145	15	Outlier (BOD, NH3); Q3 (N)	Episodic
GB109055037030	Clettwr Bk - source to conf R Wye	50015	15	24	41	172	-	-	Consistent
GB109055037060	Bach Howey Bk - source to conf R Wye	50016	15	21	29	99	-	-	Consistent
GB109055036990	Scithwen Bk - source to conf R Wye	50017	15	17	19	46	-	-	Consistent
GB109055037115	Wye - conf R Irfon to Scithwen Bk	50440	16	10	23	223	15	Outlier (BOD, NH3); Q3 (N)	Episodic
GB109055036970	Triffrwd - source to Dulas	50811	15	36	70	115	-	-	Consistent
GB109055036920	Dulas Bk - source to conf Afon Llynfi	50094	25	46	74	241	-	-	Consistent

GB109055036950	Afon Llynfi - conf Dulas Bk to conf R Wye	50098	25	64	77	193	-	-	Consistent
GB109055037111	Wye - conf Walford Bk to Bigsweir Br	50032	39	45	52	-	-	-	Consistent

Table 2. Sensitivity Testing for Failing Water Bodies on the River Wye SAC.