

Compliance Assessment of Welsh River SACs Against Water Quality Targets

Report No: 729

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Report series: NRW Evidence Reports

Report number: 729

Publication date: [January 2024]

Title: **Compliance Assessment of Welsh River SACs Against Water Quality Targets.**

Author(s): **Foster H., Jones T.G, Jâms, I.B., Hatton-Ellis T.W.**

Quality assurance: Tier 3

Approved By: Wood S.V., King, S.

Restrictions: None.

Distribution List (Core)

NRW Library, Bangor	2
National Library of Wales	1
British Library	1
Welsh Government Library	1
Scottish Natural Heritage Library	1
Natural England Library (Electronic Only)	1

Distribution List (Others)

Published and distributed via the NRW website.

Recommended Citation for this Volume:

Foster H., Jones T.G, Jâms, I.B., Hatton-Ellis T.W. 2024. Compliance Assessment of Welsh River SACs Against Water Quality Targets. NRW Evidence Report No: 729, 106pp, Natural Resources Wales, Bangor.

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Crynodeb Gweithredol

Mae naw safle Ardal Cadwraeth Arbennig (ACA) yng Nghymru â nodweddion afonol (adnabyddir hwy yn eu Cynlluniau Rheoli Creiddiol perthnasol fel):

- River Dee and Bala Lake
- Afon Gwyrfai a Llyn Cwellyn
- Coedydd Derw a Safleoedd Ystumod Meirion (Afon Glaslyn)
- Afon Eden - Cors Goch Trawsfynydd
- Afon Teifi
- Afonydd Cleddau
- Afon Tywi
- River Usk
- River Wye

Mae ansawdd dŵr yn un o nifer o elfennau a ddefnyddir i asesu cyflwr cyffredinol afonydd mewn ACAau. Mae'r ddogfen hon yn adrodd perfformiad ACAau parthed targedau ar gyfer saith nodwedd ansawdd dŵr: Ocsigen Tawdd (DO), Y Galw Biocemegol am Ocsigen (BOD), Cyfanswm Amonia, Amonia heb ei Ïoneiddio, Mynegai Diatomau Troffig (TDI), pH a'r Gallu Niwtralau Asid (ANC). Gosodir y targedau a'r dulliau asesu ar lefel y DU gan y Cydbwyllgor Cadwraeth Natur (JNCC 2016) ac maent yn rhan o'r amcanion cadwraeth ar gyfer nodweddion afonol ACAau.

At ddibenion adrodd ar ansawdd dŵr, mae Cyfoeth Naturiol Cymru (CNC) yn rhannu afonydd yn unedau a elwir yn gyrff dŵr. Roedd cyfanswm o 119 corff dŵr (o 127 posib) wedi eu hasesu (pob un â un pwynt samplu). Defnyddiwyd data ansawdd dŵr o waith monitro gwyliadwriaeth arferol CNC am gyfnod o dair blynedd (1af o Ionawr 2017 – 31ain o Ragfyr 2019) i asesu cydymffurfiaeth â thargedau. Defnyddiwyd y cyfnod hwn er mwyn bod yn gyson ag asesiad cydymffurfio o ran targedau ffosfforws (Hatton-Ellis a Jones 2021). Nid oedd data ar gael yn achos pob nodwedd ar gyfer pob corff dŵr oherwydd cynllun seiliedig-ar-risg rhaglenni monitro CNC. Aseswyd y rhan fwyaf o gyrff dŵr ar gyfer mwy nag un nodwedd.

Defnyddiwyd prosesau sicrhau ansawdd cadarn ar gyfer yr holl ddata, ac mae'r canlyniadau wedi'u cyflwyno ar ffurf tablau a mapiau. Adroddwyd methiannau i gyrraedd targedau ansawdd dŵr yn ACAau River Dee and Bala Lake, Afon Eden - Cors Goch Trawsfynydd, Afon Gwyrfai a Llyn Cwellyn, Afonydd Cleddau, Afon Teifi, River Usk ac River Wye. Roedd mwyafrif y methiannau ar gyfer BOD (methwyd y targed gan 41% o gyrff dŵr a aseswyd) a TDI (methwyd y targed gan 45% o gyrff dŵr a aseswyd), gyda nifer fechan o fethiannau ar gyfer DO (7%), Cyfanswm Amonia (5%), Amonia heb ei Ïoneiddio (0.9%) ac ANC (3%). Ni adroddwyd unrhyw fethiannau ar gyfer pH.

O ran yr asesiad hwn, yr ACAau lle cafwyd y nifer mwyaf o fethiannau targed oedd Afonydd Cleddau, River Usk, River Wye ac Afon Teifi. Mae'r canlyniadau hyn yn gyson â materion sy'n gysylltiedig â llygredd organig a chyfoethogiad maetholion, gyda methiannau eang yn nalgylchoedd Cleddau, Wysg a Gwy, a methiannau ar y Teifi yn y dalgylch isaf yn bennaf.

Yr unig ACAau â methiannau amonia oedd Afonydd Cleddau (Cyfanswm Amonia ac Amonia heb ei Ïoneiddio) ac River Usk (Cyfanswm Amonia yn unig). Mae Afonydd Cleddau yn peri pryder arbennig oherwydd bod ganddi sawl corff dŵr sy'n methu ar gyfer tair neu bedair nodwedd. Yn fras, roedd ACAau gogledd Cymru (River Dee and Bala Lake, Afon Eden - Cors Goch Trawsfynydd ac Afon Gwyrfaï a Llyn Cwellyn) yn cydymffurfio â mwy o'u targedau ansawdd dŵr na rhanbarthau eraill. Nid oedd gan Afon Tywi na Choedydd Derw a Safleoedd Ystlumod Meirion (Afon Glaslyn) unrhyw fethiannau targed.

Er mwyn ymchwilio i'r berthynas rhwng methiannau nodweddion ansawdd dŵr ac i helpu i lywio ymatebion rheoli, mae'r adroddiad hwn yn cyfeirio rhywfaint at *Compliance Assessment of Welsh River SACs against Phosphorous Targets* (Hatton-Ellis a Jones 2021). Mae llawer o fethiannau targed nodweddion yn cyd-ddigwydd, gan gynnwys y rhai ar gyfer ffosfforws.

Mae angen mesurau rhagweithiol mewn partneriaeth â rhanddeiliaid i fynd i'r afael â methiannau ansawdd dŵr, gan adeiladu ar waith presennol megis rhaglen adfer afonydd helaeth CNC a Chynlluniau Rheoli Asedau cwmniau dŵr. Dylai mesurau rheoli ddefnyddio dull ecosystem cyfannol nid yn unig wrth fynd i'r afael â ffynonellau llygredd, ond hefyd wrth wella gwytnwch ecosystemau dŵr croyw i wynebu ystod eang o bwysau sy'n effeithio arnynt.

Y gobaith yw y bydd yr asesiad cydymffurfio hwn yn helpu i arwain a blaenoriaethu camau gweithredu i symud afonydd ACAau Cymru tuag at well cydymffurfiaeth â thargedau ansawdd dŵr. Fodd bynnag, argymhellir cynnal ymchwiliadau pellach ar lefel safle i lywio ymyriadau penodol.

Executive Summary

There are nine Special Areas of Conservation (SACs) in Wales with riverine features (known in their respective Core Management Plans as):

- River Dee and Bala Lake
- Afon Gwyrfai a Llyn Cwellyn
- Coedydd Derw a Safleoedd Ystumod Meirion (Afon Glaslyn)
- Afon Eden - Cors Goch Trawsfynydd
- Afon Teifi
- Afonydd Cleddau
- Afon Tywi
- River Usk
- River Wye

Water quality is one of several components used to assess the overall condition of rivers in SACs. This document reports on the performance of SACs regarding targets for seven water quality attributes: Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, Trophic Diatom Index (TDI), pH and Acid Neutralising Capacity (ANC). The targets and methods of assessment are set at a UK level by the Joint Nature Conservation Committee (JNCC 2016) and form part of the conservation objectives for the riverine SAC features.

For the purposes of water quality reporting, Natural Resources Wales (NRW) divides rivers into units called water bodies. A total of 119 (of a possible 127) water bodies, each with a single sampling point, were assessed for one or more attribute. Water quality data collected by NRW's routine surveillance monitoring programme for a three-year period (1st of January 2017 – 31st December 2019) were used to assess compliance with targets. This period was used to be consistent with a compliance assessment regarding Phosphorous targets (Hatton-Ellis and Jones 2021). Data were not available for all attributes for all water bodies due to the risk-based design of NRW's monitoring programmes. The majority of water bodies were assessed for more than one attribute.

All data were subject to robust quality assurance processes, and results have been presented in the form of tables and maps. Failures to meet water quality targets were reported in the River Dee and Bala Lake, Afon Eden - Cors Goch Trawsfynydd, Afon Gwyrfai a Llyn Cwellyn, Afonydd Cleddau, Afon Teifi, River Usk and River Wye SACs. The majority of failures were for BOD (41% of assessed water bodies failed to meet the target) and TDI (45% of assessed water bodies failed to meet the target), with a small number of failures for DO and Total Ammonia, and one failure each for Unionised Ammonia and ANC. No failures were reported for pH.

In terms of this assessment, the SACs with the most target failures were the Afonydd Cleddau, River Usk, River Wye and Afon Teifi. These results are consistent with issues related to organic pollution and nutrient enrichment, with widespread failures in the Cleddau, Usk and Wye catchments, and failures on the Teifi mostly in the lower catchment.

The only SACs with ammonia failures were Afonydd Cleddau (Total Ammonia and Unionised Ammonia) and River Usk (Total Ammonia only). Afonydd Cleddau is of particular concern because it has several water bodies that fail for three or four attributes. Broadly, SACs in north Wales (River Dee and Bala Lake, Afon Eden - Cors Goch Trawsfynydd and Afon Gwyrfai a Llyn Cwellyn) had fewer failures. The Tywi and Coedydd Derw a Safleoedd Ystlumod Meirion (Afon Glaslyn) had no target failures.

To investigate the relationship between water quality attribute failures and to help inform management responses, this report makes some reference to the Compliance Assessment of Welsh River SACs against Phosphorus Targets (Hatton-Ellis and Jones 2021). Many attribute target failures co-occur, including those for Phosphorous.

Proactive measures in partnership with stakeholders are required to address water quality failures, building on existing work such as NRW's extensive river restoration programme and water company Asset Management Plans. Management measures should take a holistic ecosystem approach to not only address pollution sources, but also improve the resilience of freshwater ecosystems to the wide range of pressures affecting them.

It is hoped that this compliance assessment will help guide and prioritise actions to move Wales' SAC rivers towards improved water quality target compliance. However, further investigations at a site level are recommended to inform specific interventions.

Introduction

Rivers that are Part of Special Areas of Conservation in Wales

There are nine SAC sites in Wales with riverine features. These are known in their respective Core Management Plans as: [River Dee and Bala Lake](#), [Afon Gwyrfai a Llyn Cwellyn](#), [Coedydd Derw a Safleoedd Ystlumod Meirion \(Afon Glaslyn\)](#), [Afon Eden - Cors Goch Trawsfynydd](#), [Afon Teifi](#), [Afonydd Cleddau](#), [Afon Tywi](#), [River Usk](#) and [River Wye](#). See Appendix 1 for a map of locations. For brevity, in parts of this report the nine SAC sites listed above are referred to by the use of the relevant river name only, e.g. “Wye”, “Glaslyn” etc.

These SACs are designated to conserve habitats and species listed in Annexes I and II of the Habitats Directive including *Ranunculion* habitat, Atlantic salmon, allis shad, twaite shad, bullhead, brook lamprey, river lamprey, sea lamprey, freshwater pearl mussel, white-clawed crayfish, otter, and floating water plantain. These sites also support a range of rare and threatened species protected by Sites of Special Scientific Interest (SSSIs) designations.

Compliance Assessment

A wide range of attributes are used to assess the condition of a river that is part of a SAC. These attributes are set out in the Common Standards Monitoring (CSM) Guidance for Rivers (JNCC 2016) and the Guidance for Freshwater Fauna (JNCC 2015), and include attributes related to water quality, habitat structure and biological assemblages. A full condition assessment assesses compliance against all of these attributes. This document provides Natural Resources Wales’ (NRW) latest compliance assessment regarding the CSM water quality targets (except for targets for Phosphorus and “other pollutants”, see below), and is therefore only a component of a full condition assessment.

Water quality targets are published by the Joint Nature Conservation Committee (JNCC), the national advisory body for UK conservation standards. The original CSM guidance for rivers (JNCC 2005) was published in 2005 and was subsequently updated in 2014 and updated again in 2016 (JNCC 2016). CSM Guidance for Freshwater Fauna was published in 2015 (JNCC 2015) which also contains the same water quality targets. During this process of revision, some targets were tightened, some remained the same and some were added (see below).

NRW is also responsible for the implementation and management of the Water Framework Directive (WFD) Regulations in Wales. In order to simplify management and achieve better alignment between the implementation of the Habitats Regulations and the WFD Regulations, NRW is working to amend management units of rivers in SACs so that they align better with the units used for WFD Regulations reporting. This change allows more direct comparisons between Habitats Regulations and WFD Regulations assessments. Consequently, this report uses data from WFD Regulations units (known as water bodies). WFD Regulations classifications are reported on the [Water Watch Wales website](#) and are not analysed further here.

The CSM guidance states that if standards for Good Ecological Status (GES) under the WFD are more stringent than CSM targets then those GES standards should be used as

targets for favourable condition. If High Ecological Status has already been achieved then those standards should be used as favourable condition targets (JNCC 2016).

Note that for the two cross-border SAC rivers (Dee and Wye), this compliance assessment relates only to those parts of the rivers that are in Wales; those parts in England are assessed by Natural England.

Water Quality Attributes Assessed in this Compliance Assessment

A brief description of each attribute assessed in this report is provided below. Table 1 provides the targets for each attribute.

In line with JNCC (2016), the attributes can be grouped under the headings:

- **Organic Pollution:**

Dissolved Oxygen, Biochemical Oxygen Demand, Total Ammonia and Unionised Ammonia.

- **Trophic Diatom Index (TDI).**

- **Metrics Regarding Acidity:**

pH and Acid Neutralising Capacity.

Organic pollution (pollution that is derived from living matter) and nutrient enrichment are key pressures on freshwater ecosystems (Mainstone 2010). Elevated levels of nutrients in freshwaters can affect the balance of flora and fauna and can cause deoxygenation of river substrates. Elevated nutrients can increase the proportion of algae in a freshwater habitat at the detriment of higher plants and may also reduce the abundance and diversity of invertebrates. Potential sources of organic pollution include wastewater treatment discharges, agriculture and land management practices that are associated with increased rates of run-off and soil erosion.

Acidification targets are only applied to water bodies characterised as siliceous or peaty which have limited natural buffering capacity and are therefore vulnerable to acidification. Upland streams are particularly susceptible to acidification, which can cause major changes to flora, fauna and ecosystem functioning.

Table 1. Water quality attribute targets (JNCC 2016).

Attribute	Common Standards Monitoring Target
Dissolved Oxygen (DO) saturation	≥ 85% (10%ile)
Biochemical Oxygen Demand (BOD)	≤ 1.5mg/l (mean)
Total Ammonia*	≤ 200 or 250µg/l (90%ile)
Unionised Ammonia	≤ 250µg/l (95%ile)
Trophic Diatom Index	Ecological Quality Ratio ≥ 0.8
pH***	Clear waters with DOC** < 10mg/l: pH of > 6.54 (mean) Humic waters with DOC > 10mg/l: pH of > 5.1 (mean)
Acid Neutralising Capacity (ANC)	> 80 (mean)

* Total Ammonia may have a Common Standard Monitoring (CSM) target of 250 µg/l or a WFD target of 200 µg/l if the water body is meeting the latter. A stringency test has been applied. The specific target for each water body is listed in the results tables below.

**DOC – Dissolved Organic Carbon.

*** For all water bodies in scope of this assessment, the pH target is >6.54 (mean).

Organic Pollution

Dissolved Oxygen (DO)

Dissolved oxygen is a measure of the amount of oxygen that is dissolved in water. Low DO measurements can be an indication of organic pollution (DO decreases as BOD rises), however reduced DO can also be caused by other factors such as elevated temperature and river morphology.

Biochemical Oxygen Demand (BOD)

BOD is a measure of the amount of dissolved oxygen needed by aerobic organisms to break down organic material present in a given water sample over 5 days at a temperature of 20°C. High BOD values mean that fish and aquatic invertebrates are at risk of stress from a lack of oxygen in the water column.

Total Ammonia and Unionised Ammonia

Ammonia is an indicator of nutrient enrichment and is a pollutant of freshwater. The chemical form of ammonia in water comprises two forms: the more abundant ammonium ion (NH_4^+) and the less abundant unionised ammonia molecule (NH_3). These two forms are present in a dynamic equilibrium which is controlled by pH and temperature. At higher pH levels, Unionised Ammonia forms an increased proportion of Total Ammonia (US EPA 2013).

The unionised NH_3 form can be toxic to aquatic life, fish are particularly sensitive to NH_3 (Sadler 1981, Solbé and Shurben 1989). Unionised Ammonia is unstable and it is therefore difficult to detect. For this reason, Total Ammonia (i.e. the sum of NH_4^+ and NH_3) is measured as a proxy.

Metrics Regarding Acidity

Targets regarding acidity are only applicable to those rivers which are considered to be at risk of acidification. Upland rivers are most sensitive to acidification as the geology in these areas is mainly base-poor. Of the 127 water bodies in scope for this assessment, 86 have pH and ANC targets.

pH

pH is a direct measure of the acidity/alkalinity of a river, and is principally used to detect acidification, formally a widespread pressure in Welsh rivers.

Acid Neutralising Capacity (ANC)

Acid Neutralising Capacity measures the buffering capacity of a river and is therefore a measurement of the resilience of a river to acidic inputs such as acid rain.

Trophic Diatom Index (TDI)

The Trophic Diatom Index (TDI) can identify elevated nutrient concentrations by studying a group of microscopic algae called diatoms which are found attached to submerged surfaces. Diatom communities are sensitive to elevated nutrients, and this metric looks for shifts to expected community composition in response to nutrients. TDI compliance is reported simply as a pass or fail and is considered a reliable means of assessing the riverine ecological response to nutrient enrichment (Kelly *et al.* 2008).

Additional Water Quality Attributes not Covered by this Assessment

Phosphorus is also a CSM water quality attribute, however a separate compliance assessment for Phosphorus has already been published (Hatton-Ellis and Jones 2021), available [here](#). This report should be read in conjunction with the Phosphorus compliance assessment, as some data from the Phosphorus report are referred to in the results and discussion sections of this report in order to provide a cohesive overview of water quality in the SAC rivers.

“Other pollutants” (specific chemicals listed under the WFD Regulations) are also listed in the CSM guidance, however NRW has not adopted targets for these. This is due to ongoing work considering the range of chemicals and targets and their impact on SAC rivers.

Methods

Overview

Data collected from the field over three years were arranged according to a specific percentile or mean (specified by CSM guidance) and assessed as passing or failing to meet the corresponding water quality target. A relatively simple measurement of uncertainty regarding this assessment was estimated from the distribution of raw data.

A total of 127 water bodies were in scope for this assessment. It is important to note that not all water bodies were assessed for all attributes. This is because the dataset used for the assessment was collated for the 2021 WFD classification and arises from a risk-based monitoring programme derived for that purpose. As a result, sufficient data were not available for every attribute in every water body. For example, only 51% of water bodies were assessed for TDI. For the attributes related to acidity (pH and ANC), only water bodies that are classified as having a siliceous or peaty typology are given a target, and therefore only those with a target were assessed. Eight water bodies could not be assessed for any attribute.

For the assessment of the water quality attributes detailed in this report, 119 water bodies were ultimately assessed by taking samples at a single location as a representation of the water quality throughout a water body. Some sampling points were used to assess more than one water body (if an upstream water body did not have its own sampling point, for instance). Only data from sample points within the Welsh political border were assessed. Data from sample points within the English parts of the Wye and Dee SACs are assessed by Natural England. Summaries of specific methods are provided below.

Data Collection and Preparation

Dissolved Oxygen (DO)

DO was recorded as % saturation in the field using calibrated hand-held meters (NRW 2022a and 2022b). The method of calculating percentiles was matched to the method used in WFD classification, which uses parametric percentiles assuming a normal distribution.

Biochemical Oxygen Demand (BOD)

BOD was measured in the laboratory using a standard technique where samples are incubated for 5 days at 20°C in the dark. Results are expressed as mg/l of oxygen (NRW 2023a).

Total Ammonia as N

Total Ammonia was measured using NRW's standard technique (NRW 2021) and results are expressed in µg/l. The method of calculating percentiles was matched to the method used in WFD classification, which uses parametric percentiles.

Unionised Ammonia

Unionised Ammonia was calculated using values of Total Ammonia, temperature (measured using a probe in the field) and pH (see below) using the following formula, with values expressed as µg/L.

$$\text{Unionised Ammonia} = [\text{Total Ammonia } (\mu\text{g/L}) / (1 + \exp(\log(10.0) * (10.055 - (0.0324 * [\text{temp}] - [\text{pH}])))$$

The method of calculating percentiles was matched to the method used in WFD classification, which uses parametric percentiles assuming a log normal distribution.

Trophic Diatom Index (TDI)

Diatoms were sampled from suitable underwater substrates (rocks, stones, underwater wood and water plants), preserved and then identified and counted in an NRW laboratory. Different diatom species have their own TDI number ranging from 1 (nutrient sensitive) to 5 (nutrient tolerant) (WFD-UKTAG 2020).

A sample's TDI is calculated using the abundance weighted mean TDI. Each sample's TDI is divided by a reference TDI for the site predicted using alkalinity to produce an Environmental Quality Ratio (EQR). Higher EQRs indicate better ecological quality (WFD-UKTAG 2020).

The TDI data for this assessment were taken from the Cycle 3 2021 WFD classification of Phytobenthos. The WFD standard for High status corresponds to the CSM target (i.e. 0.8). Only water bodies classified with monitoring data collected during the period 2017-2019 have been included. Full details of the calculation of the TDI EQR and corresponding status can be found in the UKTAG River Assessment Method for Macrophytes and Phytobenthos (WFD-UKTAG 2020).

pH

pH was measured in the field using a calibrated hand-held meter (NRW 2022a and 2022b).

Acid Neutralising Capacity (ANC)

ANC was calculated using pH, alkalinity and dissolved organic carbon (DOC), following the WFD method of using slightly different formulae depending on the pH:

$$\text{If pH} < 5.5: \quad \text{ANC} = [\text{alkalinity } (\mu\text{Eg/L})] + (4.5 * [\text{DOC } (\text{mg/L})])$$

$$\text{If pH} \geq 5.5: \quad \text{ANC} = [\text{alkalinity } (\mu\text{Eg/L})] + (5.0 * [\text{DOC } (\text{mg/L})])$$

Data for pH, alkalinity and Dissolved Organic Carbon (DOC) must all have been measured for the same sample to be used for ANC assessment.

Alkalinity was analysed using the Grans Plot method (NRW 2023b). DOC was analysed on an air segmented flow Autoanalyser and concentrations recorded in mg/L (NRW 2022c).

Data Analysis

The CSM guidance (JNCC 2016) specifies that 3 years' data are to be used for assessment. The data period for this assessment is 1st of January 2017 – 31st of December 2019, to be consistent with the 2021 WFD classification and the Phosphorus compliance assessment (Hatton-Ellis and Jones 2021). All data for this assessment were extracted from the quality assured 2021 WFD classification dataset.

To provide a representative result, sufficient samples are required to provide a final result with an acceptable level of accuracy. Sampling intervals also need to be distributed such that seasonal variation is accounted for. For all the water quality attributes other than TDI the minimum number of samples required to provide an assessment was eight, the same for classification under WFD Regulations. For TDI, a spring and autumn sample is required from at least one sample point within each water body. The ideal number of samples for a compliance assessment is six (three spring/autumn pairs) over the three year period, however a minimum of two samples (one spring/autumn pair) will suffice. Some sampling points did not meet minimum replication thresholds for some or all of the attributes, and in these cases the result is recorded as being not assessed.

Understanding Uncertainty

The CSM guidance (JNCC 2016) has determined the method for deriving targets and guides us to assess compliance as follows:

“Compliance with each numerical target should be judged on face value (i.e. is the observed value numerically greater than the target value?)”

However, any estimate of quality or status derived from water quality monitoring data is subject to a degree of uncertainty because of a number of factors, including variability in the quality of the water, the extent to which the spatial and temporal sampling regime accurately represents water quality, and inherent errors or biases in the laboratory analysis. Quantifying and communicating that uncertainty helps to instil trust with NRW's partners and allows for appropriate action to be taken to manage the environment.

[Government best practice guidance \(cross government group 2023\)](#) recommends that “Taking account of uncertainty and being seen to do so is important for public trust”. This is echoed in the [Sustainable Management of Natural Resources \(SMNR\) principles \(NRW 2023c\)](#): “Evidence – take account of all relevant evidence, and gather evidence in respect of uncertainties”.

In the absence of a process to determine uncertainty in the CSM guidance, for all attributes except TDI, the assessment included a relatively simple measure of uncertainty using a method which assigns a 95% confidence interval to the result of the analysis. The method derives two values, one optimistic and one pessimistic, between which the real value can be expected to occur 95% of the time if the sampling and analysis were to be re-run in the same way. The calculations were performed differently depending on whether the mean or a percentile of the dataset were used, and whether the distribution was assumed to be normal or log-normal. The calculated confidence intervals are reported in the spreadsheet (Data Archive Appendix [C]) that accompanies this report.

In a number of cases the confidence interval crosses the boundary between pass and fail. In those cases, there is less certainty on which side of the target the true result lies than in cases where the confidence interval does not cross the boundary between pass and fail.

In the results section, results are reported as High or Low confidence. The method used to apportion a High or Low confidence to a result is explained in the table below.

Table 2. Method used to apply a High or Low confidence category to pass and fail results for Biochemical Oxygen Demand, Dissolved Oxygen, Total Ammonia, Unionised Ammonia, pH and Acid Neutralising Capacity.

Result	Low Confidence	High Confidence
Pass	Pessimistic confidence interval value does not meet the target.	Pessimistic confidence interval value does meet the target.
Fail	Optimistic confidence interval value does meet the target.	Optimistic confidence interval value does not meet the target.

For TDI, as the compliance assessment has taken the results directly from NRW's most recent WFD Regulations classification, we have used the confidence of class values from that classification to provide a confidence value in this report. Given that a pass result in this assessment equates to High status under WFD, the confidence we have provided is the confidence of class for High status. The confidence for a result of fail is the sum of the confidence of class values for Good, Moderate, Poor and Bad status. These percentage values have been converted into a certainty rating using thresholds also defined in WFD legislation, they are: $\geq 95\%$ = Very Certain, $\geq 75\% - 94\%$ = Quite Certain and $<75\%$ = Uncertain.

Although information is presented on the confidence in the results, it is important to note that the CSM guidance requires the reporting of compliance on face value (i.e. straightforward pass or fail). The provision of confidence information is to aid interpretation only and could potentially be used to help prioritise management measures.

Quality Assurance of Results

NRW's water chemistry database has inbuilt checks that help identify unusual data that can be reviewed before being accepted into, or omitted from, datasets.

It is not uncommon for outliers to occur in water quality datasets. Sometimes these reflect measurement or recording error, but they can also indicate real water quality problems. Outliers may have a large impact on the compliance assessment (for example by causing a water body to fail) and it is therefore important that they are scrutinised carefully.

The following checks were carried out to determine if outliers were genuine:

- unusual data were checked with the lab, and any errors (e.g. transcription errors) were corrected,

- outliers were compared with other data from the same sample that might indicate a problem – for example, compare the results of the Organic Pollution attributes with each other and with those for Phosphorus and TDI.

On occasions, however, it was necessary to omit data from analyses. Specific data quality issues identified as pertinent to this assessment are discussed below.

Holding Times

Some of NRW's water quality samples for Total Ammonia (and therefore also Unionised Ammonia) were held beyond the requisite laboratory holding times prior to analysis. These holding times are set to ensure that samples remain stable and that the recorded nutrient readings remain within an accepted level of tolerance of the true concentrations. All results with holding time breaches have been excluded from the assessment.

Dissolved Oxygen

Quality assurance of the DO field meter readings for inclusion in this compliance assessment identified apparently anomalous results in some water bodies in the Upper Wye. An investigation determined that the standard method for using the field meters was not being followed in all areas. Where this was the case, the DO concentrations recorded are likely to be lower than the real values. These data were excluded from the assessment and affected water bodies recorded as not assessed for DO.

Method of Analysis for Total Ammonia

During the period 2017-2019, Total Ammonia was occasionally analysed, using the same sample, for two different methods (Low or Very Low) on separate laboratory instruments. The Very Low method has a lower detection limit than the Low method. The most appropriate method for each site was chosen based on the range of results for that site, following an agreed protocol.

Use of Phosphorus Compliance Assessment Data in this Report

The Results and Discussion sections of this report make some reference to the Phosphorus compliance assessment data published by Hatton-Ellis and Jones in 2021. The Phosphorus compliance assessment studied the same suite of 127 water bodies as assessed in this report, and used data from the same period i.e. 1st of January 2017 – 31st of December 2019.

This report uses the Phosphorus compliance result (i.e. pass or fail) for each water body to explore the relationship between BOD, DO, Total Ammonia, Unionised Ammonia and TDI compliance and Phosphorus compliance. Understanding co-occurrences of attribute failures aids understanding of the pressures affecting the rivers. For full details of the methods used for the Phosphorus compliance assessment, see Hatton-Ellis and Jones (2021).

Results

Summary

Summarised results of water quality target exceedances are presented in the table below, followed by a section for each SAC which presents compliance for each water body in a series of tables and maps.

Table 3. Summary of water quality target exceedances.

Water Quality Attribute	Number of Water Bodies Assessed	% of Total no. Water Bodies Assessed**	Number of Water Bodies Exceeding Target	% of Assessed Water bodies Exceeding Target	SACs Where Target Exceedances Identified
DO	83	65	6	7	Afon Teifi, Afonydd Cleddau
BOD	99	78	41	41	Afon Teifi, Afonydd Cleddau, River Usk, River Wye
Total Ammonia	107	84	5	5	Afonydd Cleddau, River Usk
Unionised Ammonia	107	84	1	0.9	Afonydd Cleddau
TDI	65	51	29	45	River Dee and Bala Lake, Afon Eden - Cors Goch Trawsfynydd, Afon Teifi, Afonydd Cleddau, River Wye, River Usk
ANC*	32	37	1	3	Afon Gwyrfai a Llyn Cwellyn
pH*	76	88	0	0	-

*86 of the 127 water bodies have targets regarding acidity; only water bodies with targets are assessed for ANC and pH.

**Calculation based only on water bodies that have targets for relevant attributes.

This report is accompanied by a spreadsheet (Data Archive Appendix [C]) of the compliance assessment data, including the confidence intervals for each result. In addition, GIS layers illustrating compliance can be found on Data Map Wales and in Data Archive Appendix [B].

River Dee and Bala Lake

The Dee is the largest catchment in north Wales, with parts of the lower Dee and the Ceiriog tributary forming the border with England. The catchment has a mixed geology including base-poor resistant rocks with overlying peat, Carboniferous limestone and sandstone outcrops. The lower part of the catchment is dominated by superficial deposits.

Reservoirs in the upper part of the catchment store water and regulate flow in the Dee. They sustain abstractions for public and industrial water supply and moderate flows to control the flooding of the Dee between Bala and Chester.

One water body, the “Ceiriog upstream of Teirw”, was not assessed for any attributes.

Organic Pollution

All assessed water bodies in the Dee SAC met their targets for DO, BOD, Total Ammonia and Unionised Ammonia with High confidence except for DO on the “Dee - Chester Weir to Ceiriog” which met its target with Low confidence.

Metrics Regarding Acidity

Six of the nine water bodies in the Dee SAC passed their pH target with High confidence, whilst the remaining three water bodies (“Ceiriog - upstream of Teirw”, “Ceiriog - confluence Dee to Teirw” and “Dee - Chester Weir to Ceiriog”) were not assessed.

Only the “Tryweryn - Mynach to Llyn Celyn” was assessed for ANC, which met its target with High confidence.

TDI

Only two water bodies on the Dee were assessed for TDI, “Dee - Ceiriog to Alwen” and “Dee - Chester Weir to Ceiriog”. Both of these water bodies failed the TDI target with a confidence category of Very Certain.

Table 4. Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) compliance of the River Dee and Bala Lake Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	DO 10%ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg l ⁻¹)	Number of Samples	BOD Result
GB111067051990	Mynach	300	93.1	29	Pass (High)	1.22	29	Pass (High)
GB111067051900	Tryweryn - Dee to Mynach	294	93.3	35	Pass (High)	1.24	35	Pass (High)
GB111067051980	Tryweryn - Mynach to Llyn Celyn	288	96.5	35	Pass (High)	1.22	35	Pass (High)
GB111067051960	Meloch	496	95.6	29	Pass (High)	1.23	29	Pass (High)
GB111067052240	Dee - Alwen to Llyn Tegid / Bala Lake	1	93.5	36	Pass (High)	1.26	36	Pass (High)
GB111067052060	Dee - Ceiriog to Alwen	70	98.3	37	Pass (High)	1.26	36	Pass (High)
GB111067051610	Ceiriog upstream of Teirw	-	-	-	Not Assessed	-	-	Not Assessed
GB111067051910	Ceiriog - confluence Dee to Teirw	578	94.0	37	Pass (High)	1.22	36	Pass (High)
GB111067057080	Dee - Chester Weir to Ceiriog	671	88.5	27	Pass (Low)	1.36	27	Pass (High)

Table 5. Total Ammonia (T-NH₃) and Unionised Ammonia (U-NH₃) compliance for the River Dee and Bala Lake Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB111067051990	Mynach	300	200	34.5	19	Pass (High)	0.16	19	Pass (High)
GB111067051900	Tryweryn - Dee to Mynach	294	200	28.7	23	Pass (High)	0.36	23	Pass (High)
GB111067051980	Tryweryn - Mynach to Llyn Celyn	288	200	32.0	24	Pass (High)	0.14	24	Pass (High)
GB111067051960	Meloch	496	200	18.9	18	Pass (High)	0.16	18	Pass (High)
GB111067052240	Dee - Alwen to Llyn Tegid / Bala Lake	1	200	22.8	27	Pass (High)	0.12	27	Pass (High)
GB111067052060	Dee – Ceiriog to Alwen	70	200	41.0	31	Pass (High)	0.77	31	Pass (High)
GB111067051610	Ceiriog – upstream of Teirw	-	200	-	-	Not Assessed		-	Not Assessed
GB111067051910	Ceiriog – confluence Dee to Teirw	578	250	24.0	31	Pass (High)	0.57	31	Pass (High)
GB111067057080	Dee – Chester Weir to Ceiriog	671	250	152.9	28	Pass (High)	4.08	28	Pass (High)

Table 6. pH and Acid Neutralising Capacity (ANC) compliance for the River Dee and Bala Lake Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB111067051990	Mynach	300	7.15	29	Pass (High)	-	-	Not Assessed
GB111067051900	Tryweryn – Dee to Mynach	294	7.06	35	Pass (High)	-	-	Not Assessed
GB111067051980	Tryweryn – Mynach to Llyn Celyn	288	6.82	35	Pass (High)	119	12	Pass (High)
GB111067051960	Meloch	496	7.17	29	Pass (High)	-	-	Not Assessed
GB111067052240	Dee – Alwen to Llyn Tegid / Bala Lake	1	7.09	36	Pass (High)	-	-	Not Assessed
GB111067052060	Dee – Ceiriog to Alwen	70	7.71	37	Pass (High)	-	-	Not Assessed
GB111067051610	Ceiriog – upstream of Teirw	-	-	-	Not Assessed	-	-	Not Assessed
GB111067051910	Ceiriog – confluence Dee to Teirw	578	-	-	Not Assessed	-	-	Not Assessed
GB111067057080*	Dee – Chester Weir to Ceiriog	671	-	-	Not Assessed	-	-	Not Assessed

*This water body does not have targets regarding acidity.

Table 7. Trophic Diatom Index (TDI) compliance for the River Dee and Bala Lake Special Area of Conservation. Confidence in the result is categorised as described in the Methods section.

Water Body ID	Water body Name	Result
GB111067051990	Mynach	Not Assessed
GB111067051900	Tryweryn - Dee to Mynach	Not Assessed
GB111067051980	Tryweryn - Mynach to Llyn Celyn	Not Assessed
GB111067051960	Meloch	Not Assessed
GB111067052240	Dee - Alwen to Llyn Tegid	Not Assessed
GB111067052060	Dee - Ceiriog to Alwen	Fail (Very Certain)
GB111067051610	Ceiriog - upstream of Teirw	Not Assessed
GB111067051910	Ceiriog - confluence Dee to Teirw	Not Assessed
GB111067057080	Dee - Chester Weir to Ceiriog	Fail (Very Certain)

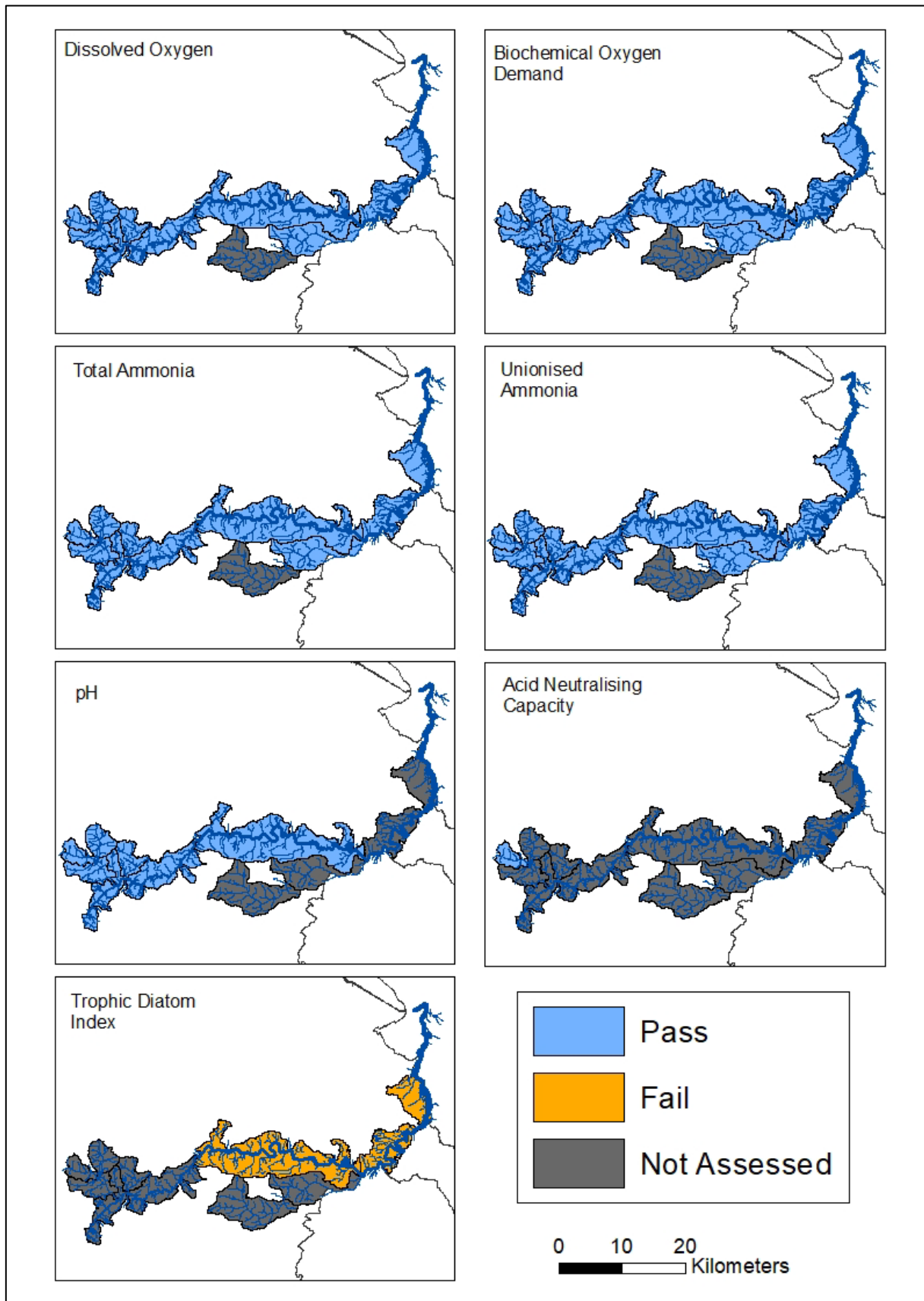


Figure 1. Maps showing compliance for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, pH, Acid Neutralising Capacity (ANC) and Trophic Diatom Index (TDI) for the River Dee and Bala Lake Special Area of Conservation. Water bodies shaded blue pass their target, water bodies shaded yellow fail their target and water bodies shaded grey were not assessed.

Afon Gwyrfai a Llyn Cwellyn

Afon Gwyrfai is a small river in Gwynedd with a base-poor geology. The river's source drains the flanks of Snowdon and the catchment includes a large natural lake, Llyn Cwellyn. Much of the catchment lies within the Eryri National Park and consists of semi-natural habitats, sheep farming, and forestry. Further downstream, as the river approaches Foryd Bay near Caernarfon, land use is more intensive. There are no large settlements within the catchment. The river is divided into two water bodies, upstream and downstream of Llyn Cwellyn. Llyn Cwellyn and the river above it have a history of acidification (Rimes 1992; Goldsmith *et al.* 2005)

Organic Pollution

All DO, BOD, Total Ammonia and Unionised Ammonia targets were passed with High confidence in both of the Gwyrfai water bodies.

Metrics Regarding Acidity

The lower water body "Gwyrfai - downstream of Cwellyn" passed its pH and ANC targets with High confidence. The water body above Llyn Cwellyn ("Gwyrfai - upstream of Cwellyn"), passed its pH target with Low confidence but failed its ANC target with High confidence. Nevertheless, a mean ANC value of 59.4 does not suggest a severe acidification pressure in the upper river.

TDI

Neither of the relevant water bodies were assessed for TDI.

Table 8. Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) compliance of the Afon Gwyrfai a Llyn Cwellyn Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	DO 10 %ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg l ⁻¹)	Number of Samples	BOD Result
GB110065054191	Gwyrfai - upstream of Cwellyn	22517	96.7	35	Pass (High)	1.05	35	Pass (High)
GB110065054190	Gwyrfai - downstream of Cwellyn	22504	97.5	37	Pass (High)	1.05	36	Pass (High)

Table 9. Total Ammonia (T-NH₃) and Unionised Ammonia (U-NH₃) compliance for the Afon Gwyrfai a Llyn Cwellyn Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB110065054191	Gwyrfai - upstream of Cwellyn	22517	200	12.3	29	Pass (High)	0.16	30	Pass (High)
GB110065054190	Gwyrfai - downstream of Cwellyn	22504	200	18.8	30	Pass (High)	0.04	29	Pass (High)

Table 10. pH and Acid Neutralising Capacity (ANC) compliance for the Afon Gwyrfai a Llyn Cwellyn Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB110065054191	Gwyrfai - upstream of Cwellyn	22517	6.61	35	Pass (Low)	59	35	Fail (High)
GB110065054190	Gwyrfai - downstream of Cwellyn	22504	7.53	37	Pass (High)	153	37	Pass (High)

Table 11. Trophic Diatom Index (TDI) compliance for the Afon Gwyrfai a Llyn Cwellyn Special Area of Conservation. Confidence in the result is categorised as described in the Methods section.

Water Body ID	Water Body Name	Result
GB110065054191	Gwyrfai - upstream of Cwellyn	Not Assessed
GB110065054190	Gwyrfai - downstream of Cwellyn	Not Assessed

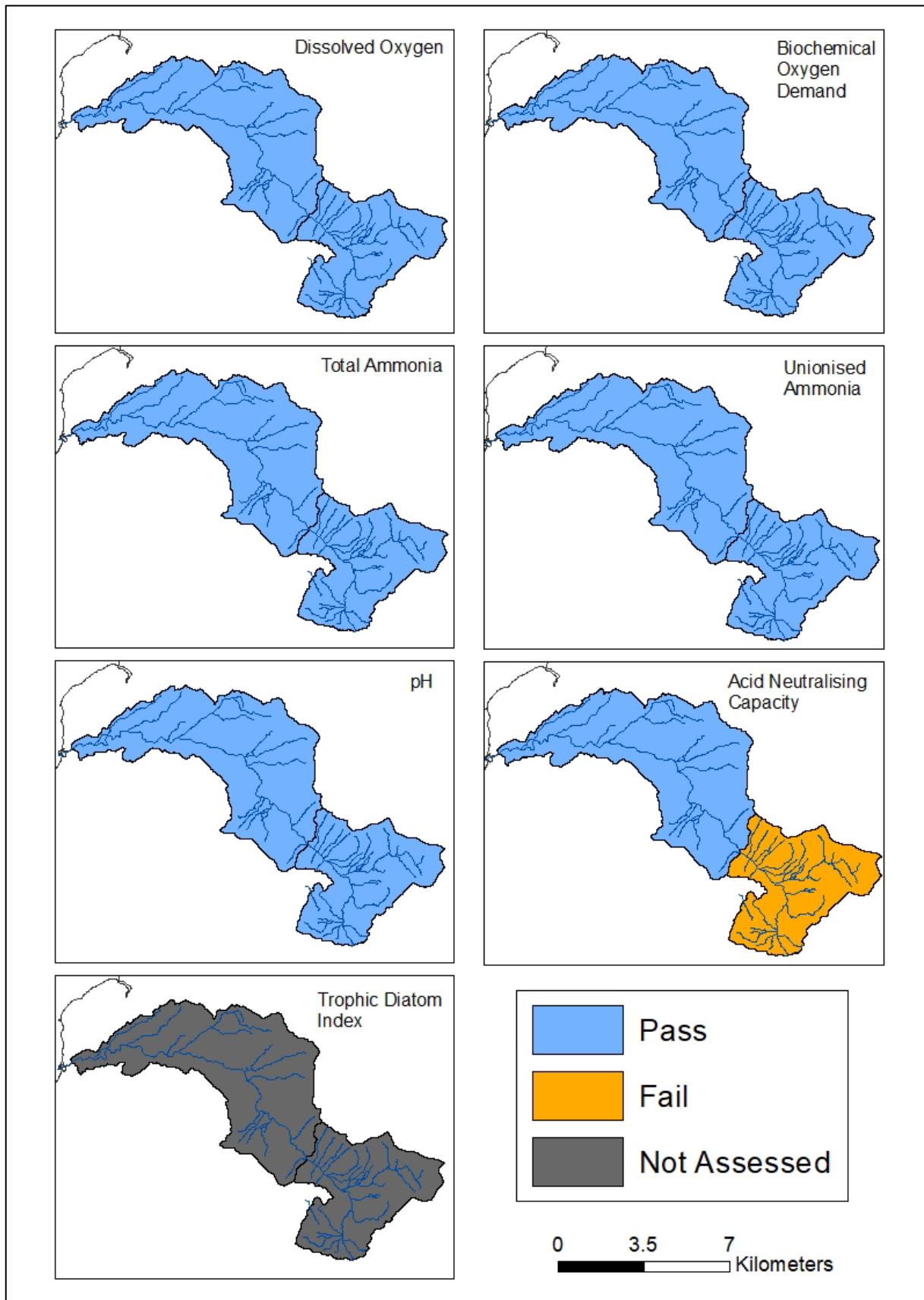


Figure 2. Maps showing compliance for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, pH, Acid Neutralising Capacity (ANC) and Trophic Diatom Index (TDI) for the Afon Gwyrfai a Llyn Cwellyn Special Area of Conservation. Water bodies shaded blue pass their target, water bodies shaded yellow fail their target and water bodies shaded grey were not assessed.

Coedydd Derw a Safleoedd Ystlumod Meirion (Afon Glaslyn)

The Afon Glaslyn is a small river in north-west Wales and is part of the Coedydd Derw a Safleoedd Ystlumod Meirion SAC. The river runs through the Eryri National Park before meeting the Dwyryd estuary near Porthmadog.

Organic Pollution

The Glaslyn water bodies passed their DO, BOD, Total Ammonia and Unionised Ammonia targets with High confidence with the exception of DO (passed with Low confidence) and BOD (not assessed) in "Glaslyn - tidal to Afon Croesor".

Metrics Regarding Acidity

Both water bodies passed their pH targets with High confidence and were not assessed for ANC.

TDI

No TDI data were available for the Glaslyn.

Table 12. Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) compliance of the Coedydd Derw a Safleoedd Ystlumod Meirion (Afon Glaslyn) Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	DO 10 %ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg l ⁻¹)	Number of Samples	BOD Result
GB110065053910	Glaslyn - Nanmor to Colwyn	22808	97.0	35	Pass (High)	0.94	35	Pass (High)
GB110065053860	Glaslyn - tidal to Afon Croesor	25553	85.3	12	Pass (Low)	-	-	Not Assessed

Table 13. Total Ammonia (T-NH₃) and Unionised Ammonia (U-NH₃) compliance for the Coedydd Derw a Safleoedd Ystlumod Meirion (Afon Glaslyn) Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB110065053910	Glaslyn - Nanmor to Colwyn	22808	200	19.6	30	Pass (High)	0.17	30	Pass (High)
GB110065053860	Glaslyn - tidal to Afon Croesor	25553	200	51.9	10	Pass (High)	0.70	10	Pass (High)

Table 14. pH and Acid Neutralising Capacity (ANC) compliance for the Coedydd Derw a Safleoedd Ystlumod Meirion (Afon Glaslyn) Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB110065053910	Glaslyn - Nanmor to Colwyn	22808	6.82	35	Pass (High)	-	-	Not Assessed
GB110065053860	Glaslyn - tidal to Afon Croesor	25553	7.08	12	Pass (High)	-	3	Not Assessed

Table 15. Trophic Diatom Index (TDI) compliance for the Coedydd Derw a Safleoedd Ystlumod Meirion (Afon Glaslyn) Special Area of Conservation. Confidence in the result is categorised as described in the Methods section.

Water Body ID	Water Body Name	Result
GB110065053910	Glaslyn - Nanmor to Colwyn	Not Assessed
GB110065053860	Glaslyn - tidal to Afon Croesor	Not Assessed

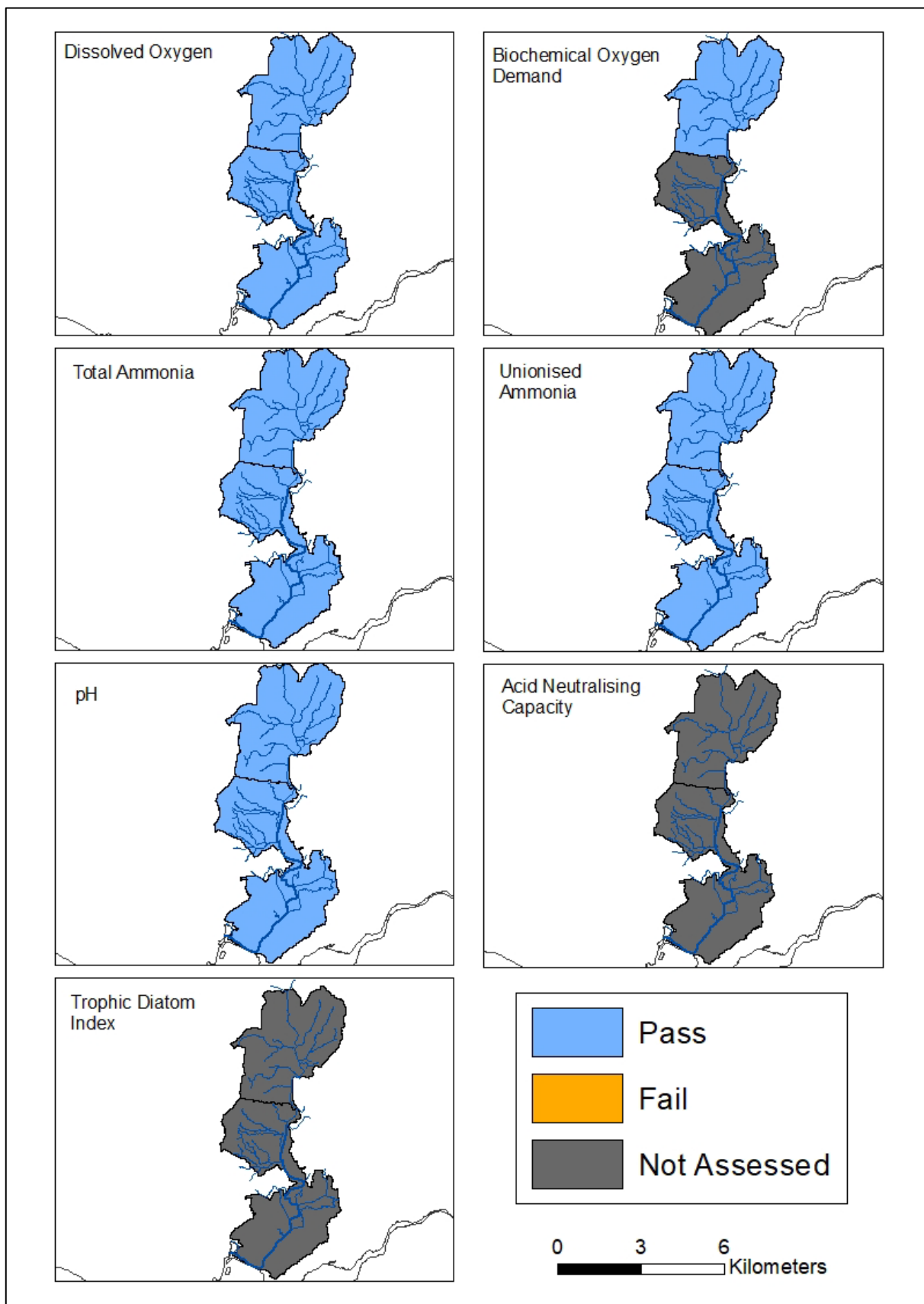


Figure 3. Maps showing compliance for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, pH, Acid Neutralising Capacity (ANC) and Trophic Diatom Index (TDI) for the Coedydd Derw a Safleoedd Ystumod Meirion (Afon Glaslyn) Special Area of Conservation. Water bodies shaded blue pass their target, water bodies shaded yellow fail their target and water bodies shaded grey were not assessed.

Afon Eden – Cors Goch Trawsfynydd

The Eden is a small river in Meirionnydd with a base-poor geology and significant peat influence. Much of the catchment lies within the Eryri National Park. There are no large settlements within the catchment.

One water body, the “Wen (Mawddach)”, was not assessed for any attributes.

Organic Pollution

All assessed water bodies in the Afon Eden – Cors Goch Trawsfynydd SAC met their targets for DO, BOD, Total Ammonia and Unionised Ammonia with High confidence except for DO in the “Eden – upper” which met its target with Low confidence.

Metrics Regarding Acidity

All assessed water bodies in the Afon Eden – Cors Goch Trawsfynydd SAC met their targets regarding acidity with High confidence, with the exception of pH for the “Eden - upper” and ANC for the “Mawddach – lower”, which passed with Low confidence.

TDI

Only one water body on the Eden, the “Mawddach - lower”, was assessed for TDI, which failed with a confidence category of Uncertain.

Table 16. Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) compliance for the Afon Eden – Cors Goch Trawsfynydd Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	DO 10 %ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg l ⁻¹)	Number of Samples	BOD Result
GB110064054630	Eden - upper	29021	91.9	13	Pass (Low)	0.94	12	Pass (High)
GB110064054610	Crawcwellt South	28902	97.7	29	Pass (High)	0.97	29	Pass (High)
GB110064048750	Eden - lower	20064	99.2	29	Pass (High)	0.82	29	Pass (High)
GB110064048740	Wen (Mawddach)	20228	-	0	Not Assessed	-	0	Not Assessed
GB110064048710	Mawddach - lower	20003	96.9	39	Pass (High)	0.96	35	Pass (High)

Table 17. Total Ammonia (T-NH₃) and Unionised Ammonia (U-NH₃) compliance for the Afon Eden - Cors Goch Trawsfynydd Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB110064054630	Eden - upper	29021	200	12.2	13	Pass (High)	0.11	13	Pass (High)
GB110064054610	Crawcwellt South	28902	200	26.8	21	Pass (High)	0.09	21	Pass (High)
GB110064048750	Eden - lower	20064	200	11.9	21	Pass (High)	0.06	21	Pass (High)
GB110064048740	Wen (Mawddach)	20228	200	-	0	Not Assessed	-	0	Not Assessed
GB110064048710	Mawddach - lower	20003	200	10.9	28	Pass (High)	0.07	28	Pass (High)

Table 18. pH and Acid Neutralising Capacity (ANC) compliance for the Afon Eden - Cors Goch Trawsfynydd Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB110064054630	Eden - upper	29021	6.71	13	Pass (Low)	116	12	Pass (High)
GB110064054610	Crawcwellt South	28902	6.92	29	Pass (High)	99	29	Pass (High)
GB110064048750	Eden - lower	20064	7.00	29	Pass (High)	122	29	Pass (High)
GB110064048740	Wen (Mawddach)	20228	-	0	Not Assessed	-	0	Not Assessed
GB110064048710	Mawddach - lower	20003	6.89	39	Pass (High)	90	35	Pass (Low)

Table 19. Trophic Diatom Index (TDI) compliance for the Afon Eden - Cors Goch Trawsfynydd Special Area of Conservation. Confidence in the result is categorised as described in the Methods section.

Water Body ID	Water Body Name	Result
GB110064054630	Eden - upper	Not Assessed
GB110064054610	Crawcwellt South	Not Assessed
GB110064048750	Eden - lower	Not Assessed
GB110064048740	Wen (Mawddach)	Not Assessed
GB110064048710	Mawddach - lower	Fail (Uncertain)

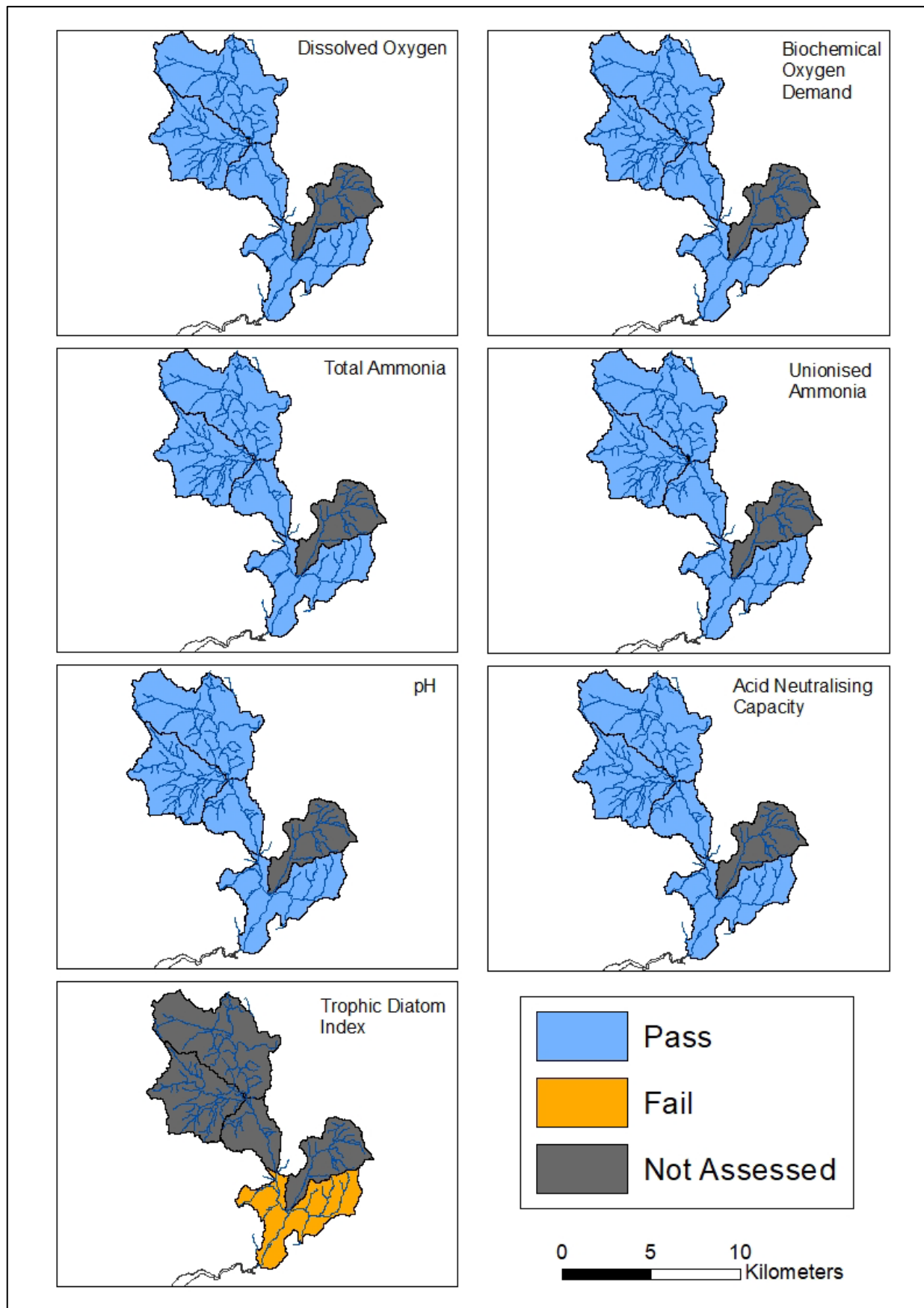


Figure 4. Maps showing compliance for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, pH, Acid Neutralising Capacity (ANC) and Trophic Diatom Index (TDI) for the Afon Eden - Cors Goch Trawsfynydd Special Area of Conservation. Water bodies shaded blue pass their target, water bodies shaded yellow fail their target and water bodies shaded grey were not assessed.

Afon Teifi

The Teifi is a medium-sized river system straddling the boundaries of Ceredigion, Carmarthenshire and Pembrokeshire in south-west Wales, with a predominantly base-poor geology. The river rises on the western flanks of the Elenydd hills and runs through several small towns before meeting the coast at Cardigan. Land use in the catchment includes sheep farms in the uplands and both mixed and dairy farms in the lower reaches.

Two large water bodies on the main stem of the Teifi, “Teifi - Afon Breninig to Afon Dulas” and “Teifi - Afon Dulas to Afon Clettwr”, as well as the “Talog -headwaters to confluence with Tyweli” were not assessed for any attributes.

Organic Pollution

The majority of assessed water bodies passed for DO, with a mix of High and Low confidence. However, there were two water bodies that failed for DO, namely, “Teifi - conf Fflur to conf Breninig” (failed with High confidence) and the “Grannell headwaters to confluence with Teifi” (failed with Low confidence).

Five of the Teifi’s 18 water bodies were not assessed for BOD. Seven of the assessed water bodies passed their targets with a mix of High and Low confidence, and six water bodies failed the target. The “Teifi - Afon Clettwr to Afon Ceri”, “Teifi - Afon Ceri to estuary” and “Ceri - Dulas to conf Teifi” failed their BOD target with High confidence. The “Teifi - conf Fflur to conf Breninig”, “Dulas - headwaters to confluence with Cych” and “Cych - headwaters to confluence with Teifi” failed their BOD target with Low confidence. The majority of the BOD failures were in the lower catchment.

All assessed water bodies passed their Unionised Ammonia target with High confidence, and all assessed water bodies passed their Total Ammonia target with a mix of High and Low confidence results.

Metrics Regarding Acidity

For pH, 15 of the Teifi’s 18 water bodies were assessed and all of those assessed reached the target with High confidence. Three water bodies, “Teifi - headwaters to confluence with Meurig”, “Teifi - conf Fflur to conf Breninig” and “Clettwr - headwaters to confluence with Teifi” were assessed for ANC and all met the target with High confidence.

TDI

Only two water bodies on the Teifi were assessed for TDI, “Ceri - headwaters to conf Dulas” and “Grannell - headwaters to confluence with Teifi”. Both of these water bodies failed the TDI target with a confidence category of Quite Certain and Very Certain, respectively.

Table 20. Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) compliance for the Afon Teifi Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	DO 10 %ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg l ⁻¹)	Number of Samples	BOD Result
GB110062043540	Teifi - headwaters to confluence with Meurig	83001	88.7	44	Pass (High)	1.25	34	Pass (High)
GB110062043501	Teifi - conf Fflur to conf Breninig	34403	81.5	41	Fail (High)	1.52	31	Fail (Low)
GB110062043566	Teifi - Afon Breninig to Afon Dulas	None	-	0	Not Assessed	-	0	Not Assessed
GB110062043490	Groes - headwaters to confluence with Teifi	89118	91.4	35	Pass (High)	1.36	25	Pass (Low)
GB110062039250	Brefi - headwaters to confluence with Teifi	87179	88.4	10	Pass (Low)	-	0	Not Assessed
GB110062039240	Dulas - headwaters to conf Teifi	83006	88.5	33	Pass (High)	1.41	26	Pass (Low)
GB110062039230	Grannell - headwaters to confluence with Teifi	83007	82.9	13	Fail (Low)	-	0	Not Assessed
GB110062043565	Teifi - Afon Dulas to Afon Clettwr	None	-	0	Not Assessed	-	0	Not Assessed
GB110062039220	Clettwr - headwaters to confluence with Teifi	83009	88.5	31	Pass (Low)	1.36	30	Pass (Low)
GB110062038980	Talog - headwaters to confluence with Tyweli	34198	-	0	Not Assessed	-	0	Not Assessed
GB110062039020	Tyweli - confluence with Talog to confluence with Teifi	83003	93.1	35	Pass (High)	0.98	34	Pass (High)
GB110062039140	Cerdin - headwaters to confluence with Teifi	34197	91.4	34	Pass (High)	1.12	33	Pass (High)
GB110062039010	Dulas - headwaters to confluence with Cych	34488	88.5	33	Pass (High)	1.95	33	Fail (Low)
GB110062039041	Cych - headwaters to confluence with Teifi	34488	88.5	33	Pass (High)	1.95	33	Fail (Low)
GB110062043564	Teifi - Afon Clettwr to Afon Ceri	34401	87.7	33	Pass (Low)	2.09	33	Fail (High)

Water Body ID	Water Body Name	Sampling Site	DO 10 %ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg l ⁻¹)	Number of Samples	BOD Result
GB110062039190	Ceri - headwaters to conf Dulas	34585	89.4	29	Pass (Low)	1.29	29	Pass (Low)
GB110062039110	Ceri - Dulas to conf Teifi	34486	88.5	35	Pass (High)	2.09	34	Fail (High)
GB110062043563	Teifi - Afon Ceri to estuary	34401	87.7	33	Pass (Low)	2.09	33	Fail (High)

Table 21. Total Ammonia (T-NH₃) and Unionised Ammonia (U-NH₃) compliance for the Afon Teifi Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB110062043540	Teifi - headwaters to confluence with Meurig	83001	200	53.5	32	Pass (High)	0.33	32	Pass (High)
GB110062043501	Teifi - conf Fflur to conf Breninig	34403	200	48.4	29	Pass (High)	0.50	29	Pass (High)
GB110062043566	Teifi - Afon Breninig to Afon Dulas	-	200	-	0	Not Assessed	-	0	Not Assessed
GB110062043490	Groes - headwaters to confluence with Teifi	89118	200	32.9	18	Pass (High)	0.83	18	Pass (High)
GB110062039250	Brefi - headwaters to confluence with Teifi	87179	200	-	6	Not Assessed	-	6	Not Assessed
GB110062039240	Dulas - headwaters to conf Teifi	83006	200	50.2	27	Pass (Low)	0.86	27	Pass (High)
GB110062039230	Grannell - headwaters to confluence with Teifi	83007	250	39.4	9	Pass (Low)	0.86	9	Pass (High)
GB110062043565	Teifi - Afon Dulas to Afon Clettwr	None	200	-	0	Not Assessed	-	0	Not Assessed
GB110062039220	Clettwr - headwaters to confluence with Teifi	83009	200	106.3	23	Pass (High)	1.72	22	Pass (High)
GB110062038980	Talog - headwaters to confluence with Tyweli	34198	250	-	0	Not Assessed	-	0	Not Assessed
GB110062039020	Tyweli - confluence with Talog to confluence with Teifi	83003	200	27.6	28	Pass (High)	0.24	28	Pass (High)
GB110062039140	Cerdin - headwaters to confluence with Teifi	34197	200	28.5	27	Pass (High)	0.28	27	Pass (High)
GB110062039010	Dulas - headwaters to confluence with Cych	34488	200	143.8	26	Pass (Low)	1.77	26	Pass (High)
GB110062039041	Cych - headwaters to confluence with Teifi	34488	200	143.8	26	Pass (Low)	1.77	26	Pass (High)
GB110062043564	Teifi - Afon Clettwr to Afon Ceri	34401	200	92.3	26	Pass (High)	1.33	26	Pass (High)
GB110062039190	Ceri - headwaters to conf Dulas	34585	200	67.9	21	Pass (High)	0.63	21	Pass (High)
GB110062039110	Ceri - Dulas to conf Teifi	34486	200	130.3	28	Pass (Low)	1.39	28	Pass (High)
GB110062043563	Teifi - Afon Ceri to estuary	34401	250	92.3	26	Pass (High)	1.33	26	Pass (High)

Table 22. pH and Acid Neutralising Capacity (ANC) compliance for the Afon Teifi Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB110062043540	Teifi - headwaters to confluence with Meurig	83001	6.91	44	Pass (High)	154	42	Pass (High)
GB110062043501	Teifi - conf Fflur to conf Breninig	34403	7.00	41	Pass (High)	352	11	Pass (High)
GB110062043566	Teifi - Afon Breninig to Afon Dulas	-	-	0	Not Assessed	-	-	Not Assessed
GB110062043490	Groes - headwaters to confluence with Teifi	89118	7.40	35	Pass (High)	-	-	Not Assessed
GB110062039250	Brefi - headwaters to confluence with Teifi	87179	7.22	10	Pass (High)	-	-	Not Assessed
GB110062039240	Dulas - headwaters to conf Teifi	83006	7.56	37	Pass (High)	-	-	Not Assessed
GB110062039230	Grannell - headwaters to confluence with Teifi	83007	7.61	13	Pass (High)	-	-	Not Assessed
GB110062043565	Teifi - Afon Dulas to Afon Clettwr	None	-	0	Not Assessed	-	-	Not Assessed
GB110062039220	Clettwr - headwaters to confluence with Teifi	83009	7.69	31	Pass (High)	335	11	Pass (High)
GB110062038980	Talog - headwaters to confluence with Tyweli	34198	-	0	Not Assessed	-	-	Not Assessed
GB110062039020	Tyweli - confluence with Talog to confluence with Teifi	83003	7.61	35	Pass (High)	-	-	Not Assessed
GB110062039140	Cerdin - headwaters to confluence with Teifi	34197	7.55	34	Pass (High)	-	-	Not Assessed
GB110062039010	Dulas - headwaters to confluence with Cych	34488	7.66	33	Pass (High)	-	-	Not Assessed
GB110062039041	Cych - headwaters to confluence with Teifi	34488	7.66	33	Pass (High)	-	-	Not Assessed
GB110062043564	Teifi - Afon Clettwr to Afon Ceri	34401	7.65	39	Pass (High)	-	-	Not Assessed
GB110062039190	Ceri - headwaters to conf Dulas	34585	7.61	29	Pass (High)	-	-	Not Assessed
GB110062039110	Ceri - Dulas to conf Teifi	34486	7.63	35	Pass (High)	-	-	Not Assessed
GB110062043563	Teifi - Afon Ceri to estuary	34401	7.65	39	Pass (High)	-	-	Not Assessed

Table 23. Trophic Diatom Index (TDI) compliance for the Afon Teifi Special Area of Conservation. Confidence in the result is categorised as described in the Methods section.

Water Body ID	Water Body Name	Result
GB110062043540	Teifi - headwaters to confluence with Meurig	Not Assessed
GB110062043501	Teifi - conf Fflur to conf Brennig	Not Assessed
GB110062043566	Teifi - Afon Brennig to Afon Dulas	Not Assessed
GB110062043490	Groes - headwaters to confluence with Teifi	Not Assessed
GB110062039250	Brefi - headwaters to confluence with Teifi	Not Assessed
GB110062039240	Dulas - headwaters to conf Teifi	Not Assessed
GB110062039230	Grannell - headwaters to confluence with Teifi	Fail (Very Certain)
GB110062043565	Teifi - Afon Dulas to Afon Clettwr	Not Assessed
GB110062039220	Clettwr - headwaters to confluence with Teifi	Not Assessed
GB110062038980	Talog - headwaters to confluence with Tyweli	Not Assessed
GB110062039020	Tyweli - confluence with Talog to confluence with Teifi	Not Assessed
GB110062039140	Cerdin - headwaters to confluence with Teifi	Not Assessed
GB110062039010	Dulas - headwaters to confluence with Cych	Not Assessed
GB110062039041	Cych - headwaters to confluence with Teifi	Not Assessed
GB110062043564	Teifi - Afon Clettwr to Afon Ceri	Not Assessed
GB110062039190	Ceri - headwaters to conf Dulas	Fail (Quite Certain)
GB110062039110	Ceri - Dulas to conf Teifi	Not Assessed
GB110062043563	Teifi - Afon Ceri to estuary	Not Assessed

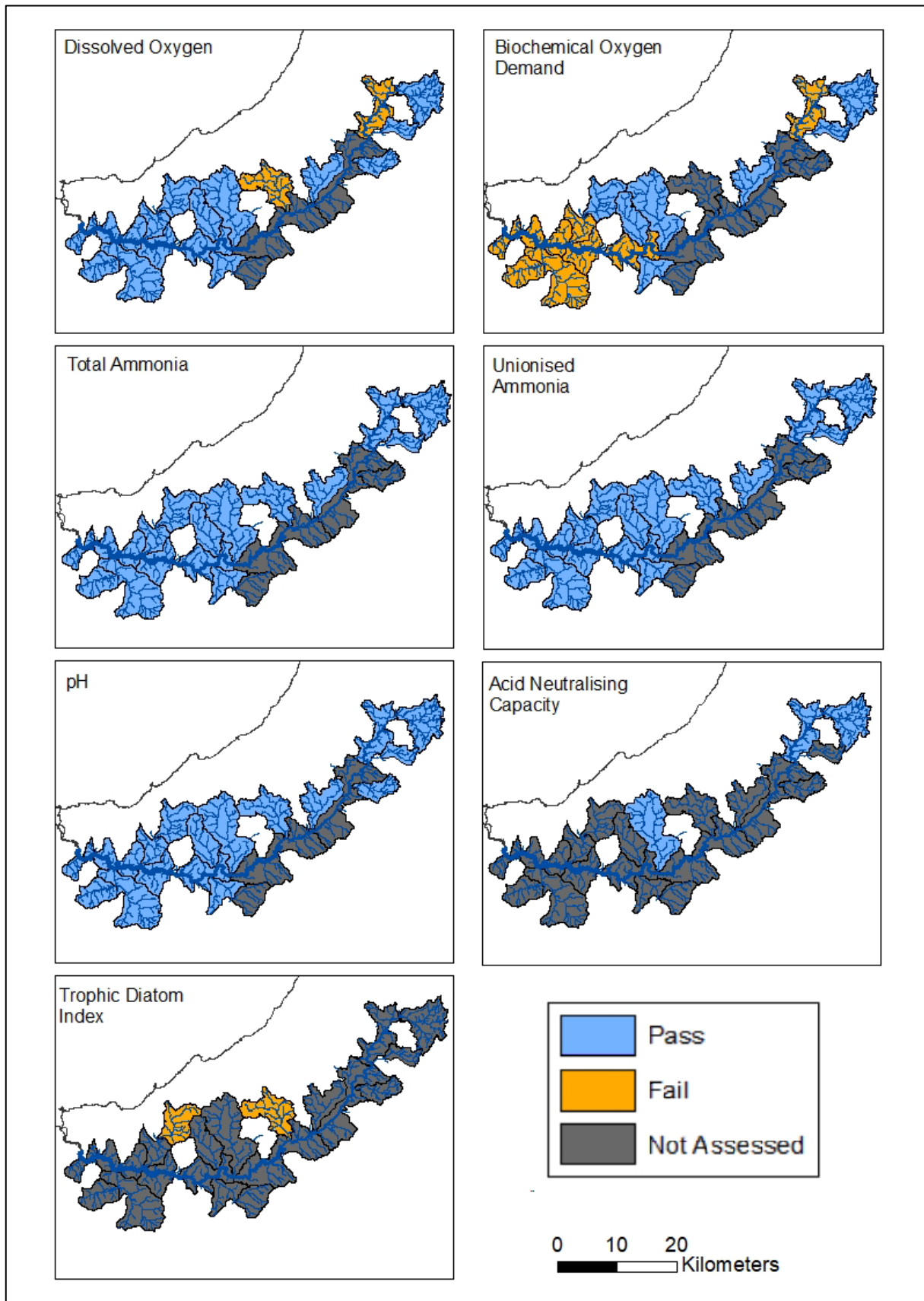


Figure 5. Maps showing compliance for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, pH, Acid Neutralising Capacity (ANC) and Trophic Diatom Index (TDI) for the Afon Teifi Special Area of Conservation. Water bodies shaded blue pass their target, water bodies shaded yellow fail their target and water bodies shaded grey were not assessed.

Afonydd Cleddau

Afonydd Cleddau in Pembrokeshire consists of two adjacent sub-catchments discharging into Milford Haven. The Eastern Cleddau is regulated by two reservoirs whereas the Western Cleddau has a relatively un-regulated flow regime. Land use in the Afonydd Cleddau catchment includes mixed and dairy farms.

Two water bodies in the Afonydd Cleddau SAC were not assessed for any attributes (“Nant y Bugail - headwaters to conf with Cleddau N” and “Cleddau North - H'waters to conf with W. Cleddau”). The “Syfynwy - headwaters to Llys-y-fran” was assessed for BOD only and the “Longford Book HW to conf with E. Cleddau” has been assessed for TDI only.

The Afonydd Cleddau SAC has several water bodies failing for multiple water quality attributes. It is the only SAC found to have recurrent Total Ammonia failures and the only failure for Unionised Ammonia.

Organic Pollution

The majority of assessed water bodies passed for DO with a mix of High and Low confidence, however, four water bodies in the mid- to lower catchment failed for DO with Low confidence, namely: “W Cleddau - Anghof conf to Cartlett Brook conf”, “Cartlett Brook - headwaters to conf with W. Cleddau”, “Syfynwy - Llys-y-fran to conf with E Cleddau” and “Deepford Brook - headwaters to conf with Syfynwy”.

The target for BOD was not met in 11 of the 15 water bodies assessed, five of which failed with High confidence. The distribution of these failures is widespread across the catchment, with most High-confidence failures being in the Western Cleddau sub-catchment.

The target for Total Ammonia was met in 11 of the 15 water bodies assessed with a mix of High and Low confidence. Four water bodies failed for Total Ammonia, three with High confidence (“Deepford Brook - headwaters to conf with Syfynwy”, “Cartlett Brook -headwaters to conf with W. Cleddau”, “Rudbaxton Water – headwaters to conf with W. Cleddau”) and one with Low confidence (“Anghof - headwaters to conf with Western Cleddau”). Three of these failing water bodies are in the lower catchment, with the Anghof failure being higher in the catchment.

All assessed water bodies passed their Unionised Ammonia target with High confidence, with the exception of “Rudbaxton Water - headwaters to conf with W. Cleddau”, which failed its target with Low confidence.

Metrics Regarding Acidity

Of the 15 water bodies assessed for pH, all passed their target with High confidence. Eight water bodies were assessed for ANC and all passed their target with High confidence.

TDI

Of the 11 water bodies assessed for TDI, only one water body passed (“Wern - headwaters to conf with Eastern Cleddau”) with a confidence category of Quite Certain. Nine water bodies failed their TDI target with a confidence category of Quite or Very Certain, and one water body, the “Camrose brook - headwaters to conf with W. Cleddau”, failed with a confidence category of Uncertain. The majority of TDI failures were on the Western Cleddau sub-catchment, although several of the Eastern Cleddau water bodies were not assessed.

Table 24. Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) compliance for the Afonydd Cleddau Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	DO 10%ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg l ⁻¹)	Number of Samples	BOD Result
Western Cleddau	-	-	-	-	-	-	-	-
GB110061038670	W Cleddau - headwaters to conf with Cleddau North	83786	90.7	30	Pass (High)	1.47	28	Pass (Low)
GB110061038660	Nant y Bugail - headwaters to conf with Cleddau N.	-	-	-	Not Assessed	-	-	Not Assessed
GB110061038680	Cleddau North - H'waters to conf with W. Cleddau	-	-	-	Not Assessed	-	-	Not Assessed
GB110061038651	Western Cleddau - Cleddau North to Anghof conf	85017	87.4	34	Pass (Low)	1.62	32	Fail (Low)
GB110061038690	Anghof - headwaters to conf with Western Cleddau	85003	89.9	34	Pass (High)	2.09	32	Fail (High)
GB110061031340	W Cleddau - Anghof conf to Cartlett Brook conf	32803	81.4	20	Fail (Low)	1.90	27	Fail (High)
GB110061031350	Spittal Brook - headwaters to conf with W. Cleddau	85004	91.6	28	Pass (High)	1.73	27	Fail (Low)
GB110061031180	Camrose Brook - headwaters to conf with W. Cleddau	85006	86.1	34	Pass (Low)	1.67	27	Fail (Low)
GB110061031190	Rudbaxton Water - HW to conf with W. Cleddau	85035	85.0	27	Pass (Low)	3.29	26	Fail (High)
GB110061031330	Cartlett Brook - HW to conf with W. Cleddau	85008	83.7	36	Fail (Low)	2.58	27	Fail (High)
Eastern Cleddau	-	-	-	-	-	-	-	-
GB110061038320	Eastern Cleddau - headwaters to conf with Wern	32498	91.9	35	Pass (High)	1.14	35	Pass (High)
GB110061038310	Wern - headwaters to conf with Eastern Cleddau	32496	91.3	35	Pass (High)	1.20	35	Pass (High)
GB110061038290	E. Cleddau - conf with Wern to conf with Syfynwy	32495	91.4	35	Pass (High)	1.53	35	Fail (Low)
GB110061038300	Syfynwy - headwaters to Llysy-fran	73775	-	-	Not Assessed	1.34	32	Pass (High)

Water Body ID	Water Body Name	Sampling Site	DO 10%ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg l ⁻¹)	Number of Samples	BOD Result
GB110061030700	Syfywly - Llys-y-fran to conf with E Cleddau	32406	84.2	13	Fail (Low)	-	-	Not Assessed
GB110061030670	Eastern Cleddau - conf with Syfywly to tidal limit	88181	89.0	35	Pass (High)	1.58	33	Fail (Low)
GB110061030680	Longford Brook - HW to conf with E. Cleddau	-	-	-	Not Assessed	-	-	Not Assessed
GB110061030660	Narbeth Brook - headwaters to conf with E. Cleddau	32407	89.4	28	Pass (High)	1.84	27	Fail (Low)
GB110061030690	Deepford Brook - headwaters to conf with Syfywly	86005	83.7	37	Fail (Low)	2.72	30	Fail (High)

Table 25. Total Ammonia (T-NH₃) and Unionised Ammonia (U-NH₃) compliance for the Afonydd Cleddau Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
Western Cleddau	-	-	-	-	-	-	-	-	-
GB110061038670	W Cleddau - headwaters to conf with Cleddau North	83786	200	108.9	24	Pass (Low)	0.45	26	Pass (High)
GB110061038660	Nant y Bugail - headwaters to conf with Cleddau N.	-	200	-	-	Not Assessed	-	-	Not Assessed
GB110061038680	Cleddau North - H'waters to conf with W. Cled	-	200	-	-	Not Assessed	-	-	Not Assessed
GB110061038651	Western Cleddau - Cleddau North to Anghof conf	85017	200	145.9	26	Pass (Low)	1.16	26	Pass (High)
GB110061038690	Anghof - headwaters to conf with Western Cleddau	85003	200	208.5	28	Fail (Low)	2.79	28	Pass (High)
GB110061031340	W Cleddau - Anghof conf to Cartlett Brook conf	32803	200	188.6	20	Pass (Low)	1.38	20	Pass (High)
GB110061031350	Spittal Brook - headwaters to conf with W. Cleddau	85004	250	244.2	20	Pass (Low)	1.62	20	Pass (High)
GB110061031180	Camrose Brook - headwaters to conf with W. Cleddau	85006	200	188.8	27	Pass (Low)	2.49	27	Pass (High)
GB110061031190	Rudbaxton Water - HW to conf with W. Cleddau	85035	200	2461.4	21	Fail (High)	34.99	20	Fail (Low)
GB110061031330	Cartlett Brook - HW to conf with W. Cleddau	85008	250	541.6	28	Fail (High)	6.85	28	Pass (High)
Eastern Cleddau	-	-	-	-	-	-	-	-	-
GB110061038320	Eastern Cleddau - headwaters to conf with Wern	32498	200	38.5	17	Pass (High)	0.25	17	Pass (High)
GB110061038310	Wern - headwaters to conf with Eastern Cleddau	32496	200	27.5	26	Pass (High)	0.45	26	Pass (High)
GB110061038290	E. Cleddau - conf with Wern to conf with Syfynwy	32495	200	53.0	26	Pass (High)	0.73	26	Pass (High)
GB110061038300	Syfynwy - headwaters to Llysy-fran	-	200	-	-	Not Assessed	-	-	Not Assessed

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB110061030700	Syfyfnywy - Llys-y-fran to conf with E Cleddau	32406	200	161.4	13	Pass (Low)	2.21	13	Pass (High)
GB110061030670	Eastern Cleddau - conf with Syfyfnywy to tidal limit	88181	200	63.9	26	Pass (High)	1.02	26	Pass (High)
GB110061030680	Longford Brook - HW to conf with E. Cleddau	-	200	-	-	Not Assessed	-	-	Not Assessed
GB110061030660	Narbeth Brook - headwaters to conf with E. Cleddau	32407	250	106.8	19	Pass (High)	2.12	19	Pass (High)
GB110061030690	Deepford Brook - headwaters to conf with Syfyfnywy	86005	200	352.0	28	Fail (High)	3.54	28	Pass (High)

Table 26. pH and Acid Neutralising Capacity (ANC) compliance for the Afonydd Cleddau Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
Western Cleddau	-	-	-	-	-	-	-	-
GB110061038670	W Cleddau - headwaters to conf with Cleddau North	83786	7.59	30	Pass (High)	-	-	Not Assessed
GB110061038660	Nant y Bugail - headwaters to conf with Cleddau N.	-	-	-	Not Assessed	-	-	Not Assessed
GB110061038680	Cleddau North - H'waters to conf with W. Cled	-	-	-	Not Assessed	-	-	Not Assessed
GB110061038651	Western Cleddau - Cleddau North to Anghof conf	85017	7.51	34	Pass (High)	-	-	Not Assessed
GB110061038690	Anghof - headwaters to conf with Western Cleddau	85003	7.58	34	Pass (High)	-	-	Not Assessed
GB110061031340	W Cleddau - Anghof conf to Cartlett Brook conf	32803	7.50	20	Pass (High)	552	8	Pass (High)
GB110061031350	Spittal Brook - headwaters to conf with W. Cleddau	85004	7.56	28	Pass (High)	-	-	Not Assessed
GB110061031180	Camrose Brook - headwaters to conf with W. Cleddau	85006	7.59	34	Pass (High)	708	12	Pass (High)
GB110061031190	Rudbaxton Water - HW to conf with W. Cleddau	85035	7.67	27	Pass (High)	-	-	Not Assessed
GB110061031330	Cartlett Brook - HW to conf with W. Cleddau	85008	7.69	36	Pass (High)	923	12	Pass (High)
Eastern Cleddau	-	-	-	-	-	-	-	-
GB110061038320	Eastern Cleddau - headwaters to conf with Wern	32498	7.51	35	Pass (High)	293	18	Pass (High)
GB110061038310	Wern - headwaters to conf with Eastern Cleddau	32496	7.64	35	Pass (High)	261	16	Pass (High)
GB110061038290	E. Cleddau - conf with Wern to conf with Syfynwy	32495	7.68	35	Pass (High)	-	-	Not Assessed
GB110061038300	Syfynwy - headwaters to Llys-y-fran	-	-	-	Not Assessed	-	-	Not Assessed

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB110061030700	Syfywly - Llys-y-fran to conf with E Cleddau	32406	7.64	13	Pass (High)	476	13	Pass (High)
GB110061030670	Eastern Cleddau - conf with Syfywly to tidal limit	88181	7.70	35	Pass (High)	426	12	Pass (High)
GB110061030680	Longford Brook - HW to conf with E. Cleddau	-	-	-	Not Assessed	-	-	Not Assessed
GB110061030660*	Narbeth Brook - headwaters to conf with E. Cleddau	32407	7.83	28	Pass (High)	-	-	Not Assessed
GB110061030690	Deepford Brook - headwaters to conf with Syfywly	86005	7.62	37	Pass (High)	776	13	Pass (High)

*This water body does not have targets regarding acidity.

Table 27. Trophic Diatom Index (TDI) compliance for the Afonydd Cleddau Special Area of Conservation. Confidence in the result is categorised as described in the Methods section.

Water Body ID	Water Body Name	Result
Western Cleddau	-	-
GB110061038670	W Cleddau - headwaters to conf with Cleddau North	Fail (Quite Certain)
GB110061038660	Nant y Bugail - headwaters to conf with Cleddau N.	Not Assessed
GB110061038680	Cleddau North - H'waters to conf with W. Cled	Not Assessed
GB110061038651	Western Cleddau - Cleddau North to Anghof conf	Not Assessed
GB110061038690	Anghof - headwaters to conf with Western Cleddau	Fail (Very Certain)
GB110061031340	W Cleddau - Anghof conf to Cartlett Brook conf	Fail (Very Certain)
GB110061031350	Spittal Brook - headwaters to conf with W. Cleddau	Fail (Very Certain)
GB110061031180	Camrose Brook - headwaters to conf with W. Cleddau	Fail (Uncertain)
GB110061031190	Rudbaxton Water - HW to conf with W. Cleddau	Fail (Very Certain)
GB110061031330	Cartlett Brook - HW to conf with W. Cleddau	Fail (Very Certain)
Eastern Cleddau	-	-
GB110061038320	Eastern Cleddau - headwaters to conf with Wern	Not Assessed
GB110061038310	Wern - headwaters to conf with Eastern Cleddau	Pass (Quite Certain)
GB110061038290	E. Cleddau - conf with Wern to conf with Syfynwy	Not Assessed
GB110061038300	Syfynwy - headwaters to Llys-y-fran	Not Assessed

Water Body ID	Water Body Name	Result
GB110061030700	Syfyfnyw - Llys-y-fran to conf with E Cleddau	Fail (Very Certain)
GB110061030670	Eastern Cleddau - conf with Syfyfnyw to tidal limit	Not Assessed
GB110061030660	Longford Brook - HW to conf with E. Cleddau	Fail (Very Certain)
GB110061030690	Narbeth Brook - headwaters to conf with E. Cleddau	Not Assessed
GB110061030680	Deepford Brook - headwaters to conf with Syfyfnyw	Fail (Very Certain)

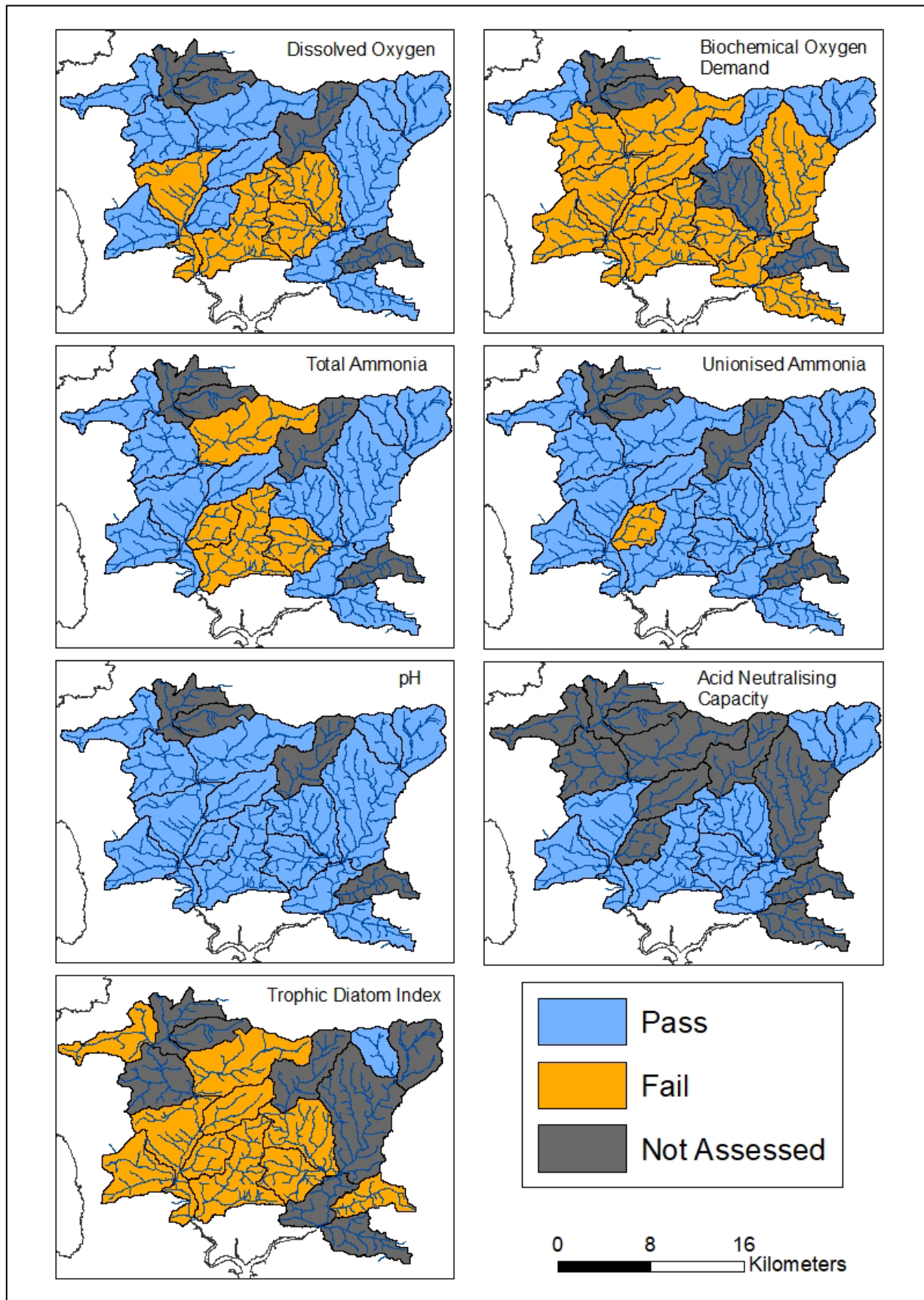


Figure 6. Maps showing compliance for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, pH, Acid Neutralising Capacity (ANC) and Trophic Diatom Index (TDI) for the Afonydd Cleddau Special Area of Conservation. Water bodies shaded blue pass their target, water bodies shaded yellow fail their target and water bodies shaded grey were not assessed.

Afon Tywi

The Tywi is a medium-sized river in south-west Wales that is particularly important for its migratory fish populations. In the headwaters, a large artificial reservoir, Llyn Brianne, regulates the flow for abstraction in the lower reaches of the river. The upper part of the catchment has base-poor geology supporting upland habitats and forestry. The mid- and lower reaches of the Tywi flow through a wide valley which supports mixed and dairy farming. The river is highly active and notable for having an intact floodplain for much of the length of the SAC.

The majority of the Tywi SAC designation lies within a particularly long water body, “Tywi- conf with Llandovery Bran to conf with Cothi” which is 47Km in length. Although the catchment has several notable tributaries, only the main river Tywi is designated as a SAC.

Organic Pollution

One of the three water bodies, the “Tywi - conf with Doethie to conf with Llandovery Bran”, was not assessed for BOD, Total Ammonia or Unionised Ammonia but met its DO target with High confidence. For the other two water bodies, all Organic Pollution (DO, BOD, Total Ammonia and Unionised Ammonia) targets were met; the ammonia targets were passed with High confidence, whereas the DO and BOD results were Low confidence.

Metrics Regarding Acidity

The three water bodies in the Tywi SAC passed their targets regarding acidity with High confidence, although the “Tywi - conf with Doethie to conf with Llandovery Bran” was not assessed for ANC.

TDI

Only one water body on the Tywi was assessed for TDI, “Tywi - confluence with Cothi to spring tidal limit”, which passed its TDI target with a confidence category of Uncertain.

Table 28. Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) compliance for the Afon Tywi Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	DO 10%ile (% saturation)	Number of Samples	DO Result	BOD Mean	Number of Samples	BOD Result
GB110060036350	Tywi - conf with Doethie to conf with Llandoverly Bran	31612	94.0	32	Pass (High)	-	0	Not Assessed
GB110060036250	Tywi- conf with Llandoverly Bran to conf with Cothi	31616	85.2	33	Pass (Low)	1.41	34	Pass (Low)
GB110060029290	Tywi - confluence with Cothi to spring tidal limit	31601	87.5	39	Pass (Low)	1.47	35	Pass (Low)

Table 29. Total Ammonia (T-NH₃) and Unionised Ammonia (U-NH₃) compliance for the Afon Tywi Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB110060036350	Tywi - conf with Doethie to conf with Llandoverly Bran	31612	200	-	0	Not Assessed	-	0	Not Assessed
GB110060036250	Tywi- conf with Llandoverly Bran to conf with Cothi	31616	200	50.1	29	Pass (High)	0.69	28	Pass (High)
GB110060029290	Tywi - confluence with Cothi to spring tidal limit	31601	200	62.8	29	Pass (High)	1.31	28	Pass (High)

Table 30. pH and Acid Neutralising Capacity (ANC) compliance for the Afon Tywi Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB110060036350	Tywi - conf with Doethie to conf with Llandoverly Bran	31612	7.26	32	Pass (High)	Not Assessed	0	Not Assessed
GB110060036250	Tywi- conf with Llandoverly Bran to conf with Cothi	31616	7.63	33	Pass (High)	592	32	Pass (High)
GB110060029290	Tywi - confluence with Cothi to spring tidal limit	31601	7.61	39	Pass (High)	488	34	Pass (High)

Table 31. Trophic Diatom Index (TDI) compliance for the Afon Tywi Special Area of Conservation. Confidence in the result is categorised as described in the Methods section.

Water Body ID	Water Body Name	Result
GB110060036350	Tywi - conf with Doethie to conf with Llandovery Bran	Not Assessed
GB110060036250	Tywi- conf with Llandovery Bran to conf with Cothi	Not Assessed
GB110060029290	Tywi - confluence with Cothi to spring tidal limit	Pass (Uncertain)

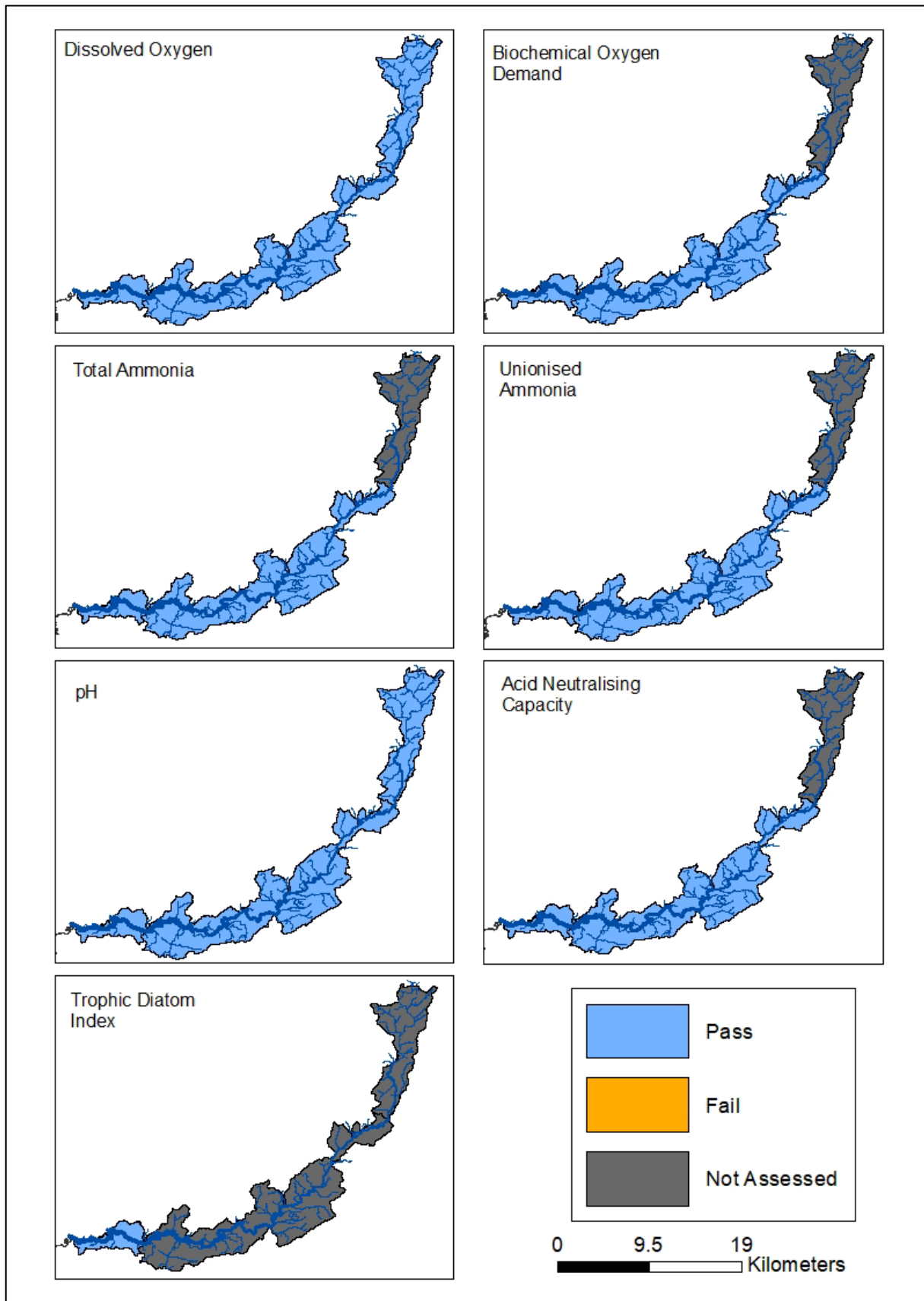


Figure 7. Maps showing compliance for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, pH, Acid Neutralising Capacity (ANC) and Trophic Diatom Index (TDI) for the Afon Tywi Special Area of Conservation. Water bodies shaded blue pass their target, water bodies shaded yellow fail their target and water bodies shaded grey were not assessed.

River Usk

The Usk is a medium-sized catchment in southeast Wales with a primarily sandstone geology. It frequently carries heavy sediment loads after rainfall. A number of reservoirs in the upper catchment modify the river flow. The headwaters drain the uplands of the Brecon Beacons, the mid-reaches pass through Brecon and Abergavenny before the river turns south to meet the Severn Estuary at Newport. Land use in the Usk catchment includes sheep farming in the uplands and both mixed and dairy farms in the lower reaches.

One water body, the “Grwyne-Fechan - source to conf Grwyne Fawr” was not assessed for any attributes. Six water bodies in the Usk SAC have been assessed for TDI only: “Cwm Treweryn - source to River Senni”, “Yscir Fechan - source to conf Afon Yscir”, “Afon Yscir - source to conf Yscir Fechan”, “Afon Yscir - conf Yscir Fechan to conf R Usk”, “Afon Cynrig - source to conf R Usk” and “Grwyne Fawr - source to conf Grwyne-Fechan”.

Organic Pollution

All of the assessed water bodies pass for DO with High confidence with the exception of “Usk - conf Afon Senni to conf Afon Crawnon” and “Usk - conf Olway Brook to New Br” which pass with Low confidence.

The target for BOD was not met in 12 of the 15 water bodies assessed with Low confidence, and they were distributed in the upper and mid-parts of the catchment. All failing water bodies had regular exceedances of targets as opposed to occasional or “one-off” events. Three water bodies, “Usk - conf R Gavenny to conf Olway Bk”, “Usk - conf Olway Bk to New Br” and “Nant Bran - source to conf R Usk” passed BOD with Low confidence.

The majority of the 17 water bodies assessed for Total and Unionised Ammonia passed their targets with High confidence. The “Nant Menasgin - source to conf R Usk” passed its Total Ammonia target with Low confidence, and the “Rhiangoll - source to conf R Usk” failed for Total Ammonia with Low confidence and passed for Unionised Ammonia with Low confidence. The Rhiangoll failed to meet its Total Ammonia target due to a single sample with a very high result in April 2017.

Metrics Regarding Acidity

Only four water bodies were assessed for pH, the “Usk -conf Afon Hydfer to conf Afon Senni”, “Afon Hydfer – source to conf R Usk”, “Afon Crai – source to conf R Usk” and “Caerfanell - source to conf R Usk” and all met the target with High confidence. None of the Usk water bodies were assessed for ANC.

TDI

Of the 18 water bodies assessed for TDI, 12 passed their target with a confidence category of Quite Certain or Very Certain. Four water bodies passed their target with a confidence category of Uncertain. Two water bodies, the “Usk-conf R. Gavenny to conf Olway Brook” and “Usk-conf Olway Brook to New Br”, failed to meet the target with confidence categories of Very Certain and Quite Certain, respectively. The two failing water bodies are the most downstream water bodies on the main stem of the Usk. The pattern of TDI compliance in the Usk SAC is opposite to the pattern of BOD compliance, however the two water bodies that failed for TDI also failed their Phosphorus target (Hatton-Ellis and Jones 2021).

Table 32. Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) compliance for the River Usk Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	DO 10%ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg)	Number of Samples	BOD Result
GB109056039970	Usk - source to conf Afon Hydfer	40866	93.8	34	Pass (High)	1.55	34	Fail (Low)
GB109056033030	Afon Hydfer - source to conf R Usk	40865	94.5	12	Pass (High)	-	0	Not Assessed
GB109056039980	Usk - conf Afon Hydfer to conf Afon Senni	40870	95.3	33	Pass (High)	1.58	32	Fail (Low)
GB109056033040	Cwm Treweryn - source to River Senni	-	-	0	Not Assessed	-	0	Not Assessed
GB109056033050	Senni - source to conf River Usk	40879	94.5	33	Pass (High)	1.84	33	Fail (Low)
GB109056033080	Afon Crai - source to conf R Usk	40875	91.9	28	Pass (High)	1.72	28	Fail (Low)
GB109056040030	Cilieni - source to conf R Usk	40885	94.4	34	Pass (High)	1.58	34	Fail (Low)
GB109056040050	Yscir Fechan - source to conf Afon Yscir	41575	-	0	Not Assessed	-	0	Not Assessed
GB109056040070	Afon Yscir - source to conf Yscir Fechan	-	-	0	Not Assessed	-	0	Not Assessed
GB109056040020	Afon Yscir - conf Yscir Fechan to conf R Usk	40895	-	0	Not Assessed	-	0	Not Assessed
GB109056040081	Usk - conf Afon Senni to conf Afon Cwannon	40914	85.1	34	Pass (Low)	1.76	34	Fail (Low)
GB109056040060	Honddu - source to conf R Usk	40899	93.9	34	Pass (High)	1.80	34	Fail (Low)
GB109056040082	Usk conf Afon Cwannon to conf Gavenny R	40950	92.8	33	Pass (High)	1.73	33	Fail (Low)
GB109056033070	Afon Tarell - source to conf R Usk	40897	96.2	33	Pass (High)	1.69	33	Fail (Low)
GB109056033020	Afon Cynrig - source to conf R Usk	40903	-	0	Not Assessed	-	0	Not Assessed
GB109056040000	Grwyne Fawr - source to conf Grwyne-Fechan	-	-	0	Not Assessed	-	0	Not Assessed
GB109056032980	Grwyne Fawr - conf Grwyne-Fechan to conf R Usk	40937	-	0	Not Assessed	-	0	Not Assessed

Water Body ID	Water Body Name	Sampling Site	DO 10%ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg)	Number of Samples	BOD Result
GB109056039960	Grwyne-Fechan - source to conf Grwyne Fawr	-	-	0	Not Assessed	-	0	Not Assessed
GB109056033000	Caerfanell - source to conf R Usk	40917	92.8	28	Pass (High)	1.51	28	Fail (Low)
GB109056039990	Rhiangoll - source to conf R Usk	40926	92.4	25	Pass (High)	2.08	26	Fail (Low)
GB109056040040	Nant Bran - source to conf R Usk	40893	94.9	28	Pass (High)	1.43	27	Pass (Low)
GB109056033010	Nant Menasgin - source to conf R Usk	40913	91.1	25	Pass (High)	1.71	26	Fail (Low)
GB109056040083	Usk - conf R Gavenny to conf Olway Bk	40970	92.7	32	Pass (High)	1.46	34	Pass (Low)
GB109056026890	Usk - conf Olway Bk to New Br	41000	88.8	32	Pass (Low)	1.50	34	Pass (Low)

Table 33. Total Ammonia (T-NH₃) and Unionised Ammonia (U-NH₃) compliance for the River Usk Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB109056039970	Usk - source to conf Afon Hydfer	40866	200	28.4	29	Pass (High)	0.58	29	Pass (High)
GB109056033030	Afon Hydfer - source to conf R Usk	40865	200	24.5	10	Pass (High)	0.56	10	Pass (High)
GB109056039980	Usk - conf Afon Hydfer to conf Afon Senni	40870	200	25.7	27	Pass (High)	0.43	26	Pass (High)
GB109056033040	Cwm Treweryn - source to River Senni	-	200	-	0	Not Assessed	-	0	Not Assessed
GB109056033050	Senni - source to conf River Usk	40879	200	84.6	26	Pass (High)	1.43	25	Pass (High)
GB109056033080	Afon Crai - source to conf R Usk	40875	200	37.7	22	Pass (High)	0.76	22	Pass (High)
GB109056040030	Cilieni - source to conf R Usk	40885	200	30.7	28	Pass (High)	0.70	28	Pass (High)
GB109056040050	Yscir Fechan - source to conf Afon Yscir	41575	200	-	0	Not Assessed	-	0	Not Assessed
GB109056040070	Afon Yscir - source to conf Yscir Fechan	-	200	-	0	Not Assessed	-	0	Not Assessed
GB109056040020	Afon Yscir - conf Yscir Fechan to conf R Usk	40895	250	-	0	Not Assessed	-	0	Not Assessed
GB109056040081	Usk - conf Afon Senni to conf Afon Crawnon	40914	200	55.0	28	Pass (High)	1.50	28	Pass (High)
GB109056040060	Honddu - source to conf R Usk	40899	200	69.7	29	Pass (High)	1.50	29	Pass (High)
GB109056040082	Usk conf Afon Crawnon to conf Gavenny R	40950	200	61.2	26	Pass (High)	1.98	25	Pass (High)
GB109056033070	Afon Tarell - source to conf R Usk	40897	200	33.9	26	Pass (High)	0.74	25	Pass (High)
GB109056033020	Afon Cynrig - source to conf R Usk	40903	200	-	0	Not Assessed	-	0	Not Assessed
GB109056040000	Grwyne Fawr - source to conf Grwyne-Fechan	-	250	-	0	Not Assessed	-	0	Not Assessed

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB109056032980	Grwyne Fawr - conf Grwyne-Fechan to conf R Usk	40937	250	44.7	26	Pass (High)	1.59	25	Pass (High)
GB109056039960	Grwyne-Fechan - source to conf Grwyne Fawr	-	250	-	0	Not Assessed	-	0	Not Assessed
GB109056033000	Caerfanell - source to conf R Usk	40917	250	25.9	23	Pass (High)	0.55	23	Pass (High)
GB109056039990	Rhiangoll - source to conf R Usk	40926	250	445.6	18	Fail (Low)	16.43	17	Pass (Low)
GB109056040040	Nant Bran - source to conf R Usk	40893	200	56.3	22	Pass (High)	1.91	22	Pass (High)
GB109056033010	Nant Menasgin - source to conf R Usk	40913	200	97.7	18	Pass (Low)	2.76	17	Pass (High)
GB109056040083	Usk - conf R Gavenny to conf Olway Bk	40970	250	58.3	34	Pass (High)	1.77	33	Pass (High)
GB109056026890	Usk - conf Olway Bk to New Br	41000	250	48.2	34	Pass (High)	1.27	33	Pass (High)

Table 34. pH and Acid Neutralising Capacity (ANC) compliance for the River Usk Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB109056039970*	Usk - source to conf Afon Hydfer	40866	-	-	Not Assessed	-	-	Not Assessed
GB109056033030	Afon Hydfer - source to conf R Usk	40865	7.72	12	Pass (High)	-	-	Not Assessed
GB109056039980	Usk - conf Afon Hydfer to conf Afon Senni	40870	7.75	33	Pass (High)	-	-	Not Assessed
GB109056033040*	Cwm Treweryn - source to River Senni	-	-	-	Not Assessed	-	-	Not Assessed
GB109056033050*	Senni - source to conf River Usk	40879	-	-	Not Assessed	-	-	Not Assessed
GB109056033080	Afon Crai - source to conf R Usk	40875	7.59	35	Pass (High)	-	-	Not Assessed
GB109056040030*	Cilieni - source to conf R Usk	40885	-	-	Not Assessed	-	-	Not Assessed
GB109056040050*	Yscir Fechan - source to conf Afon Yscir	41575	-	-	Not Assessed	-	-	Not Assessed
GB109056040070*	Afon Yscir - source to conf Yscir Fechan	40895	-	-	Not Assessed	-	-	Not Assessed
GB109056040020*	Afon Yscir - conf Yscir Fechan to conf R Usk	40895	-	-	Not Assessed	-	-	Not Assessed
GB109056040081*	Usk - conf Afon Senni to conf Afon Crawnon	40914	-	-	Not Assessed	-	-	Not Assessed
GB109056040060*	Honddu - source to conf R Usk	40899	-	-	Not Assessed	-	-	Not Assessed
GB109056040082*	Usk conf Afon Crawnon to conf Gavenny R	40950	-	-	Not Assessed	-	-	Not Assessed
GB109056033070*	Afon Tarell - source to conf R Usk	40897	-	-	Not Assessed	-	-	Not Assessed
GB109056033020*	Afon Cynrig - source to conf R Usk	40903	-	-	Not Assessed	-	-	Not Assessed
GB109056040000	Grwyne Fawr - source to conf Grwyne-Fechan	-	-	-	Not Assessed	-	-	Not Assessed

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB109056032980*	Grwyne Fawr - conf Grwyne-Fechan to conf R Usk	-	-	-	Not Assessed	-	-	Not Assessed
GB109056039960*	Grwyne-Fechan - source to conf Grwyne Fawr	-	-	-	Not Assessed	-	-	Not Assessed
GB109056033000	Caerfanell - source to conf R Usk	40917	7.91	28	Pass (High)	-	-	Not Assessed
GB109056039990*	Rhiangoll - source to conf R Usk	40926	-	-	Not Assessed	-	-	Not Assessed
GB109056040040*	Nant Bran - source to conf R Usk	40893	-	-	Not Assessed	-	-	Not Assessed
GB109056033010*	Nant Menasgin - source to conf R Usk	40913	-	-	Not Assessed	-	-	Not Assessed
GB109056040083*	Usk - conf R Gavenny to conf Olway Bk	40970	-	-	Not Assessed	-	-	Not Assessed
GB109056026890*	Usk - conf Olway Bk to New Br	-	-	-	Not Assessed	-	-	Not Assessed

*These water bodies do not have targets regarding acidity.

Table 35. Trophic Diatom Index (TDI) compliance for the River Usk Special Area of Conservation. Confidence in the result is categorised as described in the Methods section.

Water Body ID	Water Body Name	Result
GB109056039970	Usk - source to conf Afon Hydfer	Pass (Uncertain)
GB109056033030	Afon Hydfer - source to conf R Usk	Pass (Very Certain)
GB109056039980	Usk - conf Afon Hydfer to conf Afon Senni	Not Assessed
GB109056033040	Cwm Treweryn - source to River Senni	Pass (Quite Certain)
GB109056033050	Senni - source to conf River Usk	Not Assessed
GB109056033080	Afon Crai - source to conf R Usk	Not Assessed
GB109056040030	Cilieni - source to conf R Usk	Pass (Uncertain)
GB109056040050	Yscir Fechan - source to conf Afon Yscir	Pass (Quite Certain)
GB109056040070	Afon Yscir - source to conf Yscir Fechan	Pass (Quite Certain)
GB109056040020	Afon Yscir - conf Yscir Fechan to conf R Usk	Pass (Quite Certain)
GB109056040081	Usk - conf Afon Senni to conf Afon Crawnon	Pass (Uncertain)
GB109056040060	Honddu - source to conf R Usk	Pass (Very Certain)
GB109056040082	Usk conf Afon Crawnon to conf Gavenny R	Not Assessed
GB109056033070	Afon Tarell - source to conf R Usk	Pass (Quite Certain)
GB109056033020	Afon Cynrig - source to conf R Usk	Pass (Very Certain)
GB109056040000	Grwyne Fawr - source to conf Grwyne-Fechan	Pass (Quite Certain)

Water Body ID	Water Body Name	Result
GB109056032980	Grwyne Fawr - conf Grwyne-Fechan to conf R Usk	Pass (Quite Certain)
GB109056039960	Grwyne-Fechan - source to conf Grwyne Fawr	Not Assessed
GB109056033000	Caerfanell - source to conf R Usk	Pass (Uncertain)
GB109056039990	Rhiangoll - source to conf R Usk	Pass (Quite Certain)
GB109056040040	Nant Bran - source to conf R Usk	Pass (Uncertain)
GB109056033010	Nant Menasgin - source to conf R Usk	Pass (Very Certain)
GB109056040083	Usk - conf R Gavenny to conf Olway Bk	Fail (Very Certain)
GB109056026890	Usk - conf Olway Bk to New Br	Fail (Quite Certain)

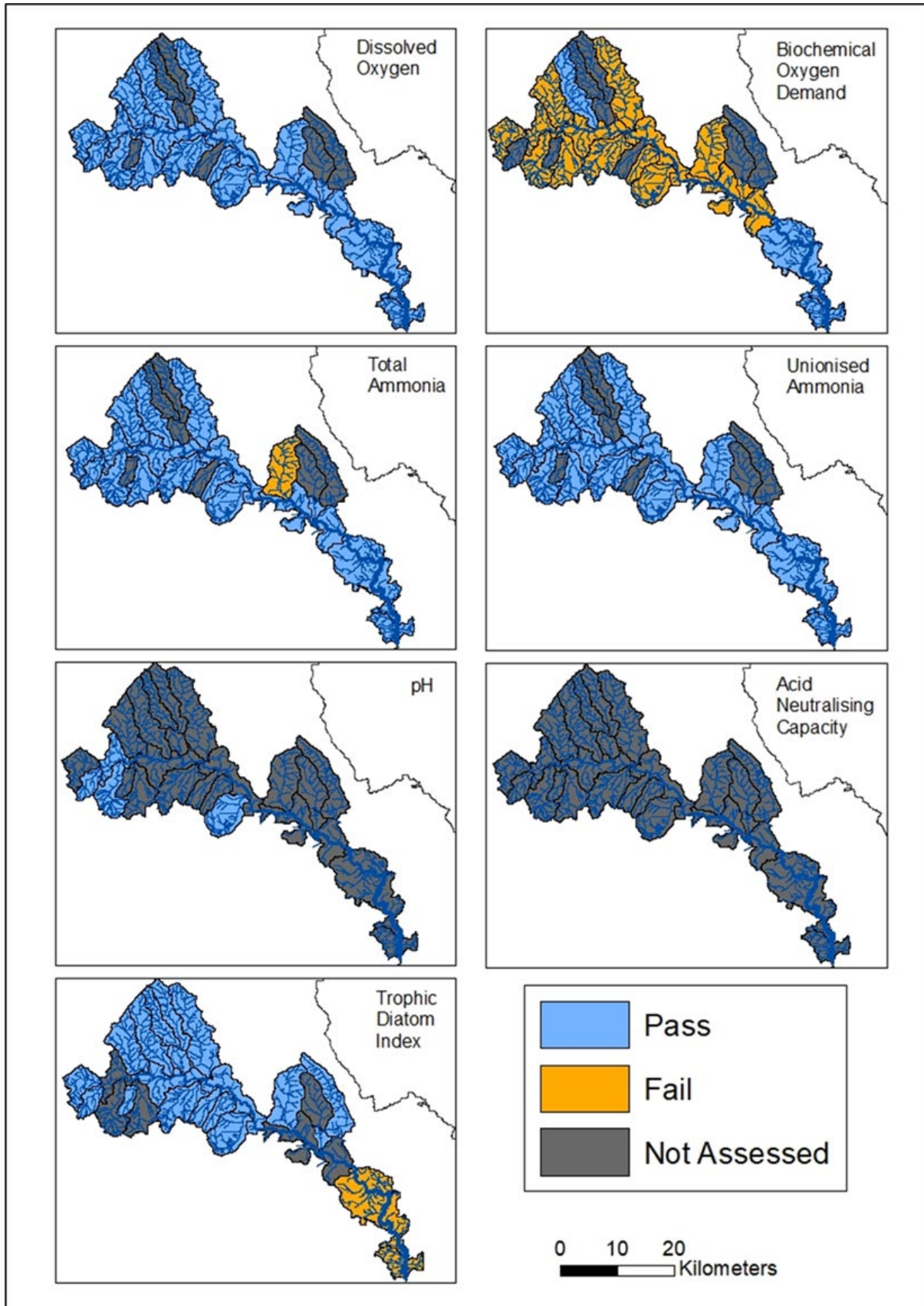


Figure 8. Maps showing compliance for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, pH, Acid Neutralising Capacity (ANC) and Trophic Diatom Index (TDI) for the River Usk Special Area of Conservation. Water bodies shaded blue pass their target, water bodies shaded yellow fail their target and water bodies shaded grey were not assessed.

River Wye

The Wye is the largest Welsh SAC river, with a catchment covering much of southern Powys and part of the Bannau Brycheiniog National Park before crossing the border into England near Hay-on-Wye. It is divided into 45 water bodies in Wales, with two water bodies straddling the border. There are an additional three water bodies entirely in England, and the river re-enters Wales near Monmouth where it forms the border with England. The river is regulated by the Elan Valley Reservoirs for abstraction to the Forest of Dean and at Monmouth.

Two water bodies, the “Afon Elan - Caban-coch Rsvr to conf R Wye” and the “Aran - source to conf R Ithon”, were assessed for TDI only.

Organic Pollution

Of the 45 water bodies in the River Wye SAC, only 17 were assessed for DO. This is partly due to the anomalous DO results for some Wye water bodies in the upper and eastern part of the catchment which were omitted from the assessment, as described in the Methods section above. The majority of water bodies assessed for DO met the target with High confidence, with three water bodies passing with Low confidence.

For BOD, 38 water bodies were assessed, of which 27 met the target with a roughly equal proportion passing with High and Low confidence. There were 11 water bodies that failed the BOD target, all with Low confidence with the exception of “Afon Llynfi - conf Dulas Bk to conf R Wye” which failed with High confidence. The water bodies failing for BOD were distributed across the catchment with no clear pattern, although there is a group of four failing water bodies in the Irfon sub-catchment.

All water bodies apart from two were assessed for Total and Unionised Ammonia, and all passed their targets with High confidence with the exception of “Clettwr Bk - source to conf R Wye”, “Wye - conf R Irfon to Scithwen Brook” and “Triffrwd - source to Dulas” which passed with Low confidence.

Metrics Regarding Acidity

For pH, 26 water bodies were assessed. These water bodies were in the upper catchment and on the main stem of the river, and all met the target with High confidence. For ANC, 12 water bodies in the upper catchment were assessed, and they all passed the target with High confidence with the exception of “Irfon - conf Afon Gwesyn to conf Cledan” which passed with Low confidence.

TDI

Of the 29 water bodies assessed for TDI, 17 passed the target, seven with a confidence category of Quite Certain or Very Certain and 10 with a confidence category of Uncertain. There were 12 water bodies that failed their TDI target, nine with a confidence category of Quite certain or Very Certain, and three with a confidence category of Uncertain. The failing water bodies were distributed across the catchment, however there is a cluster on the Ithon sub-catchment. A clear pattern of co-occurrence of TDI failures and BOD or Phosphorus failures was not apparent on the Wye, however only 65% of water bodies were assessed for TDI.

Table 36. Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) compliance or the River Wye Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	DO 10%ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg l ⁻¹)	Number of Samples	BOD Result
GB109055042320	Wye - conf Afon Tarenig to conf Afon Bidno	50361	-	0	Not Assessed	0.77	36	Pass (High)
GB109055042320	Wye - conf Afon Bidno to conf Afon Marteg	50004	-	0	Not Assessed	0.84	38	Pass (High)
GB109055042340	Afon Bidno - source to conf R Wye	50003	-	0	Not Assessed	0.76	28	Pass (High)
GB109055042280	Wye - conf Afon Marteg to conf Afon Elan	50177	-	0	Not Assessed	1.08	38	Pass (High)
GB109055042310	Afon Marteg - source to conf R Wye	50005	-	0	Not Assessed	1.12	38	Pass (High)
GB109055042260	Afon Elan - Caban-coch Rsvr to conf R Wye	50008	-	0	Not Assessed	-	0	Not Assessed
GB109055042250	Wye - conf Afon Elan to conf R Ithon	50010	97.3	33	Pass (High)	1.36	34	Pass (Low)
GB109055042180	Ithon - source to conf Llaethdy Bk	51354	-	0	Not Assessed	1.13	33	Pass (High)
GB109055042160	Llaethdy Bk - source to conf R Ithon	51352	-	0	Not Assessed	1.20	22	Pass (High)
GB109055042170	Gwenlas Bk - source to conf R Ithon	51353	-	0	Not Assessed	1.74	24	Fail (Low)
GB109055042150	Ithon - conf Llaethdy Bk to conf Gwenlas Bk	50086	-	0	Not Assessed	1.43	33	Pass (Low)
GB109055042130	Camddwr Bk - source to conf R Ithon	50820	-	0	Not Assessed	1.15	21	Pass (High)
GB109055042140	Ithon - conf Gwenlas Bk to conf Camddwr Bk	50086	-	0	Not Assessed	1.43	33	Pass (Low)
GB109055042110	Aran - source to conf R Ithon	50084	-	0	Not Assessed	-	0	Not Assessed
GB109055041960	Mithil Bk - source to conf R Ithon	50825	-	0	Not Assessed	1.26	22	Pass (Low)
GB109055041900	Howey Bk - source to conf R Ithon	50089	-	0	Not Assessed	1.33	22	Pass (Low)
GB109055042080	Nantmel Dulas - source to conf R Ithon	50821	-	0	Not Assessed	1.29	22	Pass (Low)

Water Body ID	Water Body Name	Sampling Site	DO 10%ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg l ⁻¹)	Number of Samples	BOD Result
GB109055042270	Ithon - conf Camddwr Bk to conf R Wye	50090	-	0	Not Assessed	1.27	34	Pass (High)
GB109055042090	Clywedog Bk - source to conf Bachell Bk	50823	-	0	Not Assessed	0.97	22	Pass (High)
GB109055042120	Bachell Bk - source to conf Clywedog Bk	50824	-	0	Not Assessed	-	0	Not Assessed
GB109055042070	Clywedog Bk - conf Bachell Bk to conf R Ithon	50087	-	0	Not Assessed	1.09	28	Pass (High)
GB109055037150	Wye - conf R Ithon to conf R Irfon	50813	-	0	Not Assessed	1.21	33	Pass (High)
GB109055041870	Afon Gwesyn - source to conf R Irfon	57103	89.4	21	Pass (Low)	-	0	Not Assessed
GB109055036760	Irfon - conf Afon Gwesyn to conf Cledan	57712	92.3	34	Pass (High)	-	0	Not Assessed
GB109055036680	Cledan - source to conf R Irfon	50818	91.2	23	Pass (High)	1.51	21	Fail (Low)
GB109055036690	Tirabad Dulas - source to conf R Irfon	50077	87.1	27	Pass (Low)	1.57	26	Fail (Low)
GB109055041880	Afon Cammarch - source to conf R Irfon	50078	90.5	34	Pass (High)	1.47	33	Pass (Low)
GB109055041890	Garth Dulas - source to conf R Irfon	50079	89.7	35	Pass (High)	1.81	34	Fail (Low)
GB109055042190	Chwefru - source to conf R Irfon	50081	93.8	34	Pass (High)	1.41	34	Pass (Low)
GB109055037090	Irfon - conf Cledan to conf R Wye	50080	88.2	35	Pass (High)	1.60	34	Fail (Low)
GB109055037160	Builth Dulas Bk - source to conf R Wye	50501	-	0	Not Assessed	1.32	23	Pass (Low)
GB109055037050	Duhonw - source to conf R Wye	50012	94.8	33	Pass (High)	1.37	34	Pass (Low)
GB109055042200	Edw - source to conf Colwyn Bk	51355	-	0	Not Assessed	1.55	35	Fail (Low)
GB109055042370	Camnant Brook - source to confluence R Edw	50510	-	0	Not Assessed	1.60	29	Fail (Low)
GB109055037130	Edw - conf Camnant Bk to conf Clas Bk	50815	-	0	Not Assessed	1.30	34	Pass (Low)

Water Body ID	Water Body Name	Sampling Site	DO 10%ile (% saturation)	Number of Samples	DO Result	BOD Mean (mg l ⁻¹)	Number of Samples	BOD Result
GB109055037080	Edw - conf Clas Bk to conf R Wye	51305	-	0	Not Assessed	1.30	34	Pass (Low)
GB109055037030	Clettwr Bk - source to conf R Wye	50015	95.1	25	Pass (High)	1.54	26	Fail (Low)
GB109055037060	Bach Howey Bk - source to conf R Wye	50016	-	0	Not Assessed	1.42	29	Pass (Low)
GB109055036990	Scithwen Bk - source to conf R Wye	50017	95.0	25	Pass (High)	1.04	25	Pass (High)
GB109055037115	Wye - conf R Irfon to Scithwen Bk	50440	94.7	34	Pass (High)	1.47	34	Pass (Low)
GB109055036970	Triffrwd - source to Dulas	50811	93.3	26	Pass (High)	2.02	21	Fail (Low)
GB109055036920	Dulas Bk - source to conf Afon Llynfi	50094	94.4	12	Pass (High)	-	0	Not Assessed
GB109055036950	Afon Llynfi - conf Dulas Bk to conf R Wye	50098	88.4	31	Pass (Low)	1.88	31	Fail (High)
GB109055037116*	Wye - Scithwen Bk to Bredwardine Br (Wales)	50018	-	0	Not Assessed	-	0	Not Assessed
GB109055037111	Wye - conf Walford Bk to Bigsweir Br	50032	89.7	34	Pass (High)	1.70	34	Fail (Low)

*This is a cross-border unit so assessment applies to the Welsh section only.

Table 37. Total Ammonia (T-NH₃) and Unionised Ammonia (U-NH₃) compliance for the River Wye Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB109055042320	Wye - conf Afon Tarenig to conf Afon Bidno	50361	200	9.4	29	Pass (High)	0.03	29	Pass (High)
GB109055042320	Wye - conf Afon Bidno to conf Afon Marteg	50004	200	9.8	32	Pass (High)	0.11	32	Pass (High)
GB109055042340	Afon Bidno - source to conf R Wye	50003	200	9.7	29	Pass (High)	0.10	29	Pass (High)
GB109055042280	Wye - conf Afon Marteg to conf Afon Elan	50177	200	20.5	32	Pass (High)	0.17	32	Pass (High)
GB109055042310	Afon Marteg - source to conf R Wye	50005	200	41.8	32	Pass (High)	1.01	32	Pass (High)
GB109055042260	Afon Elan – C. Coch Rsvr to conf R Wye	50008	200	-	0	Not Assessed	-	0	Not Assessed
GB109055042250	Wye - conf Afon Elan to conf R Ithon	50010	200	66.4	29	Pass (High)	1.74	28	Pass (High)
GB109055042180	Ithon - source to conf Llaethdy Bk	51354	200	29.8	29	Pass (High)	0.40	29	Pass (High)
GB109055042160	Llaethdy Bk - source to conf R Ithon	51352	200	32.7	16	Pass (High)	0.68	16	Pass (High)
GB109055042170	Gwenlas Bk - source to conf R Ithon	51353	200	63.8	23	Pass (High)	1.33	23	Pass (High)
GB109055042150	Ithon - conf Llaethdy Bk to conf Gwenlas Bk	50086	200	37.4	29	Pass (High)	0.82	29	Pass (High)
GB109055042130	Camddwr Bk - source to conf R Ithon	50820	200	52.1	17	Pass (High)	0.61	17	Pass (High)
GB109055042140	Ithon- conf Gwenlas Bk to conf Camddwr Bk	50086	200	37.4	29	Pass (High)	0.82	29	Pass (High)
GB109055042110	Aran - source to conf R Ithon	50084	200	-	0	Not Assessed	-	0	Not Assessed
GB109055041960	Mithil Bk - source to conf R Ithon	50825	200	64.4	18	Pass (High)	0.61	16	Pass (High)
GB109055041900	Howey Bk - source to conf R Ithon	50089	250	47.7	16	Pass (High)	0.83	16	Pass (High)

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB109055042080	Nantmel Dulas - source to conf R Ithon	50821	200	52.9	17	Pass (High)	0.44	17	Pass (High)
GB109055042270	Ithon - conf Camddwr Bk to conf R Wye	50090	200	38.5	22	Pass (High)	1.05	22	Pass (High)
GB109055042090	Clywedog Bk - source to conf Bachell Bk	50823	200	47.7	25	Pass (High)	0.41	17	Pass (High)
GB109055042120	Bachell Bk - source to conf Clywedog Bk	50824	200	14.1	8	Pass (High)	0.15	8	Pass (High)
GB109055042070	Clywedog Bk - conf Bachell Bk to conf R Ithon	50087	200	27.7	17	Pass (High)	0.69	25	Pass (High)
GB109055037150	Wye - conf R Ithon to conf R Irfon	50813	250	31.2	26	Pass (High)	0.57	26	Pass (High)
GB109055041870	Afon Gwesyn - source to conf R Irfon	57103	200	43.1	21	Pass (High)	0.48	21	Pass (High)
GB109055036760	Irfon - conf Afon Gwesyn to conf Cledan	57712	200	24.9	12	Pass (High)	0.30	12	Pass (High)
GB109055036680	Cledan - source to conf R Irfon	50818	200	44.6	15	Pass (High)	0.57	15	Pass (High)
GB109055036690	Tirabad Dulas - source to conf R Irfon	50077	200	42.5	19	Pass (High)	0.94	19	Pass (High)
GB109055041880	Afon Cammarch - source to conf R Irfon	50078	200	73.1	27	Pass (High)	0.80	27	Pass (High)
GB109055041890	Garth Dulas - source to conf R Irfon	50079	200	31.1	28	Pass (High)	0.54	28	Pass (High)
GB109055042190	Chwefru - source to conf R Irfon	50081	200	43.4	29	Pass (High)	0.69	29	Pass (High)
GB109055037090	Irfon - conf Cledan to conf R Wye	50080	200	65.2	27	Pass (High)	1.28	27	Pass (High)
GB109055037160	Builth Dulas Bk - source to conf R Wye	50501	200	29.4	16	Pass (High)	0.47	16	Pass (High)
GB109055037050	Duhonw - source to conf R Wye	50012	200	33.8	29	Pass (High)	0.56	28	Pass (High)
GB109055042200	Edw - source to conf Colwyn Bk	51355	200	68.8	28	Pass (High)	0.66	28	Pass (High)
GB109055042370	Camnant Brook - source to confluence R Edw	50510	200	35.9	23	Pass (High)	0.46	23	Pass (High)

Water Body ID	Water Body Name	Sampling Site	T-NH ₃ Target (µg l ⁻¹)	T-NH ₃ 90%ile (µg l ⁻¹)	Number of Samples	T-NH ₃ Result	U-NH ₃ 95%ile (µg l ⁻¹)	Number of Samples	U-NH ₃ Result
GB109055037130	Edw - conf Camnant Bk to conf Clas Bk	50815	200	30.7	28	Pass (High)	0.58	28	Pass (High)
GB109055037080	Edw - conf Clas Bk to conf R Wye	51305	200	30.7	28	Pass (High)	0.58	28	Pass (High)
GB109055037030	Clettwr Bk - source to conf R Wye	50015	200	106.9	21	Pass (Low)	3.80	20	Pass (High)
GB109055037060	Bach Howey Bk - source to conf R Wye	50016	200	26.2	22	Pass (High)	0.62	22	Pass (High)
GB109055036990	Scithwen Bk - source to conf R Wye	50017	200	21.9	21	Pass (High)	0.45	20	Pass (High)
GB109055037115	Wye - conf R Irfon to Scithwen Bk	50440	200	154.9	29	Pass (Low)	2.89	29	Pass (High)
GB109055036970	Triffrwd - source to Dulas	50811	200	67.2	14	Pass (Low)	0.70	14	Pass (High)
GB109055036920	Dulas Bk - source to conf Afon Llynfi	50094	200	34.6	9	Pass (High)	1.07	9	Pass (High)
GB109055036950	Afon Llynfi - conf Dulas Bk to conf R Wye	50098	200	75.3	25	Pass (High)	1.29	25	Pass (High)
GB109055037116*	Wye - Scithwen Bk to Bredwardine Br (Wales)	50018	200	43.6	26	Pass (High)	1.29	26	Pass (High)
GB109055037111	Wye - conf Walford Bk to Bigsweir Br	50032	250	73.7	33	Pass (High)	1.93	32	Pass (High)

*This is a cross-border unit so assessment applies to the Welsh section only.

Table 38. pH and Acid Neutralising capacity (ANC) compliance for the River Wye Special Area of Conservation. Confidence in the result is classified as High or Low as described in the Methods section.

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB109055042320	Wye - conf Afon Tarenig to conf Afon Bidno	50361	6.88	36	Pass (High)	96	36	Pass (High)
GB109055042320	Wye - conf Afon Bidno to conf Afon Marteg	50004	7.39	41	Pass (High)	-	-	Not Assessed
GB109055042340	Afon Bidno - source to conf R Wye	50003	7.24	36	Pass (High)	97	34	Pass (High)
GB109055042280	Wye - conf Afon Marteg to conf Afon Elan	50177	7.31	41	Pass (High)	180	11	Pass (High)
GB109055042310	Afon Marteg - source to conf R Wye	50005	7.42	41	Pass (High)	328	8	Pass (High)
GB109055042260	Afon Elan - Caban-coch Rsvr to conf R Wye	50008	-	0	Not Assessed	-	0	Not Assessed
GB109055042250	Wye - conf Afon Elan to conf R Ithon	50010	7.43	33	Pass (High)	124	8	Pass (High)
GB109055042180	Ithon - source to conf Llaethdy Bk	51354	7.71	35	Pass (High)	-	-	Not Assessed
GB109055042160	Llaethdy Bk - source to conf R Ithon	51352	7.77	23	Pass (High)	-	-	Not Assessed
GB109055042170	Gwenlas Bk - source to conf R Ithon	51353	7.78	30	Pass (High)	-	-	Not Assessed
GB109055042150	Ithon - conf Llaethdy Bk to conf Gwenlas Bk	50086	7.76	35	Pass (High)	-	-	Not Assessed
GB109055042130**	Camddwr Bk - source to conf R Ithon	50820	-	-	Not Assessed	-	-	Not Assessed
GB109055042140	Ithon - conf Gwenlas Bk to conf Camddwr Bk	50086	7.76	35	Pass (High)	-	-	Not Assessed
GB109055042110**	Aran - source to conf R Ithon	50084	-	-	Not Assessed	-	-	Not Assessed
GB109055041960**	Mithil Bk - source to conf R Ithon	50825	-	-	Not Assessed	-	-	Not Assessed
GB109055041900**	Howey Bk - source to conf R Ithon	50089	-	-	Not Assessed	-	-	Not Assessed

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB109055042080	Nantmel Dulas - source to conf R Ithon	50821	7.64	23	Pass (High)	-	-	Not Assessed
GB109055042270**	Ithon - conf Camddwr Bk to conf R Wye	50090	-	-	Not Assessed	-	-	Not Assessed
GB109055042090	Clywedog Bk - source to conf Bachell Bk	50823	7.62	23	Pass (High)	276	23	Pass (High)
GB109055042120	Bachell Bk - source to conf Clywedog Bk	50824	7.52	12	Pass (High)	-	-	Not Assessed
GB109055042070	Clywedog Bk - conf Bachell Bk to conf R Ithon	50087	7.75	32	Pass (High)	-	-	Not Assessed
GB109055037150	Wye - conf R Ithon to conf R Irfon	50813	7.87	34	Pass (High)	415	12	Pass (High)
GB109055041870	Afon Gwesyn - source to conf R Irfon	57103	6.85	21	Pass (High)	-	-	Not Applicable
GB109055036760	Irfon - conf Afon Gwesyn to conf Cledan	57712	7.15	34	Pass (High)	96	9	Pass (Low)
GB109055036680	Cledan - source to conf R Irfon	50818	7.26	34	Pass (High)	-	-	Not Assessed
GB109055036690	Tirabad Dulas - source to conf R Irfon	50077	7.60	27	Pass (High)	-	-	Not Assessed
GB109055041880	Afon Cammarch - source to conf R Irfon	50078	7.38	24	Pass (High)	210	34	Pass (High)
GB109055041890	Garth Dulas - source to conf R Irfon	50079	7.49	35	Pass (High)	237	34	Pass (High)
GB109055042190	Chwefru - source to conf R Irfon	50081	7.56	34	Pass (High)	-	-	Not Assessed
GB109055037090	Irfon - conf Cledan to conf R Wye	50080	7.60	35	Pass (High)	405	12	Pass (High)
GB109055037160**	Builth Dulas Bk - source to conf R Wye	50501	-	-	Not Assessed	-	-	Not Assessed
GB109055037050**	Duhonw - source to conf R Wye	50012	-	-	Not Assessed	-	-	Not Assessed
GB109055042200**	Edw - source to conf Colwyn Bk	51355	-	-	Not Assessed	-	-	Not Assessed
GB109055042370**	Camnant Brook - source to confluence R Edw	50510	-	-	Not Assessed	-	-	Not Assessed

Water Body ID	Water Body Name	Sampling Site	Mean pH	Number of Samples	pH Result	Mean ANC	Number of Samples	ANC Result
GB109055037130**	Edw - conf Camnant Bk to conf Clas Bk	50815	-	-	Not Assessed	-	-	Not Assessed
GB109055037080**	Edw - conf Clas Bk to conf R Wye	51305	-	-	Not Assessed	-	-	Not Assessed
GB109055037030**	Clettwr Bk - source to conf R Wye	50015	-	-	Not Assessed	-	-	Not Assessed
GB109055037060**	Bach Howey Bk - source to conf R Wye	50016	-	-	Not Assessed	-	-	Not Assessed
GB109055036990**	Scithwen Bk - source to conf R Wye	50017	-	-	Not Assessed	-	-	Not Assessed
GB109055037115	Wye - conf R Irfon to Scithwen Bk	50440	7.86	34	Pass (High)	580	33	Pass (High)
GB109055036970**	Triffrwd - source to Dulas	50811	-	-	Not Assessed	-	-	Not Assessed
GB109055036920**	Dulas Bk - source to conf Afon Llynfi	50094	-	-	Not Assessed	-	-	Not Assessed
GB109055036950**	Afon Llynfi - conf Dulas Bk to conf R Wye	50098	-	-	Not Assessed	-	-	Not Assessed
GB109055037116*	Wye - Scithwen Bk to Bredwardine Br (Wales)	50018	8.05	26	Pass (High)	-	-	Not Assessed
GB109055037111**	Wye - conf Walford Bk to Bigsweir Br	50032	-	-	Not Assessed	-	-	Not Assessed

*This is a cross-border unit so assessment applies to the Welsh section only.

**These water bodies do not have targets regarding acidity.

Table 39. Trophic Diatom Index (TDI) compliance for the River Wye Special Area of Conservation. Confidence in the result is categorised as described in the Methods section.

Water Body ID	Water Body Name	Result
GB109055042330	Wye - conf Afon Tarenig to conf Afon Bidno	Pass (Quite Certain)
GB109055042320	Wye - conf Afon Bidno to conf Afon Marteg	Pass (Uncertain)
GB109055042340	Afon Bidno - source to conf R Wye	Not Assessed
GB109055042280	Wye - conf to conf Afon Marteg to conf Afon Elan	Fail (Quite Certain)
GB109055042310	Afon Marteg - source to conf R Wye	Fail (Uncertain)
GB109055042260	Afon Elan - Caban-coch Rsvr to conf R Wye	Pass (Uncertain)
GB109055042250	Wye - conf Afon Elan to conf R Ithon	Pass (Uncertain)
GB109055042180	Ithon - source to conf Llaethdy Bk	Not Assessed
GB109055042160	Llaethdy Bk - source to conf R Ithon	Not Assessed
GB109055042170	Gwenlas Bk - source to conf R Ithon	Not Assessed
GB109055042150	Ithon - conf Llaethdy Bk to conf Gwenlas Bk	Not Assessed
GB109055042140	Camddwr Bk - source to conf R Ithon	Pass (Very Certain)
GB109055042130	Ithon - conf Gwenlas Bk to conf Camddwr Bk	Pass (Uncertain)
GB109055042110	Aran - source to conf R Ithon	Pass (Very Certain)
GB109055041960	Mithil Bk - source to conf R Ithon	Pass (Very Certain)
GB109055041900	Howey Bk - source to conf R Ithon	Fail (Very Certain)

Water Body ID	Water Body Name	Result
GB109055042080	Nantmel Dulas - source to conf R Ithon	Not Assessed
GB109055042270	Ithon - conf Camddwr Bk to conf R Wye	Fail (Quite Certain)
GB109055042090	Clywedog Bk - source to conf Bachell Bk	Fail (Quite Certain)
GB109055042120	Bachell Bk - source to conf Clywedog Bk	Not Assessed
GB109055042070	Clywedog Bk - conf Bachell Bk to conf R Ithon	Fail (Quite Certain)
GB109055037150	Wye (Avon Gwy) - conf R Ithon to conf R Irfon	Pass (Uncertain)
GB109055041870	Afon Gwesyn - source to conf R Irfon	Pass (Quite Certain)
GB109055036760	Irfon - conf Afon Gwesyn to conf Cledan	Fail (Uncertain)
GB109055036680	Cledan - source to conf R Irfon	Pass (Uncertain)
GB109055036690	Tirabad Dulas - source to conf R Irfon	Pass (Quite Certain)
GB109055041880	Afon Cammarch - source to conf R Irfon	Pass (Uncertain)
GB109055041890	Afon Garth Dulas - source to conf R Irfon	Pass (Uncertain)
GB109055042190	Afon Chwefru - source to conf R Irfon	Fail (Quite Certain)
GB109055037090	Irfon - conf Cledan to conf R Wye	Not Assessed
GB109055037160	Builth Dulas Bk - source to conf R Wye	Fail (Very Certain)
GB109055037050	Duhonw - source to conf R Wye	Pass (Quite Certain)
GB109055042200	Edw - source to conf Colwyn Bk	Pass (Uncertain)
GB109055042370	Camnant Brook - source to confluence R Edw	Fail (Quite Certain)

Water Body ID	Water Body Name	Result
GB109055037130	Edw - conf Camnant Bk to conf Clas Bk	Not Assessed
GB109055037080	Edw - conf Clas Bk to conf R Wye	Pass (Uncertain)
GB109055037030	Clettwr Bk - source to conf R Wye	Not Assessed
GB109055037060	Bach Howey Bk - source to conf R Wye	Not Assessed
GB109055036990	Scithwen Bk - source to conf R Wye	Not Assessed
GB109055037115	Wye - conf R Irfon to Scithwen Bk	Not Assessed
GB109055036970	Triffrwd - source to Dulas	Fail (Uncertain)
GB109055036920	Dulas Bk - source to conf Afon Llynfi	Not Assessed
GB109055036950	Afon Llynfi - conf Dulas Bk to conf R Wye	Fail (Quite Certain)
GB109055037116*	Wye - Scithwen Bk to Brewardine Br	Not Assessed
GB109055037111	Wye - conf Walford Bk to Bigsweir Br	Not Assessed

*This is a cross-border unit so assessment applies to the Welsh section only.

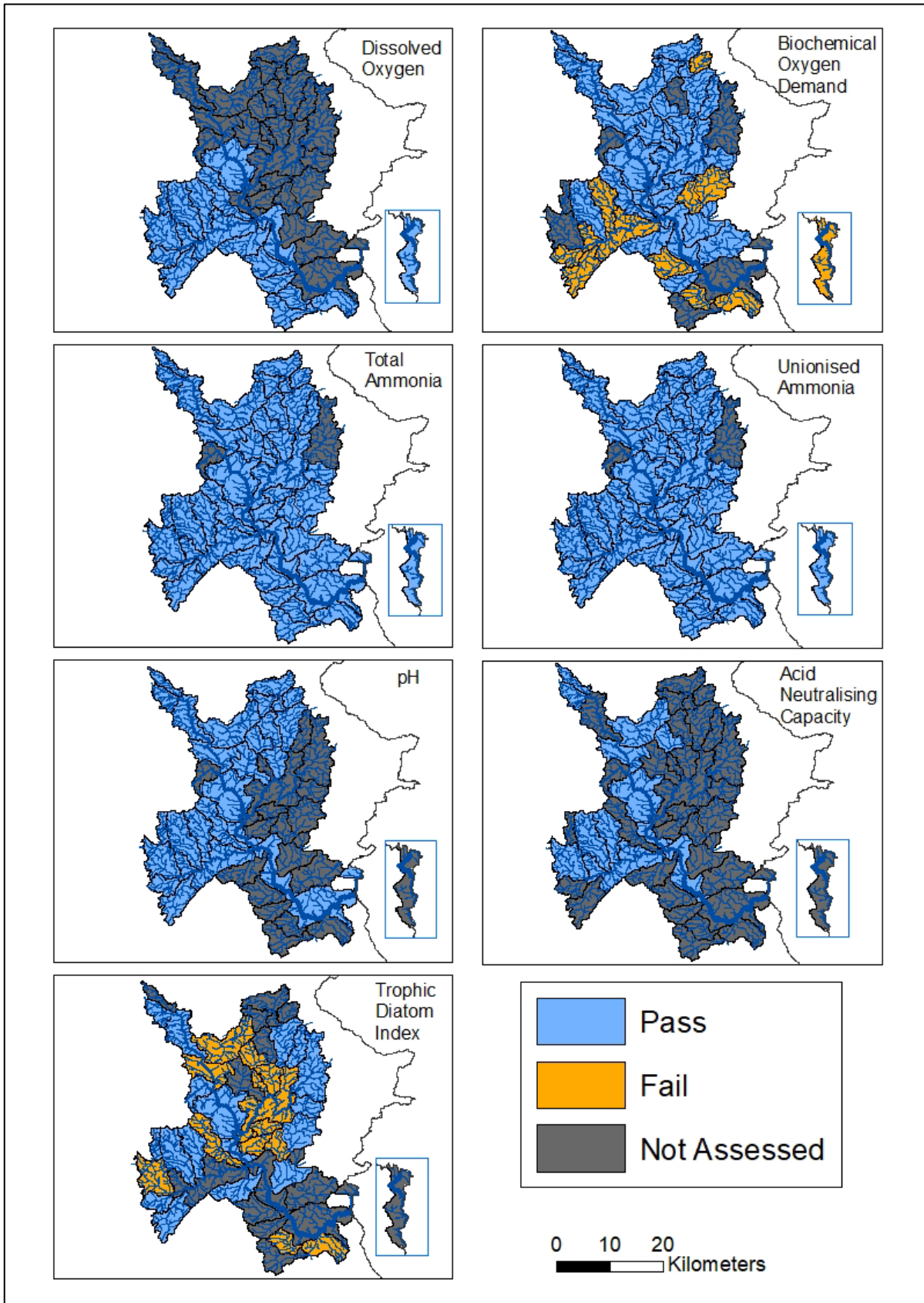


Figure 9. Maps showing compliance for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, pH, Acid Neutralising Capacity (ANC) and Trophic Diatom Index (TDI) for the River Wye Special Area of Conservation. Water bodies shaded blue pass their target, water bodies shaded yellow fail their target and water bodies shaded grey were not assessed. Inset in each figure shows “Wye - conf Walford Bk to Bigsweir Br”.

Relationships Between Water Quality Attribute Failures

Understanding the relationship between attribute failures will help inform measures to address those failures. The table below presents information on the number of water bodies failing for multiple attributes, and combinations of attribute failures. Note that the table includes failures for Phosphorus (Phosphorus data taken from Hatton-Ellis and Jones 2021).

Table 40. Number of water bodies with exceedances for one or multiple water quality attributes. Note these data include Phosphorus failures (Phosphorus data taken from Hatton-Ellis and Jones 2021).

Number of Water Quality Attributes Exceeded	Number of Water Bodies	SACs	Notes
1	36	Afonydd Cleddau Afon Teifi River Usk River Wye Afon Eden - Cors Goch Trawsfynydd Afon Gwyrfai a Llyn Cwellyn River Dee	Majority of these exceedances are for P, with a few for TDI and BOD, and one for ANC.
2	36	Afonydd Cleddau Afon Teifi River Usk River Wye River Dee and Bala Lake	Majority of these exceedances are P with BOD. Also several P with TDI.
3	6	Afonydd Cleddau River Usk River Wye	Majority are P, BOD and TDI.
4	2	Afonydd Cleddau.	P, BOD, TDI with either DO or Total Ammonia.
5	3	Afonydd Cleddau.	P, BOD, TDI, Total Ammonia with either DO or Unionised Ammonia.

These data suggest potential links between failures to meet various targets. Many failures to meet BOD, Trophic Diatom Index, Total Ammonia and Unionised Ammonia targets co-occur with failures to meet Phosphorous targets (Figure 10).

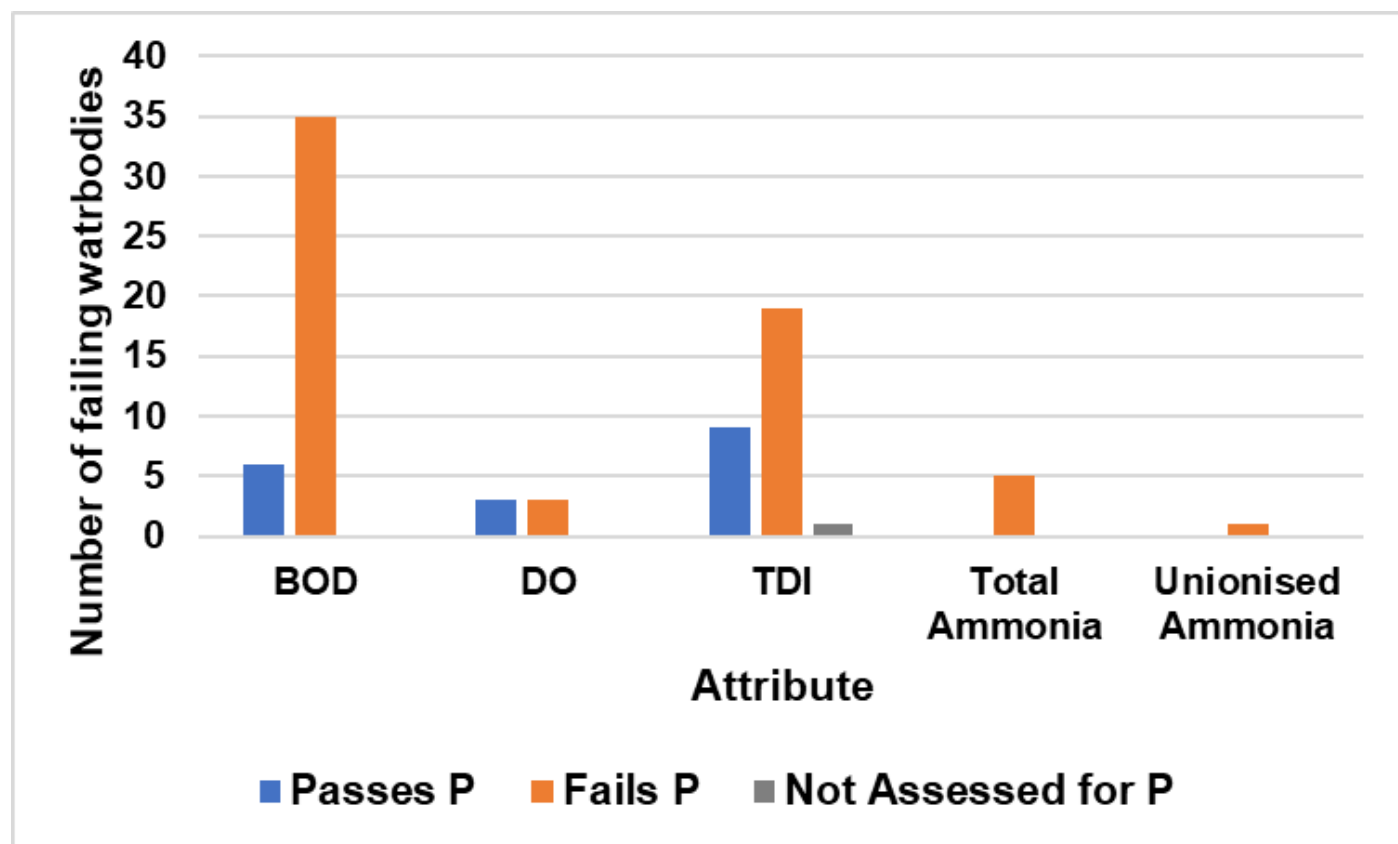


Figure 10. Chart showing co-occurrence of attribute failures with Phosphorus compliance (Phosphorus data taken from Hatton-Ellis and Jones 2021).

Discussion

Data Availability

A total of 127 water bodies were in scope for this assessment, and of these 119 were assessed for one or more attributes. The data were subject to robust quality assurance as described in the Methods section.

Not all water bodies were assessed for all attributes due to the design of NRW's monitoring programmes. Eight water bodies were not assessed at all, and nine water bodies were assessed for TDI only. Notable data gaps include a lack of data for a large proportion of the main river Teifi and several of the Usk tributaries, limited DO data for the Wye and a general lack of TDI data, particularly on rivers in north Wales. Further details on data gaps are provided in Appendix 2.

Overview of Compliance

The results of this assessment demonstrate a general spatial pattern of better water quality compliance in the north Wales SAC rivers than those in mid- and south Wales. The SACs with the most failures are the Afonydd Cleddau, River Usk, River Wye and Afon Teifi. With the exception of the Dee, these results generally mirror the outcome of the Phosphorus compliance assessment (Hatton-Ellis and Jones 2021).

The attributes with the highest number of failing water bodies were BOD and TDI (41 and 29 failing water bodies respectively, see Table 3). BOD and TDI indicate biochemical and biological responses to elevated nutrients. With the exception of one TDI failure on the Eden and two on the Dee, all of these failures are in the Cleddau, Usk, Wye and Teifi catchments.

The majority of the BOD failures were caused by regular target exceedances within the water body dataset as opposed to a small number of high exceedances skewing the mean. The BOD target for SAC rivers is equivalent to near natural conditions, and may be difficult to achieve for those catchments subjected to a higher degree of anthropogenic pressures.

Five water bodies failed their Total Ammonia target, four of these are in the Cleddau catchment and one in the Usk. The failure on the Usk was caused by a severe pollution event on the Rhiangoll tributary (see below), whereas the exceedances on the four Cleddau tributaries were recurrent. The only Unionised Ammonia failure was also in the Cleddau, on Rudbaxton Water.

Six water bodies failed their DO target, four of these were in the Cleddau catchment and two on the upper Teifi. These were all Low confidence failures with the exception of the "Teifi - confluence with Fflur to confluence with Brennig".

No water bodies failed their pH target, and only one failed for ANC on the Gwyrfa. Diatom analyses of Llyn Cwellyn have suggested a historic problem with moderate acidification in the upper catchment, however since the 1980s lake diatom sampling has shown a gradual improvement in acidification impacts (NRW 2022d).

Several water bodies have multiple failures. The Cleddau, Teifi, Usk and Wye have water bodies which failed for two attributes (mostly BOD and TDI), and the Cleddau has additional water bodies which failed for three or four attributes (BOD, TDI, Total Ammonia with either DO or Unionised Ammonia) Further information on the pattern of target exceedances seen in these SACs is provided below.

The data presented here suggest potential links between failures to meet various targets. Many failures to meet BOD, TDI, Total Ammonia and Unionised Ammonia targets co-occur with failures to meet Phosphorous targets (Table 40, Figure 10). Measures addressing phosphorus and ammonia enrichment are likely to improve BOD, TDI and DO compliance.

Afonydd Cleddau

The Afonydd Cleddau SAC has several water bodies failing for multiple water quality attributes, and has the most combined failures of all the SACs (see Tables 3 and 40). The BOD and TDI failures in the Cleddau SAC are numerous and widespread across the catchment. Four water bodies also fail for DO. With the exception of one tributary on the Usk, the Cleddau is the only SAC that has ammonia failures (both Total and Unionised Ammonia).

Total Ammonia exceedances were detected on four tributaries, one in the Eastern Cleddau sub-catchment (the Deepford Brook) and three on the Western Cleddau sub-catchment (“Anghof - headwaters to conf with Western Cleddau”, “Cartlett Brook - HW to conf with W. Cleddau” and “Rudbaxton Water - HW to conf with W. Cleddau”).

These Total Ammonia failures were mostly High confidence and were caused by several target exceedances as opposed to a single high value. The magnitude of the Total Ammonia exceedance in Rudbaxton Water is of particular concern, with a result of 2461 µg/L (90%ile). This water body is also the only one that failed for Unionised Ammonia. This failure is mainly attributed to one high exceedance in November 2018 (which coincides with high exceedances for BOD and Total Ammonia), however there is also a lower-level exceedance in January 2019. All water bodies failing for ammonia (both Total Ammonia and Unionised Ammonia) also failed for Phosphorus (Hatton-Ellis and Jones 2021).

Regarding the Afonydd Cleddau SAC, particularly the Western Cleddau sub-catchment, the results of this compliance assessment, together with Hatton-Ellis and Jones (2021), are consistent with issues related to organic pollution and nutrient enrichment.

Afon Teifi

The majority of failures in the Afon Teifi SAC are BOD failures in the lower catchment. One upper catchment water body, the “Teifi - conf Fflur to conf Breninig”, failed for DO and BOD but passed its other targets including Phosphorus.

The two TDI failures on the Teifi do not co-occur with BOD failures, however one of the TDI failures, the “Ceri – headwaters to conf Dulas”, does fail its Phosphorus target (Hatton-Ellis and Jones 2021).

The results of this compliance assessment together with the Phosphorus compliance assessment Hatton-Ellis and Jones (2021), regarding the lower Teifi, Cych and Ceri, are consistent with issues related to organic pollution and nutrient enrichment.

River Usk

The majority of the failures in the Usk catchment are for BOD. There were 12 water bodies in the upper and mid-catchment that failed their BOD target, and these failures were caused by regular exceedances in the data set indicating chronic elevated BOD. However the failures are all Low confidence.

The widespread and regular nature of these BOD failures is a potential cause for concern, particularly given the extent of failures in the upper part of the catchment. The majority of water bodies that failed for BOD also failed their Phosphorus target (Hatton-Ellis and Jones 2021). However the TDI results for the Usk do not follow this pattern. All water bodies assessed for TDI passed their target, except for the two most downstream water bodies on the main river. This finding would benefit from further investigation.

One tributary, "Rhiangoll - source to conf R Usk" failed to meet its Total Ammonia target due to a single sample with a very high result in April 2017 which coincides with high BOD and Phosphorus results. It is likely that this sample was taken during a pollution event. With the exception of this one high result, the remainder of the samples taken on the Rhiangoll within the three year data period comfortably met the Total Ammonia target.

River Wye

All failures on the Wye were for BOD or TDI, however there is limited co-occurrence of the failures for these two attributes, with only three water bodies failing for both. The distribution of failures is spread across the catchment, although there is a cluster of four water bodies on the Irfon sub-catchment that failed for BOD, and four on the Ithon sub-catchment that failed for TDI.

Regarding the Irfon, Gwenlas Brook, Edw, Camnant Brook, Clettwr Brook, Triffrwd, Llynfi and the "Wye - conf Walford Bk to Bigsweir Br", the BOD failures generally co-occur with Phosphorus failures (Hatton-Ellis and Jones 2021) and may be consistent with issues related to organic pollution and nutrient enrichment. TDI and Phosphorus failures co-occurred less often, however the combined results for these attributes suggest that investigations regarding potential nutrient enrichment in the Ithon sub-catchment may be beneficial.

Recommendations

Recommendations arising from this compliance assessment are summarised below, and should be considered alongside the recommendations of the related Phosphorus compliance assessment (Hatton-Ellis and Jones 2021).

- The data gaps listed in Appendix 2 should be given consideration when planning future monitoring programmes.
- Consideration should be given to achieving an improved resolution of water quality monitoring for the very large water bodies, in particular the “Dee-Chester weir to Ceiriog”, “Wye- Scithwen Brook to Bredwardine Bridge” and “Tywi-Llandoverly Bran to Cothi”. This could be achieved either by subdividing the water bodies, or by monitoring more sample points within each water body to reflect changes in river typology.
- More intensive monitoring (both spatially and temporally) or the use of passive or remote monitoring techniques at strategic locations should be considered to better understand the causes of water quality failures.
- Investigations are required to understand the causes of water quality target failures. These could be WFD Regulations investigations as well as the actions in NRW’s Safle database (protected sites database). Whilst the compliance results must be taken on face value, the confidence of each result may be of use to prioritise investigations and actions.
- The results of this assessment should inform action to address pressures on the river SACs with a particular focus on the Cleddau, Teifi, Usk and Wye catchments. Such action may include holistic catchment-wide river restoration projects such as the 4 Rivers for LIFE project, water company Asset Management Plans, NRW permit reviews and proposals for the new Sustainable Farming Scheme.
- The SAC river Nutrient Management Boards which have been established since the publication of the Phosphorus compliance report should have regard to the results of this assessment when considering management measures.
- The results of this assessment should be used to inform future revisions of NRW’s advice relating to SAC rivers for planning authorities.
- The results of this compliance assessment should be included in any future feature condition assessments of the studied SACs.

Conclusion

Failures to meet water quality targets were reported in the River Dee and Bala Lake, Afon Eden – Cors Goch Trawsfynydd, Afon Gwyrfai a Llyn Cwellyn, Afonydd Cleddau, Afon Teifi, River Usk and River Wye SACs. The majority of failures were for BOD and TDI, with a small number of failures for DO and Total Ammonia, and one failure each for Unionised Ammonia and ANC. No failures were reported for pH.

In terms of this assessment, the SACs with the most target failures were the Afonydd Cleddau, River Usk, River Wye and Afon Teifi. Widespread failures in the Cleddau, Usk and Wye, and failures in the Teifi (mostly in the lower catchment), are consistent with issues related to organic pollution and nutrient enrichment. The SAC rivers in north Wales (Dee, Eden, Gwyrfai and Glaslyn) had fewer failures, and the Tywi had no failures.

Many failures to meet BOD, Trophic Diatom Index, Total Ammonia and Unionised Ammonia targets co-occurred with failures to meet Phosphorous targets. Measures to address Phosphorous and ammonia compliance may improve BOD, TDI and DO compliance.

Proactive measures in partnership with stakeholders are required to address water quality failures, building on existing work such as NRW's extensive river restoration programme, and water company Asset Management Plans. Management measures should take a holistic ecosystem approach to not only address pollution sources, but to also improve the resilience of freshwater ecosystems to the range of pressures affecting them.

When planning management measures, careful interpretation of the results and underlying data presented in this compliance assessment is required. Further investigations are recommended to inform specific interventions.

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Further Reading

[NRW \(Natural Resources Wales\) \(2022\). Core Management Plan Including Conservation Objectives for Afonnydd Cleddau / Cleddau Rivers Special Area of Conservation \(SAC\). Cardiff: Natural Resources Wales.](#)

[NRW \(Natural Resources Wales\) \(2022\). Core Management Plan Including Conservation Objectives for Afon Teifi / River Teifi Special Area of Conservation \(SAC\). Cardiff: Natural Resources Wales.](#)

[NRW \(Natural Resources Wales\) \(2022\). Core Management Plan Including Conservation Objectives for Afon Tywi / River Tywi Special Area of Conservation \(SAC\). Cardiff: Natural Resources Wales.](#)

[NRW \(Natural Resources Wales\) \(2022\). Core Management Plan Including Conservation Objectives for River Wye / Afon Gwy Special Area of Conservation \(SAC\). Cardiff: Natural Resources Wales.](#)

[NRW \(Natural Resources Wales\) \(2022\). Core Management Plan Including Conservation Objectives for River Usk / Afon Wysg Special Area of Conservation \(SAC\). Cardiff: Natural Resources Wales.](#)

[NRW \(Natural Resources Wales\) \(2022\). Core Management Plan Including Conservation Objectives for Afon Eden - Cors Goch Trawsfynydd Special Area of Conservation \(SAC\). Cardiff: Natural Resources Wales.](#)

[NRW \(Natural Resources Wales\) \(2022\). Core Management Plan Including Conservation Objectives for River Dee and Bala Lake Special Area of Conservation \(SAC\). Cardiff: Natural Resources Wales.](#)

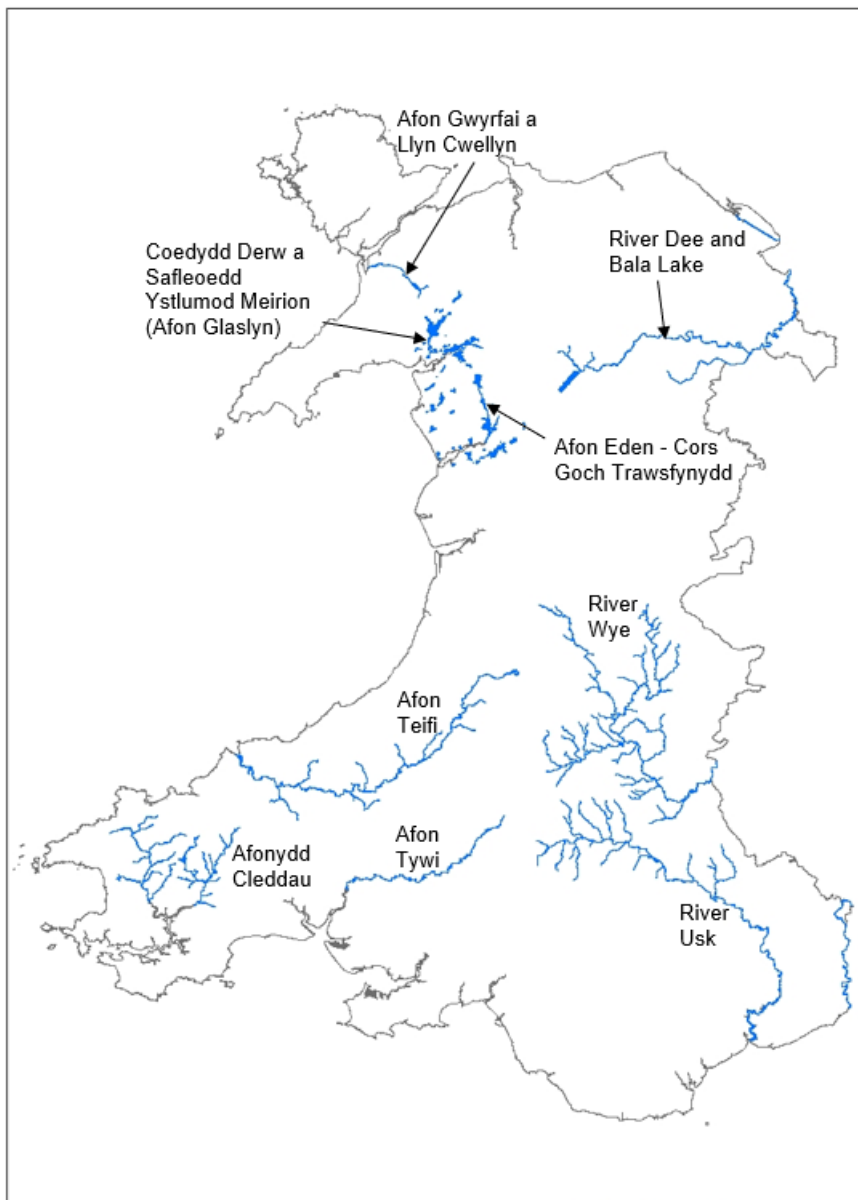
[NRW \(Natural Resources Wales\) \(2022\). Core Management Plan Including Conservation Objectives for Coedydd Derw a Safleodd Ystlumod Meirion Special Area of Conservation \(SAC\). Cardiff: Natural Resources Wales.](#)

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Acknowledgements

Many thanks to Sue Hearn, Rhian Thomas and Dave Johnston for their support and technical input during the production of this compliance assessment.

Appendix 1



The locations of the nine Special Areas of Conservation in Wales assessed in this compliance assessment.

Appendix 2 (Data Gaps)

Due to the risk-based design of Natural Resources Wales' water quality surveillance monitoring, it is not possible to sample and assess every attribute for every water body. However, the tables below highlight the main gaps for consideration when planning future monitoring programmes.

Table 41. Water bodies which were not assessed for any attributes.

Special Area of Conservation	Water Body ID	Water Body Name
River Dee and Bala lake	GB111067051610	Ceiriog - upstream of Teirw
Afon Eden - Cors Goch Trawsfynydd	GB110064048740	Wen (Mawddach)
Afon Teifi	GB110062038980	Talog - headwaters to confluence with Tyweli
Afon Teifi	GB110062043565	Teifi - Afon Dulas to Afon Clettwr
Afon Teifi	GB110062043566	Teifi - Afon Brennig to Afon Dulas
Afonydd Cleddau	GB110061038660	Nant y Bugail - headwaters to conf with Cleddau N.
Afonydd Cleddau	GB110061038680	Cleddau North - H'waters to conf with W. Cled
River Usk	GB109056039960	Grwyne-Fechan - source to conf Grwyne Fawr

Table 42. Water bodies which were assessed for one attribute only.

Special Area of Conservation	Water Body ID	Water Body Name	Attribute Assessed
Afonydd Cleddau	GB110061030680	Longford Brook - HW to conf with E. Cleddau	TDI
River Usk	GB109056033020	Afon Cynrig - source to conf R Usk	TDI
River Usk	GB109056033040	Cwm Treweryn - source to River Senni	TDI
River Usk	GB109056040000	Grwyne Fawr - source to conf Grwyne-Fechan	TDI
River Usk	GB109056040020	Afon Yscir - conf Yscir Fechan to conf R Usk	TDI
River Usk	GB109056040050	Yscir Fechan - source to conf Afon Yscir	TDI
River Usk	GB109056040070	Afon Yscir - source to conf Yscir Fechan	TDI
River Wye	GB109055042110	Aran - source to conf R Ithon	TDI
River Wye	GB109055042260	Afon Elan - Caban-coch Rsvr to conf R Wye	TDI
Afonydd Cleddau	GB110061038300	Syfyntywy - headwaters to Llys-y-fran	BOD

Table 43. Data gaps regarding each Special Area of Conservation.

Special Area of Conservation	Data Gap
River Wye	62% of water bodies not assessed for DO. 36% of water bodies not assessed for TDI.
Afon Teifi	89% of water bodies not assessed for TDI.
Afon Tywi	66% of water bodies not assessed for TDI.
Afon Eden - Cors Goch Trawsfynydd	80% of water bodies not assessed for TDI.
Afon Gwyrfai a Llyn Cwellyn	No water bodies assessed for TDI.
Coedydd Derw a Safleoedd Ystlumod Meirion (Afon Glaslyn)	No water bodies assessed for TDI.
River Dee and Bala Lake	78% of water bodies not assessed for TDI.

Data Archive Appendix

Data outputs associated with this project are archived on server-based storage at Natural Resources Wales.

The data archive contains:

- [A] The final report in Microsoft Word and Portable Document Format (PDF) formats.
- [B] Geographic Information System (GIS) layers in ArcMap format upon which the maps in the report are based.
- [C] A Microsoft Excel spreadsheet entitled SAC Water Quality Assessment Data 2017_19.xlsx summarising the dataset used to undertake this compliance assessment.

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue at <https://libcat.naturalresources.wales> (English Version) and <https://catllyfr.cyfoethnaturiol.cymru> (Welsh Version) by searching 'Dataset Titles'. The metadata is held as record no 125707.

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