River Basin Management Plan Overview Annex Wales

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Mae Rheoliadau'r Amgylchedd Dŵr (Y Gyfarwyddeb Fframwaith Dŵr) (Cymru a Lloegr) 2017 (y cyfeirir atynt fel Rheoliadau'r Gyfarwyddeb Fframwaith Dŵr 2017) yn darparu'r prif fframwaith ar gyfer rheoli'r amgylchedd dŵr yng Nghymru. Wrth wraidd y rheoliadau mae dull rheoli ar lefel yr ecosystem a dull seiliedig ar ddalgylch sy'n ei gwneud yn ofynnol i fesurau gael eu cymryd i annog defnydd cynaliadwy o ddŵr ac i amddiffyn a gwella'r amgylchedd dŵr, gyda'r nod o sicrhau statws da. Maent yn cydnabod bod angen i grwpiau sydd â diddordeb gydweithio gyda'i gilydd er mwyn cynllunio a gweithredu'r gwelliannau, gan fabwysiadu dull cyfannol ac integredig ar gyfer rheoli'r amgylchedd dŵr.

O dan Reoliadau'r Gyfarwyddeb Fframwaith Dŵr 2017, rhaid datblygu Cynllun Rheoli Basn Afon ar gyfer pob ardal basn afon. Caiff y cynlluniau hyn eu cyhoeddi'n gyntaf ym mis Rhagfyr 2009. Maent yn amlinellu'r camau gweithredu sydd angen eu cymryd er mwyn sicrhau statws da ar gyfer mwy o ddyfroedd.

Rhaid i'r cynlluniau (yn ogystal â'r amcanion a'r mesurau sydd ynddynt), gael eu hadolygu a'u diweddaru bob chwe blynedd. Mae Cyfoeth Naturiol Cymru yn arwain ar gyhoeddi'r Cynlluniau Rheoli Basn Afon ar gyfer Gorllewin Cymru ac afon Dyfrdwy, ond mae Asiantaeth yr Amgylchedd yn arwain ar gyhoeddi'r Cynllun Rheoli Basn Afon ar gyfer afon Hafren. Mae Rheoliadau'r Gyfarwyddeb Fframwaith Dŵr 2017 yn nodi bod rhaid cynnal ymgynghoriad cyhoeddus ar fersiynau drafft o'r Cynlluniau Rheoli Basn Afon am chwe mis.

Mae'r ddogfen hon yn amlinellu'r manylion sydd y tu ôl i'r broses o wneud penderfyniadau sydd wedi llywio'r diweddariad hwn o'r Cynlluniau Rheoli Basn Afon drafft yng Nghymru. Mae'n esbonio pob cam yn y broses, gan gysylltu â gwybodaeth fanylach lle y bo'n briodol.

Gwybodaeth ategol

Mae llawer o'r data sy'n ategu'r cynllun hwn ar gael ar gyfer pob corff dŵr yng Nghymru ar wefan Arsylwi Dyfroedd Cymru gan gynnwys:

- · Canlyniadau'r broses ddosbarthu
- · Rhesymau dros beidio â chyflawni statws da
- · Amcanion cyrff dŵr
- · Rhesymau dros amcanion statws eraill
- · Rhwydweithiau monitro
- · Mesurau sydd eu hangen er mwyn gwella cyrff dŵr i sicrhau statws da
- · Cyrff dŵr a addaswyd yn sylweddol

1.1 Yr hyn a gwmpesir gan y ddogfen hon

Mae Rheoli'r amgylchedd dŵr (yr adran nesaf) yn disgrifio pam fod dŵr yn adnodd mor bwysig ac yn crynhoi'r polisïau sy'n llywio sut mae'r amgylchedd dŵr yng Nghymru yn cael ei reoli.

Mae Rheoliadau'r Gyfarwyddeb Fframwaith Dŵr 2017 (adran 3) yn disgrifio nodau ac amcanion Rheoliadau'r Gyfarwyddeb Fframwaith Dŵr 2017, gan gynnwys cymhwyso esemptiadau. Disgrifir y broses a ddefnyddir yng Nghymru ar gyfer cynllunio gwaith rheoli basn afon, gan gynnwys y ffordd mae Cyfoeth Naturiol Cymru yn gweithio gydag eraill. Mae'r adran hon hefyd yn disgrifio sut y datblygwyd y cynllun drafft ar gyfer y trydydd cylch.

Mae Diffinio a disgrifio'r amgylchedd dŵr (adran 4) yn disgrifio sut y rhannwyd a dosbarthwyd yr amgylchedd dŵr at ddibenion gweithredu Rheoliadau'r Gyfarwyddeb Fframwaith Dŵr 2017. Mae'n nodi'r ffordd y mae'r amgylchedd yn cael ei fonitro, a sut mae canlyniadau'r gwaith monitro hwnnw'n cael eu defnyddio i asesu ac adrodd ar statws yr amgylchedd dŵr. Mae'r rhan olaf o'r adran yn disgrifio'r prif heriau sy'n effeithio ar y gwaith o reoli'r amgylchedd dŵr yng Nghymru, sut mae risgiau ar gyfer y dyfodol wedi cael eu hasesu, a sut y nodwyd achosion problemau presennol.

Mae Nodi mesurau ac amcanion (adran 5) yn disgrifio rôl yr arfarniad economaidd ac yn amlinellu'r broses gyffredinol a ddefnyddir ar gyfer pennu'r amcanion amgylcheddol, gan gynnwys amcanion statws corff dŵr a datblygu mesurau.

Mae Crynodeb o'r gwaith ymgysylltu (adran 6) yn trafod y gwaith ymgysylltu rydym wedi'i wneud, gan gynnwys mynediad cyhoeddus at wybodaeth, ymgynghoriadau a rhagolwg.

Mae Gofynion Cynlluniau Rheoli Basn Afon (adran 7) yn amlinellu'r gofynion o dan Reoliad 27(2)(d) o'r Gyfarwyddeb Fframwaith Dŵr ac yn dangos lle y gellid dod o hyd i'r wybodaeth honno.

Mae Mecanweithiau ar gyfer amddiffyn yr amgylchedd dŵr (adran 8) yn darparu diweddariad ar unrhyw fecanweithiau newydd/diwygiedig ac yn cyfeirio at Atodiad Trosolwg 2015 ar gyfer manylion yr holl fecanweithiau sy'n tanategu'r mesurau i wella'r amgylchedd dŵr.

Mae Rhestr termau (adran 9) yn rhestr gynhwysfawr o'r holl acronymau a defnyddir trwy gydol y ddogfen

1. Introduction to this document

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (referred to as WFD Regulations 2017) provides the main framework for managing the water environment in Wales. At its heart is an ecosystem and catchment-based approach that requires measures to be taken to encourage the sustainable use of water and to protect and improve the water environment, with the aim of achieving good status. It recognises that interested groups need to work together to design and implement improvements, taking a holistic and integrated approach to managing the water environment.

Under the WFD Regulations 2017, a River Basin Management Plan (RBMP) must be developed for each River Basin District (RBD). These plans were first published in December 2009. They outline the actions that need to be taken to get more waters to good status.

The plans, (plus the objectives and measures contained within them), must be reviewed and updated every six years. Natural Resources Wales (NRW) leads on publishing the Western Wales and Dee RBMPs, whereas the Environment Agency leads on publishing the Severn RBMP. The WFD Regulations 2017 specify that there must be a public consultation on draft RBMPs for 6 months.

This document sets out the detail behind the decision making which has shaped this update to the third RBMPs for Wales. It explains each step of the process, linking to more detailed information where appropriate.

Supporting information

Much of the data which supports this plan is available for every water body in Wales on **Water Watch Wales** including:

- Classification results
- Reasons for not achieving good status (RNAGs)
- Water body objectives
- Reasons for alternative status objectives
- Monitoring networks
- Measures required to improve water bodies to good status
- Heavily Modified Water Bodies

1.1 What this document covers

Managing the water environment (the next section) describes why water is such an important resource and summarises the policies which shape how the water environment in Wales is managed.

The WFD Regulations 2017 (section 3) describes the aims and objectives of the WFD Regulations 2017 including the application of exemptions. The river basin management planning process used in Wales is described, including how NRW is

working with others. This section also describes how the third cycle plan was developed.

Defining and describing the water environment (section 4) describes how the water environment is divided up and characterised for the purposes of implementing the WFD Regulations 2017. It sets out how the environment is monitored, and the results of that monitoring used to assess and report on the status of the water environment. The latter part of the section describes the main challenges affecting management of the water environment in Wales, how future risks have been assessed and current causes of problems identified.

Identifying measures and objectives (section 5) describes the role of economic appraisal and sets out the overall process used for determining environmental objectives, including water body status objectives and developing measures.

Summary of engagement (section 6) looks at the engagement work we have done including public access to information, consultations and a forward look.

River Basin Management Plan requirements (section 7) sets out the requirements under WFD Regulation 27(2)(d) and shows where that information can be found.

Mechanisms for protecting the water environment (section 8) provides an update on any new/revised mechanisms and links to the 2015 Overview Annex for details of all mechanisms that underpin the measures to improve the water environment.

Glossary (section 9) a comprehensive list of all acronyms used throughout the document.

2. Managing the water environment

Summary of this section

This section provides an introduction to the management of the water environment, describes why water is such an important resource and the policies that shape how the water environment is managed in Wales.

Topics covered:

Importance of water management; policy and legislative context; NRW's role.

2.1 Water – a vital resource

Water and water environments are essential for life and livelihoods. Water is a vital resource for businesses and agriculture and is critical to ensure the economy will grow and prosper.

The average person in Wales uses about 140 litres of water every day in their home. If you include all the water used in growing and manufacturing the things people use or consume, the figure is much greater.

Rivers, lakes, estuaries, coastal areas, wetlands and groundwater provide many different benefits to society, from supplying drinking water and supporting fisheries to providing an essential resource for business and agriculture, transport routes and opportunities for leisure that promote well-being such as physical and mental health.

Healthy water environments also help protect the nation from floods and droughts and regulate the quality of the air and the climate.

It is essential that these activities are managed in a sustainable way. This will ensure that the natural environment, business and economic growth will be protected and the long-term benefits to health and well-being improved.

2.2 Managing the water environment in Wales

Much of the policy relating to water management is driven by Regulations that have been introduced over the last 40 years. Some relate to the water quality required for different uses of water such as drinking water, bathing waters and shell fisheries. Some set the requirements to protect wildlife such as the Regulations on habitats and birds. Others concern the control of pollution from chemicals such as hazardous substances.

There is also legislation that sets standards for the performance of sewerage systems and wastewater treatment and emissions from industrial processes. These have been important in driving investment by water companies and others. They have led to major improvements in the water environment.

Over recent years there has been a move to introduce a more strategic approach to water management policy. The WFD Regulations 2017 (see section 3) provides a major overarching framework for river basin management. The Flood Risk Regulations 2009 (see section 2.2.2) sets out a strategic approach to flood risk management planning. As competent authority for implementing this legislation NRW has an important role in coordinating their implementation in Wales (see section 2.3).

Welsh Government is responsible for policy on water management in Wales. There are a number of recent policy initiatives that are important in shaping the future of water management in Wales, namely: The Environment (Wales) Act 2016, Planning (Wales) Act 2015, National Flood and Erosion Risk Strategy, Marine and Fisheries Strategic Action Plan, Rural Development Programme, Well-being of Future Generations (Wales) Act 2015, Wales National Marine Plan 2019 and The control of Agricultural Pollution (Wales) Regulations 2021. There are a number of other plans and strategies that affect the water environment (see Appendix A). For other policy and legislation that may also be relevant see Section 8 below.

The Environment (Wales) Act 2016, together with the Wales National Marine Plan 2019, set out a new statutory framework and integrated natural resource management for the Sustainable Management of Natural Resources (SMNR).

This new framework for managing natural resources, will build on the UN ecosystem approach, defined as ‘an integrated strategy for the management of natural resources’. Therefore, the Environment (Wales) Act 2016 will legislate for a more joined-up management process, focused on delivering a healthier, more resilient and sustainable Wales through economic, social and environmental benefits.

The vision of the Water Strategy for Wales is to ensure that Wales continues to have a thriving water environment which is sustainably managed to support healthy communities, flourishing businesses and the environment.

The strategy is set within the context of the long-term policy direction to improve natural resource management and covers a broad range of matters relating to the management of our water systems, including all inland waters, estuaries and coastal waters. The aim is that policies will contribute to wider Welsh Government priorities and well-being goals, including promoting green growth, resource efficiency, and tackling poverty.

2.2.1 Government guidance on river basin planning

To support the first cycle RBMPs, the Government issued two volumes of statutory guidance on the implementation of the WFD: Volume 1 (2006) and Volume 2 (2008). The guidance set out the expectations of Government in relation to the important steps and principles of the river basin management planning process and the content of the documents.

The guidance was reviewed and reissued in July 2014 River basin planning guidance (July 2014), this replaced the previous volumes 1 and 2. Changes include an emphasis on catchment planning and working with partners, use of economic appraisal within the planning process, new environmental standards and revised water body classifications and integrating requirements relating to Protected Areas.

For third cycle, Welsh Government have again reviewed this guidance and the revised River Basin Planning Guidance 2020 can be found on the Welsh Government Website.

2.2.2 Managing flooding in Wales

Under the Flood Risk Regulations 2009, NRW and Lead Local Flood Authorities (LLFAs) are required to update the Flood Risk Management Plans (FRMPs) every 6 years. Under the Flood Risk Regulations, the responsibility for producing FRMPs is

split by source with NRW responsible for main rivers, reservoirs and the sea across Wales and LLFAs responsible for surface water flood risk in their area.

The first cycle plans were produced on the 22nd December 2015. We are required to publish progress against the first cycle plans and include any new measures that describe what we are going to do over the coming years.

We are currently drafting our second cycle FRMPs. Consultation on these plans has been delayed as a result of the February 2020 flooding that was followed up by Covid-19. It is anticipated that these plans will be ready for consultation in 2022.

The FRMPs are the final stage in the flood risk management planning cycle which also includes the following products:

- Preliminary flood risk assessment reports by 22 December 2018 (on the basis of which 'Flood Risk Areas' are identified catchment scale improvements and River Restoration opportunities in Wales)
- Flood hazard maps and flood risk maps by 22 December 2019
- FRMPs

All the assessments, maps and plans from the first cycle are being reviewed and updated. The preliminary flood risk assessment maps and reports, and the flood hazard maps, and the flood risk maps have been completed and are available on the NRW website.

FRMPs enable us to share the proposed action we plan to take to manage the risk of flooding in those areas that are at greatest risk. They can help our customers to better understand their risk and what we intend to do to reduce their risk.

We are working to improve the linkages between the FRMPs and RBMPs for this cycle and will be looking to incorporate greater detail into the second cycle FRMP.

Supporting information

Preliminary Flood Risk Assessments

Flood Risk Maps and information on flood risk management plans

2.2.3 Estuarine and coastal waters and other marine policies

UK Marine Strategy

The UK Marine Strategy establishes an integrated policy for the protection of the marine environment aiming to progress towards achievement of 'good environmental status' in marine waters. The scope of the UK Marine Strategy is broader than that of the WFD Regulations 2017, covering a greater range of biodiversity components and indicators. However, there are some significant areas of overlap with good ecological and chemical status for the WFD Regulations 2017, particularly in relation to chemical quality, eutrophication and aspects of ecological and hydromorphological quality and these targets and indicators are aligned wherever possible. Where both apply in coastal waters, the UK Marine Strategy

covers those aspects of good environmental status not covered by the WFD Regulations 2017, for example noise, litter and aspects of biodiversity.

Marine Area Statement

NRW published its first Marine Area Statement in March 2020. Engagement with our partners highlighted a range of issues and opportunities relevant to RBMP, particularly the need to improve the quality of water quality in the marine environment on order to increase the resilience of marine ecosystems, and a focus on implementing nature-based solutions at the coast that work with natural processes. To a large extent, addressing water quality issues in our marine and coastal water bodies is reliant on improved management on land. In driving forwards the area statement, we will raise awareness of how land management affects the marine environment; target effort through opportunity catchments; and influence terrestrial management processes, including the Sustainable Farming Scheme (SFS), to improve the outcomes for the marine environment.

Marine Spatial Plans

The Welsh National Marine Plan (WNMP) contains contain plans and policies which will:

- support our vision for clean, healthy, safe and diverse seas
- guide future sustainable development
- support the growth of marine space and natural resources (’blue growth’)

The WNMP has general policies on water quality and sector policies on surface water and wastewater treatment and disposal. The RBMP directly supports these specific policies set out in the Welsh Marine Plan and supports many of the other policies indirectly.

Given the strong links between the UK Marine Strategy, WNMP and the RBMPs it is important for marine stakeholders to engage in river basin management planning to ensure that a source to sea approach to management is implemented and that integration between marine policies is realised. The RBMP has regard to the appropriate marine policy documents, including the North West Marine Plan.

2.2.4 Biodiversity conservation

Improving the water environment through WFD Regulations 2017 actions will be a core contribution to achieving Welsh Government’s nature conservation and biodiversity obligations and outcomes. Part of this contribution comes from the fact that it includes specific requirements to meet conservation objectives for European sites (Protected Areas). For the purposes of the RBMP water dependent SACs, SPAs and Ramsar sites have been called European sites.

On the 30th June 2021 Welsh Government declared a nature emergency in Wales. The Senedd is one of the first parliaments in the world to declare such an emergency.

The third cycle RBMPs will have a key role in supporting the delivery of Welsh Government, UK and global biodiversity commitments by contributing to improving

habitat quality, habitat creation and restoration outcomes for water dependent habitats and species including the marine environment.

Although the WFD Regulations 2017 statutory requirements only apply to Protected Areas and water bodies, delivering other actions for water quality and resources or invasive species for example will also be key contributions to improving biodiversity and many other important nature conservation areas too. It is the Welsh Governments' policy that the environment should be managed in an integrated way and the river basin management planning process will help with this by taking into account and contributing to the objectives of relevant European site core management plans. RBMPs also provide an opportunity to integrate other biodiversity improvement drivers, e.g. Welsh Government Nature Recovery Plan.

Habitat improvement or creation activity needs to focus towards implementing larger-scale schemes in the most appropriate places. In the case of wetlands for example, targeting restoration activities toward sites with the greatest potential to become wetland habitat as part of a nature-based solutions approach will deliver wider ecosystem benefits as well as supporting the Governments' biodiversity outcomes. Restoring functioning floodplains will provide multiple benefits including better flood storage, mitigating diffuse pollution, establishing more natural hydrological regimes, storing carbon, and protecting groundwater and wetlands as well as benefiting biodiversity more generally.

Supporting information

There is more information on Welsh Government's Nature Recovery Plan and other associated work to deliver the Government's biodiversity obligations

Vital Nature

The Well-being of Future Generations (Wales) Act 2015 changed the focus of NRW's planning, governance and delivery to ensure we maximise our contribution to the seven Well-being Goals for Wales and implement its five ways of working when undertaking our duties.

The introduction of the Environment (Wales) Act 2016 changed NRW's core purpose and commitment to applying the nine principles of SMNR in all our work. Strengthening our duty to act for nature, to seek to maintain and enhance biodiversity wherever possible when carrying out our work. Shifting focus away from delivering many individual statutory functions in isolation towards addressing the pressures and drivers of ecosystem change.

Halting and reversing the loss of biodiversity on land and in the sea is integral to the SMNR objectives.

In 2019 statutory guidance to implement the Environment (Wales) Act included a clear framework for embedding the objective and principles of SMNR in our work and shows that Sustainable Development (as defined in the Well-being of Future Generations (Wales) Act 2015) is in practice implemented at the same time.

NRW is one of over 200 public authorities defined in Section 6 of the Environment (Wales) Act, 2016, all having a duty to seek to maintain and enhance biodiversity and promote the resilience of ecosystems. Whilst our protected sites (including European sites Protected Areas under WFD Regulations 2017) and species are important, the Section 6 duty is also about taking steps to protect nature in our

towns, cities, public places and wider landscape, both through practical action on the ground, and in the way all public functions are carried out. The Section 6 duty has been declared by Welsh Government as a key legislative driver to maximise the contribution from the public sector towards achieving the objectives of the Nature Recovery Action Plan (NRAP) – Wales' national commitment to halting and reversing biodiversity decline under the International Convention on Biological Diversity.

Vital Nature published in 2019 is NRW's strategic steer for biodiversity to 2022. It sets out our aspirations, priorities and ways of working to reverse the decline in biodiversity. It is intended to steer our work across the full range of NRW functions as we strive to maximise the positive impacts of our decisions and those of others on biodiversity and ecosystems.

Vital nature sets out NRW's priority areas for our work on biodiversity and ecosystem resilience to 2020 under six themes (listed below) all are intended to contribute to achieving NRW's well-being objectives and the objectives of the Wales Nature Recovery Action Plan:

- Connecting people and biodiversity
- Embedding the consideration of biodiversity and ecosystem resilience into NRW's functions
- Improving the approach to protected sites
- Working with others to maintain and enhance biodiversity
- Having the right evidence to inform our work
- Investing in the knowledge and skills of our staff

Each of these themes are set out in more detail in Vital Nature with the goals that we wish to achieve, a series of commitments and high level actions. In response to the nature emergency NRW has prioritised 5 Vital Nature themes in a mitigation hierarchy which includes the delivery of landscape scale collaborative projects, peatland/woodland and saltmarsh habitat restoration initiatives and tackling hydrological change and pollution.

We are also working with others to develop a shared 2050 vision for Wales' natural environment.

Whilst developing the third cycle RBMP we have considered the use of nature-based solutions, achievement of multiple benefits and improving the resilience of ecosystems into our early thinking in identifying the proposed opportunity catchments. The challenge going forward into third cycle will be to highlight the links between the delivery of measures for WFD Regulations 2017 with biodiversity recovery and re-connecting people with nature.

2.2.5 River Restoration

NRW has developed an integrated River Restoration Programme to bring together related work across Wales. The aim is to take a nature-based approach to restore characteristic river habitat for the benefit of hydromorphology, water quality,

biodiversity, fisheries and flood regulation. The focus of this work can be defined as the re-establishment of natural physical processes (e.g. variation of flow and sediment movement), features (e.g. sediment size and river shape) and physical habitats of a river system (including submerged, bank and floodplain areas).

Completed river restoration and fisheries plans can be requested through the NRW Library.

Fisheries Habitat restoration plans

As part of the Salmon and sea trout plan of action for Wales 2020: areas for action tackling physical habitat constraints in the freshwater environment is one of the key themes.

NRW has commissioned Fisheries Habitat Restoration Plans for all important migratory salmonid rivers in Wales. These reports compile catchment-scale information on physical constraints to fish population status. More plans will be produced during the third cycle to inform restoration delivery, contact NRW for more info.

Sustainable fisheries programme

The sustainable fisheries concept was driven originally by the declining status of fish populations, particularly migratory fish populations, across Wales and the statutory duties set out in the Salmon and Freshwater Fisheries Act 1975 (as amended) and the Environment Act 1995. The details of work driven by this programme is contained within NRW's Salmon and sea trout plan of action for Wales 2020: areas for action, a plan required by the Minister for Environment, Energy and Rural Affairs.

The programme is based principally on restoration of river habitats and therefore delivers wider benefits for all aquatic flora and fauna including other species of fish.

The Sustainable Fisheries Programme is not a published plan but a programme of activities that will continue to be developed based on evidence, priorities delivered at the project-level based on available funding to enhance and protect the fish stocks and fisheries and rivers across Wales. The location and nature of projects is continually reviewed based on budget availability and technical and environmental constraints and opportunities.

2.2.6 Eel management plans

The European eel *(Anguilla anguilla*) population has declined by as much as 95% across Europe since the 1980s. In 2007, the European Union (EU) adopted a new regulation establishing measures for the recovery of the eel stock. In 2009 the UK and other member states produced an eel management plan for each of their RBDs.

These plans aim to achieve an increase in escapement of adult silver eel to the sea to spawn. The objective is to achieve at least 40% of pristine escapement levels in the long term. These plans address the causes of the decline by implementing management actions which are achievable.

Responsibility for the management of eel, including human impacts, and the delivery of Eel Management Plans (EMPs) rests with NRW in Wales – the

Environment Agency (EA) leads on the cross-border Severn EMP whereas NRW leads on the Dee EMP. The main focus of EMP delivery in Wales is on improving habitat and removing barriers to migration. Since the England and Wales Eel Regulations (2009) were introduced, NRW and have invested many millions of pounds across Wales on constructing eel passes (e.g. NRW gauging weirs) and retro-fitting screens on water and power company abstractions.

All fishing for eel in England and Wales requires authorisation, which is subject to standard conditions that control seasons, methods, and apply geographic restrictions and other measures to protect bycatch species. NRW has recently suspended all eel fishing in Wales due to ongoing concerns about the status of eel stock and local populations as well as international advice about reducing anthropogenic impacts.

NRW monitors and reports on the status of eel populations in Wales. Reporting is undertaken annually to the International Council for the Exploration of the Seas (ICES). Progress with delivering EMPs and meeting the 40% Silver eel escapement target is reported every three years to the UK and Welsh Governments (before EU exit reporting was to the EC).

Given there are currently no catches of eel in Wales the main source of data to inform assessments is now from annual fully quantitative electrofishing surveys of yellow eel. NRW surveys a number of index rivers around Wales, the Dee (Dee RBD), Teifi, Mawddach (Western Wales RBD) and the Usk (Severn RBD). Data from a number of semi-quantitative sites is also used to supplement the index river data. Site population estimates are incorporated in to a Cefas model (SMEP2) so that Silver eel production and escapement can be estimated from each EMP. Current escapement is then compared with estimates of escapement before the population crashed around the end of the 1980s. None of the EMPs in Wales are currently meeting the 40% target (and all three are currently <10% of pristine).

The latest annual ICES report as well as the latest Triennial EMP progress report were published in 2022.

Supporting information

UK eel management plans

2.2.7 Taking account of climate change

To be sustainable, any action in the river basin should:

- Recognise, and where possible contribute to, the UK's greenhouse gas (GHG) emissions reduction targets

- Be adapted, or easily adaptable, to the changes in climate that are occurring now, and those projected in the future.

Actions to address climate change should be considered right at the outset of any work, and not considered as an afterthought

The Governance and Policy Framework

A combination of UK and Welsh legislation provides the statutory framework for addressing climate change in Wales. The UK Climate Change Act 2008 provides the original underpinning policy on this topic. It legally binds the UK to reducing

emissions to achieve a net zero status by 2050 and sets interim 5-yearly UK carbon budgets along the way. It also provides the legal framework for adaptation policy in the UK.

The Environment (Wales) Act (2016) similarly sets a net zero target for Wales by 2050, additionally, in line with the advice from the UK Committee on Climate Change, the Climate Change (Wales) Regulations in 2021 set interim GHG reduction targets for 2030 (63%) and 2040 (89%). In 2019. Welsh Government published the first Low Carbon Delivery Plan for Wales *Prosperity for All: A Low Carbon Wales,* which contained 76 existing policies from across the Welsh Government, UK Government and the EU along with 24 proposals to explore and develop future policy actions. In October 2021, the revised second Low Carbon Delivery Plan *Net Zero Wales* was published with 123 policies and proposals set out across all sectors. The achievement of decarbonisation across Wales is also implicit within the Well-being of Future Generations Act (2015) and its goals – *A prosperous Wales* and *A globally responsible Wales* include reference to transition to a 'low carbon society' and 'make a positive contribution to global well-being' respectively.

The Intergovernmental Panel on Climate Change (IPPC) Special Report on Global Warming of 1.5°C published in October 2018 was a landmark report stating that "limiting global warming to 1.5°C with no or limited overshoot, would require rapid and far-reaching transitions […] and imply deep emissions reductions in all sectors". In response to the International Panel on Climate Change (IPCC) report the UK Climate Change Committee (UKCCC) produced advice recommending both a UK and Welsh net-zero GHG target for 2050 that will deliver on the commitment that the UK made by signing the Paris Agreement. More recently, the IPCC has reinforced the urgency for action to rapidly reduce emissions in its 6th Assessment 2021 report.

In April 2019, the Welsh Government declared a 'Climate Emergency' in Wales with the intention of prompting 'a wave of action at home and internationally from communities, businesses and organisations in Wales to parliaments and governments around the world.' The declaration reiterated the ambition for the Welsh public sector to be carbon neutral by 2030. Most local authorities and many town and community councils in Wales have made similar declarations and often set targets aiming to be carbon neutral by specific dates.

The Climate Change Act requires the UK Government to publish a 5-yearly risk assessment. The UK Climate Change Risk Assessment (CCRA) is a review of both risks and opportunities and the need for further adaptation action to address them. It provides the evidence base for Government-led national adaptation programmes in the UK nations, including Wales. The first and second reports were published in 2012 and 2017 (CCRA2), respectively. The CCRA3 report published in 2021 identified 61 risks and opportunities with more action needed to address 32 of them in Wales, while sustaining current action is only deemed appropriate for five risks. A suite of research projects covering water resources, flood risk, socio-economic dimensions, behaviour change, thresholds in the natural environment and interacting risks were commissioned by the UKCCC to inform the report.

The climate change adaptation plan for Wales - Prosperity for All: A Climate Conscious Wales was published in late 2019, setting out 32 actions for 2020 - 2025 to achieve a more resilient Wales through increasing knowledge, capacity and resilience. The main risk areas set out in the Plan are largely informed by the CCRA2 that identified risks to people, communities, buildings and infrastructure from flooding; risks to water resources from drought and low river flows; and risks to

ecosystems and agriculture from climatic changes as urgent priorities. A review of the Plan taking account of the CCRA3 outputs is planned for 2022.

Future Climate and Climate-related Risks and Opportunities

The Met Office Hadley Centre led UK Climate Projections 18 (UKCP18) provides information on temperature, precipitation, wind, sea level rise, storm surge, snow and weather types. In Wales by 2050 it is projected that:

- summer average temperatures rise by an estimated 1.34ºC
- winter precipitation increases by an estimated 5%
- summer precipitation decreases by an estimated 16%
- sea level rise of an estimated 24 cm (at Cardiff)

The UKCP18 projections are broadly consistent with previous UKCP09 outputs but provide a finer resolution of data down to 2.2km scale so providing better assessment of fine-scale storm convective processes and consequently rainfall patterns. It remains the case that it is expected that there will be more intense rainfall events.

- More flooding of low-lying coastal areas
- Hotter, drier summers
- More heatwaves
- Milder and wetter winters
- Less snowfall and frost
- Lower groundwater levels

Natural variability in the weather will continue to be important. The Met Office report “Too hot, too cold, too wet, too dry” (March 2014) confirmed the underlying UKCP09 trends but also stated “new analysis suggests that we should also plan to be resilient to wet summers and to cold winters throughout this century”.

The Future Flows and Groundwater Levels project provides an assessment of the impact of climate change on river flows across 282 catchments in the UK. The model takes into account different assumptions of possible climate behaviours and feedback to provide an indication of the uncertainty associated with climate projections. Annual low flows (Q95) are expected to decrease under all scenarios and in almost all locations by 2050.

Further information and flow projections from the Future Flows and Groundwater Levels project.

In terms of the CCRA3, 61 risks and opportunities have been identified for Wales. Those that have a high future magnitude score and where more action is required now to address them, after considering any existing adaptation responses, include the following:

- The impacts of climate change on the natural environment, including terrestrial, freshwater, coastal and marine species, forests and agriculture

- An increase in the range, quantities and consequences of pests, pathogens and invasive species, negatively affecting terrestrial, freshwater and marine priority habitats species, forestry and agriculture

- The risk of climate change impacts, especially more frequent flooding and coastal erosion, causing damage to our infrastructure services, including energy, transport, water and Information and Communication Technologies.

- The impact of extreme temperatures, high winds and lightning on the transport network

- The impact of increasing high temperatures on people's health and well-being

- Increased severity and frequency of flooding of homes, communities and businesses

- The impact on coastal businesses due to sea level rise, coastal flooding and erosion

- Disruption to the delivery of health and social care services due to a greater frequency of extreme weather

- Damage to our cultural heritage assets as a result of temperature, precipitation, groundwater and landscape changes

- Impacts internationally that may affect the UK, such as risks to food availability, safety and security, risks to international law and governance from climate change that will affect the UK, international trade routes, public health and the multiplication of risks across systems and geographies

Implications

In terms of GHG emission reductions, the land use, land use change and forestry sector is the most important of relevance to this report. Depending upon its use and the associated management regime, land can either be a net source of emissions or a net sink. In 2019, in Wales, the sector was a net carbon sink, equivalent to under 1% of total Welsh emissions. The National Atmospheric Emissions Inventory *Mapping Carbon Emissions & Removals for the Land Use, Land-Use Change & Forestry Sector* report provides full details (2020).

In terms of the agriculture sector nitrous oxide arising principally from the application of nitrogenous fertilisers and land cultivation along with methane emitted principally by livestock and by the handling of slurries are the main GHG emissions. These agricultural emissions are significant: in 2019 they contributed 13.7% of total emissions in Wales.

During 2020, the UKCCC published an assessment of the role of land use policies required to achieve net zero emissions by 2050 and subsequently updated its recommendations for the 6th UK Carbon Budget report, which identified the following key measures for the UK:

- **Increase tree planting** – increasing UK forestry cover from 13% to at least 18% by 2050 by planting around 30,000 hectares of broadleaf and conifer woodland each year by 2025 rising to 50,000 hectares by 2035 onwards

- **Encourage low-carbon farming practices** – such as 'controlled-release' fertilisers, improving livestock health and slurry acidification
- Use around 10% of agricultural land for agro-forestry
- **Restore peatlands** – restoring all upland peat and 60% of lowland peat by 2050
- **Encourage bioenergy crops** – expand the planting of UK energy crops to around 720,000 hectares by 2050

Turning to adaptation, the first CCRA identified impacts on water as a high risk across each of its five central themes, as shown in the table below.

Table 1: High risk impacts on water

Theme	**Main risks**
Agriculture and Forestry	Drier soils; reducing crop and timber yields, extra demand for water for irrigation; loss of agricultural land for floodplain.
Business	Flooding; increased competition for water; disruption of transport networks and communication links; indirect risks from changes in agriculture and the natural environment.
Health and Well-being	Injury, death and stress/mental health problems due to flooding; increase in water-borne diseases and food poisoning.
Buildings and Infrastructure	Flooding of road, rail, river bridges, water supply and energy infrastructure; performance of buildings in higher temperatures; Urban Heat Island effect.
Natural Environment	Lower summer river and estuarine flows may lead to poor water quality; warmer rivers, lakes, estuaries and coastal waters may suit some species, but others will not thrive; invasive species may gain advantage; native species may not be able to move to track favoured conditions; more rain falling in intense bursts might increase agricultural runoff.

Evidence suggests that the following measures are particularly useful in mitigating these risks:

- Vegetation planting within catchments (including riparian tree planting to provide river shading) to increase habitat connectivity, keep rivers cool and manage run-off

- Increase soil carbon and improve soil structure (including peatland restoration) to manage run-off, improve habitat condition and avoid carbon losses to water and the atmosphere

- Reconnecting rivers with their floodplains and naturalising river channels to increase habitat connectivity and manage episodes of greater rainfall intensity

- Promotion of water efficiency and high flow storage to avoid deterioration in wetland habitats and help agriculture to remain viable in the face of decreasing water resource availability

- Adopting Water Sensitive Urban Design, which brings multiple benefits including reducing flooding; reducing discharges of storm water to watercourses; resilience to drought; and more attractive neighbourhoods with more green space

This list of adaptation measures is not exhaustive.

More general advice and specific advice on flood risk management and water resources management, can be found in Guidance document No. 24 “River Basin Management in a Changing Climate”, issued under the Common Implementation Strategy. In particular, this guidance advocates that, where feasible ‘no-regret’ or ‘win-win’ measures should be adopted as these yield beneficial outcomes regardless of the eventual outcomes of climate variability and change. Although climate change is not explicitly included in the text of the WFD Regulations 2017, the stepwise and cyclical approach of the river basin management planning process makes it well suited to adaptively manage climate change impacts.

Two further publications are relevant to the UK specifically:

- The Living with Environmental Change (LWEC) Water Report Card 2012-13 presents information on a range of potential climate change impacts, and explicitly states the degree of confidence for each projection

- The Centre for Ecology and Hydrology has published a report on Future Flows and Groundwater Levels, which assesses the impact of climate change across 282 catchments in the UK. This can be used to inform planning at the catchment scale

Blue Carbon Initiative

Carbon storage in woodlands and peatland habitats is well-known. However, marine habitats are also important in storing ’blue carbon’. NRW has commissioned a study that investigates these blue carbon habitats in Wales. The study shows that, alongside other mitigation and adaptation measures, marine habitats can play an important part in helping us to increase carbon storage and adapt to the impacts of climate change.

We know that there are likely to be serious and irreversible changes to communities in Wales as a result of climate change. Of all the coastal habitats looked at in the report, saltmarshes were the most efficient at capturing carbon and placing it in long term storage, a process called sequestration. They are also important to mitigate other climate impacts, through defending the coast from storms and reducing coastal flooding. Many blue carbon habitats are already protected through Wales’ extensive marine Protected Area network.

Management of these areas aims to increase the resilience of habitats to future change and protect and enhance their quality.

Some blue carbon habitats in Wales have been impacted by human activities and restoring them to good condition may increase the amount of carbon they can store. NRW is working with partners to restore blue carbon habitat at sites such as Cwm Ivy on the Gower Peninsula, thus helping to increase Wales' resilience to climate impacts.

2.3 NRW's role in managing the water environment

NRW is the lead organisation for water management and environmental regulation in Wales. Established in 2013, it has taken over the functions of the Countryside Council for Wales, Forestry Commission Wales, Environment Agency Wales, as well as some functions of Welsh Government.

Our responsibilities include:

- Managing flood risk to protect people and property
- Strategically planning water resources to ensure adequate water supplies
- Maintaining, improving and developing salmon and freshwater fisheries
- Maximising the social, economic, environmental and heritage benefits of the waterways for which NRW is the navigation authority
- Helping to conserve and enhance the diversity of native wildlife and habitats, the landscape and historic environment
- Promoting the recreational use of inland and coastal waters and associated land
- Protecting, enhancing and restoring the environmental quality of inland and coastal surface water and groundwater
- Protecting important, recognised sites that make up 30% of Wales' land and waters – including National Nature Reserves, Marine Nature Reserves, Sites of Special Scientific Interest (SSSIs), Ramsar sites, Special Areas of Conservation (SAC) and Special Protection Areas (SPAs)
- Managing 126,000 hectares of woodlands, that's 6% of the country's total land area, producing approximately 850,000 tonnes of timber per year

We work within a framework of Government policy and legislation (see section 2.1) that defines our powers and duties, and the environmental aims, objectives and standards to which we work.

Managing the water environment involves targeting effort and resources to reduce risks and to provide the greatest benefits for people and wildlife. We bring together our different water management functions through a number of iterative activities including:

- Monitoring the environment to understand the state it is in and why
- Planning the action needed to achieve agreed outcomes

- Taking action and working with others to achieve these outcomes
- Checking compliance with standards and permit conditions, and carrying out enforcement activities, if necessary, to make sure that the legal requirements are met

3 The WFD Regulations 2017

Summary of this section

This section provides an introduction to the WFD Regulations 2017, its aims and objectives before giving an overview of the approach to river basin management planning used in Wales. The important role of all stakeholders, including the work in catchments, is discussed. The section finishes by setting out the timetable for updating the RBMPs and briefly describes the Environmental Assessment screening that has been undertaken to support the third cycle plans.

Topics covered:

WFD Regulations 2017 and its objectives; river basin management planning; working with others; catchment approach; river basin management planning timetable; assessments to support the development of the third cycle RBMPs.

3.1 The WFD Regulations 2017

The WFD Regulations 2017 is focused on establishing an integrated approach for the protection and sustainable use of the water environment from catchment to coast. This requires a holistic approach to managing waters, looking at the water within the wider ecosystem and taking into account the movement of water through the hydrological cycle.

It is implemented through river basin management and planning that involves setting environmental objectives for all groundwaters and surface waters (including estuaries and coastal waters) and devising and implementing programmes of measures (sets of actions) to meet those objectives.

It also requires that other environmental priorities, economic considerations and social issues have to be considered and taken into account when setting water management objectives.

Aims

- prevent further deterioration and protect and enhance the status of aquatic ecosystems and associated wetlands
- promote the sustainable consumption of water
- reduce pollution of waters from priority substances
- prevent the deterioration in the status and to progressively reduce pollution of groundwaters
- contribute to mitigating the effects of floods and droughts

Environmental objectives

- prevention of deterioration in status of surface waters and groundwater
- achievement of objectives and standards for Protected Areas

- aim to achieve good status for all water bodies by 2015. Where this is not possible and subject to the criteria set out in the WFD Regulations 2017, aim to achieve good status by 2021 or 2027 or set a less than good (less stringent) objective
- aim to achieve good ecological potential and good surface water chemical status for heavily modified water bodies and artificial water bodies
- reversal of any significant and sustained upward trends in pollutant concentrations in groundwater
- cessation of discharges of priority hazardous substances into surface waters
- progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants

Additional objectives

- reduce level of purification treatment required for drinking water
- the water treatment regime will meet the requirements of the legislation

3.1.1 Preventing Deterioration

The no deterioration baseline for each water body is the status reported in the RBMPs at the time of publication.

Deterioration is formally assessed and reported over the six years of a river basin management planning cycle. Any water bodies that show a deterioration in status compared to the 2015 baseline will be investigated further to clarify if the deterioration is a real environmental change and if so, we will ensure that measures are put in place to reverse the deterioration.

The WFD Regulations 2017 does not allow any deterioration in status of water bodies, except in specified circumstances. The following are the main aspects of NRW's approach to implementing the no deterioration requirements of the Regulations.

- Deterioration from one status class to a lower one is not permitted.
- While deterioration within a status class does not contravene the requirements of the WFD Regulations 2017, (except for Drinking Water parameters in Drinking Water Protected Areas (DrWPAs), and provided that the objectives and requirements of other domestic legislation are complied with) action should be taken to limit within status class deterioration as far as practicable. For groundwater quality, measures must also be taken to reverse any environmentally significant deteriorating trend, whether or not it affects status.
- Where the water body is already in the lowest status class (bad ecological status or potential; fail to achieve good chemical status; poor groundwater chemical status; or poor groundwater quantitative status) no significant further deterioration shall be permitted.
- The no deterioration requirements are to be applied independently to each of the elements that come together to form the water body classification as required by the WFD Regulations 2017.

- For groundwater the no deterioration requirements will be applied to each of the four component tests for quantitative status and the five component tests for chemical status.

Exemptions can be applied to justify deterioration caused by new physical modifications in specific circumstances. As the climate changes there may be fundamental changes to the character of some of our water bodies, for example coastal freshwater water bodies becoming saline due to sea-level rise or streams becoming ephemeral (only flowing in winter). We do not yet know exactly how, when and where these changes will take place, particularly in the shorter term, and so we do not intend to proactively change the objectives we will seek to achieve. We need to focus on building a baseline understanding of state of the water bodies and monitor and review the performance of measures (for example fish passes, abstraction changes) to ensure they deliver the benefits and resilience required.

3.1.2. Protected Areas

The objectives for Protected Areas are either governed by the Conservation of Habitats and species Regulations 2017 (as amended) for SACs and SPAs or the objectives as set out in the WFD Regulations 2017 itself, for example Drinking Water and Shellfish Water Protected Areas.

The WFD Regulations 2017 requires NRW to establish a register of Protected Areas. The types of Protected Areas that must be included in the register are:

- Areas designated for the abstraction of water for human consumption (DrWPAs)
- Areas designated for the protection of economically significant aquatic species (Shellfish Water Protected Areas)
- Bodies of water designated as recreational waters, including Bathing Waters
- Nutrient-sensitive areas are areas designated as sensitive under Urban Waste Water Treatment (England and Wales) Regulations 1994
- Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection including relevant European sites

The Protected Area Register has been updated and is published with the final third cycle RBMP on our website.

i. Drinking Water Protected Areas

The objectives for DrWPAs are to ensure that:

- Under the water treatment regime applied, the drinking water produced needs to meet the requirements of the Water Supply (Water Quality) Regulations 2018 and the Private Water Supplies (Wales) Regulations 2017. This will be achieved by meeting the requirements of these legislative instruments (including the standards) plus any UK requirements to ensure drinking water is free from contamination.

- The necessary protection to achieve the aim of avoiding deterioration in the water quality in DrWPAs in order to reduce the level of purification treatment required.

DrWPAs have been designated to protect raw waters used for public supply. There are currently 125 DrWPA (Surface) and 39 DrWPA (Groundwater) in Wales.

In Wales the 2011 Risk Assessment, together with subsequent supporting data submitted by the Water Companies operating within Political Wales, has identified 'at risk' DrWPAs where there is evidence of failure, or risk of failure, of the Drinking Water Inspectorate (DWI) targets with upward trend. This was completed in early 2020 after Dŵr Cymru/Welsh Water (DCWW) carried out additional catchment investigations to investigate where catchment schemes may be beneficial and identify DrWPAs at risk of failing the objectives.

These 'at risk' DrWPAs have been taken forward as Safeguard Zones (SgZs) with the intention of implementing catchment management led by DCWW with the support of stakeholders including NRW. The SgZ describe the extent of the agreed measure and may be designated to cover a part of a water bodies, a complete water body, group of water bodies or even a whole catchment – depending on the extent at which the improvement measures are applied. While the SgZ assessment process is statutory, once designated SgZ do not bring any additional statutory powers. Improvements within SgZs rely on stakeholder buy-in and NRW extant regulatory powers.

There are 23 SgZs in Wales (two groundwater SgZs and the remainder surface water), 21 of the SgZs were proposed in the latest round of catchment investigations by DCWW.

ii. Economically Significant Species

Shellfish Water Protected Areas are designated under the WFD Regulations 2017. When waters are designated as Shellfish Waters Protected Areas the aim is to protect and improve water quality to support the growth of healthy shellfish (bivalve and gastropod molluscs) and contribute to good quality edible shellfish. Welsh Government conducted a review of Shellfish Waters in Wales in 2022 resulting in 7 being declassified, 15 being retained and 1 new Shellfish Water being identified (Lower Cleddau).

Further information about the designated Shellfish Waters can be found on our website.

iii. Recreational Waters (Bathing Waters)

From 2014 the objective for Bathing Waters as defined by the Bathing Waters Regulations 2013 (as amended) is to preserve, protect and improve the quality of the environment and to protect human health. This objective is achieved by meeting the sufficient quality standards of the Bathing Waters Regulations 2013 (as amended); and by taking such realistic and proportionate measures considered appropriate with a view to increasing the number of Bathing Waters classified as 'excellent' or 'good'. There are 105 Bathing Waters in Wales and 1 in the English part of the Dee RBD.

A project known as Event Duration Monitoring is underway to install telemetry on all Combined Sewer Overflows (CSOs). This will allow data to be collected on how long and how often storm overflows operate so that high spilling CSOs and those that are unsatisfactory or substandard can be identified for improvement. In addition, all CSOs that have previously been improved under the National Environment Programme (NEP) to meet the standards will have a specific spill frequency condition applied to the permit requiring an investigation if the limit is breached.

Supporting information

Further information on the Bathing Water profile, current quality standard and key information can be found on the NRW website under Bathing Water quality.

iv. Nutrient Sensitive Areas (UWWT)

A sensitive area is a water body identified as affected by eutrophication or having a surface water abstraction affected by elevated nitrate concentrations from wastewater treatment works. Designating a sensitive area is a trigger for action to reduce or prevent further pollution caused by nutrients.

The general objective of the Urban Waste Water Treatment (England and Wales) Regulations 1994 is to protect the environment from the adverse effects of urban wastewater discharges and wastewater discharges from certain industrial sectors.

This is to be achieved by ensuring that discharges from relevant urban wastewater treatment plants meet the appropriate emission standards. For areas affected by eutrophication this includes phosphorus and/or nitrogen reduction measures.

v. Nitrate Vulnerable Zones

The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021 have been introduced in Wales to reduce losses of pollutants from agriculture to the environment by setting rules for certain farming practices. The Regulations also set standards for silage making, storage of silage effluent and for slurry storage systems. They replace the Nitrate Pollution Prevention (Wales) Regulations (2013) and the Water Resources (Control of Pollution)(Silage and Slurry)(Wales) Regulations 2010 and establish good practice requirements for nutrient management into one set of regulations to reduce complexity. As a result, the Nitrate Vulnerable Zones previously designated in Wales, have been removed from the Protected Area Register for the third cycle RBMPs.

vi. European sites Protected Areas

The Conservation of Habitats and species Regulations 2017 (as amended), are key legal instruments to protect and enhance biodiversity.

Post EU Exit, SACs and SPAs in the UK no longer form part of the EU's Natura 2000 ecological network. The Habitats and Species Regulations 2017 (as amended) have created a national site network on land and at sea, including both the inshore and offshore marine areas in the UK. The national site network includes existing SACs and SPAs and new SACs and SPAs designated under these Regulations.

Maintaining a coherent network of protected sites with overarching conservation objectives is still required in order to fulfil the commitment made by government to

maintain environmental protections and continue to meet our international legal obligations, such as the Bern Convention, the Oslo and Paris Conventions (OSPAR), Bonn and Ramsar Conventions.

NRW is the statutory nature conservation body for Wales and works towards ensuring that Wales's unique natural environment including its flora and fauna, land and seascapes, geology and soils is protected and improved. This includes in particular the protection, improvement and management of European sites. NRW has a lead role in ensuring the appropriate management of the sites. It must carry out its own regulatory and land management functions so as to meet the requirements of the Conservation of Habitats and Species Regulations 2017 (as amended) as well as provide advice to local authorities, Welsh Government and other bodies to enable them to comply with their obligations under the Regulations.

Since the second RBMPs were published in 2015 new sites have been designated and some existing sites extended to form an extensive network across land and sea in Wales. The network covers more than 2 million hectares of European site Protected Areas (86 SACs, 20 SPAs and 10 Ramsar) which have water dependent features and will be included on the Protected Area register (listed under Part 3 of the WFD Regulations 2017).

The overall objective for European sites is to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of community importance. Meeting site conservation objectives will ensure that the integrity of the European site is maintained or restored as appropriate and ensures that the site contributes to achieving the 'favourable conservation status' of its qualifying features. The provisions of the WFD Regulations 2017 only relate to water dependent habitats and species. The objective is to protect and, where necessary, improve the water environment to work towards achieving the conservation objectives for the water dependent features of the site.

vii Ramsar sites

Designated Wetlands of International Importance (known as Ramsar sites) do not form part of the national site network. All Ramsar sites in Wales are also European sites (Protected Areas) and it is likely that only a few additional measures in the majority of these sites will be required to meet their objectives. This is because meeting the conservation objectives for water dependent European sites Protected Area interest features will also meet the conservation requirements for any overlapping Ramsar features. NRW applies the same considerations to environmental water objectives for Ramsar sites as to European site Protected Areas (listed under Part 3, of the WFD Regulations 2017).

For Ramsar sites, the criteria are generally broader than for other European site Protected Areas.

The NRW designated sites (Safle) database should be used as the principal reference for determining the required measures under the WFD Regulations 2017, supplemented by reference to published Conservation Objectives for European sites.

For the purposes of the RBMP water dependent SACs, SPAs and Ramsar sites have been called European sites.

Supporting information

Further information on Natura 2000 and Ramsar Protected Areas

Further information on all protected conservation sites in Wales (including Natura 2000, Ramsar and SSSI)

ix Sites of Special Scientific Interest

SSSI that are not European sites are not WFD Regulations Protected Areas. Whilst designation of SSSI is under UK national legislation it should be recognised that many water dependent SSSI (except for some wetlands) are also WFD Regulation water bodies. The attainment of good ecological status for these water bodies, whilst not necessarily equivalent to a SSSI achieving favourable condition (as targets for SSSI may in some cases be more stringent), is likely to be an important step toward those sites meeting their conservation objectives and contributing to the Welsh Government's objectives for SSSI under The Environment Strategy for Wales.

3.1.3 Artificial and heavily modified water bodies (A/HMWBs)

Some water bodies contain features that provide valuable social and economic benefits or uses, for instance through flood risk management schemes or reservoirs that supply drinking water. In many cases significant physical modifications have been required to support this use, for example the installation of a weir or a dam. To achieve good ecological status in these water bodies we would have to alter the modifications to such an extent that their function was compromised, for example the removal of a weir installed for flood defence purposes. It is vitally important to protect the uses that benefit society and the economy and therefore we can designate these water bodies as A/HMWBs under the WFD Regulations 2017 and determine objectives accordingly. An exception to this would be if there were other options for achieving the same benefits for society; in these cases, designation would not be allowed (Common Implementation Strategy guidance document four, 2003).

Once designated, A/HMWBs water bodies are required to reach the objective of good ecological potential. Good ecological potential is similar to good ecological status but takes into account the constraints imposed by the social and/or economic uses and involves using a Mitigation Measures Assessment (MMA). This MMA requires putting into place a series of measures to maximize the ecology, accepting that we cannot achieve good ecological status in these water bodies and is considered alongside the classification of other elements to determine whether the water body will achieve an overall status of good ecological potential.

In some instances, it may not be appropriate to implement a specific mitigation measure if doing so is likely to have a significant adverse impact on the designated use/social and economic benefits provided by the water body. Where it is not appropriate to implement a mitigation measure due it having a significant adverse impact on use, that mitigation measure is then excluded from the classification process and would not prevent a water body from achieving good ecological potential.

A/HMWB are still required to aim to achieve good chemical status.

Under the WFD Regulations 2017 there is a requirement to review A/HMWB designations six-yearly and report any changes. We have conducted a review of all A/HMWBs and further detail on those that have been amended is in Appendix B.

3.1.4. Exemptions to the environmental objectives (alternative objectives)

We aim to implement measures to achieve good overall status for surface and groundwaters by 2027. Alternatives to that objective are allowable which may result in 2 additional options:

- an objective of less than good by 2027 (less stringent objective) due to technical infeasibility (no known technical solution is available) or disproportionate cost (unfavourable balance of costs and benefits)
- or an extended deadline of good status or potential beyond 2027 for reasons of natural conditions (ecological recovery) or technical infeasibility for a small number of chemicals

Temporary deterioration in status

In certain circumstances a temporary deterioration in status of a water body, caused by exceptional or unforeseen events such as extreme floods, prolonged droughts or accidents, is allowed. The exception does not apply to those effects of extreme floods and prolonged droughts which could reasonably have been planned for and prevented, nor does it apply in the case of accidents which could reasonably have been foreseen.

This exemption requires responsible authorities to demonstrate that:

- all practicable steps were taken to prevent further deterioration in status
- the measures to be taken under exceptional circumstances are included in the Programme of Measures and will not compromise the recovery of the quality of the body of water once the circumstances are over
- all practicable measures are taken to restore the body of water to its status prior to the effects of those circumstances as soon as reasonably practicable, and
- a summary of the effects of the circumstances and the measures taken are included in the next update of the RBMP

Prolonged droughts

In Wales, the main bodies responsible for managing water resources are NRW, water companies and the Welsh Government. All of these bodies have a role in drought management. Water companies prepare for droughts by producing Drought Plans detailing the actions that will be taken if a drought occurs.

NRW is responsible for securing the proper use of water resources in Wales and making sure there is enough water available for all needs including the environment. We achieve this by regulating the abstraction of water, monitoring the environment and working closely with the water industry and other abstractors to manage resources. During droughts we monitor and report on the impacts on the environment, monitor water company actions to confirm they are following their drought plans and determine drought permit applications.

Water companies are responsible for developing and maintaining an efficient and economical system for public water supply in their area, without damaging the environment or affecting the needs of other water users. During a drought they will take actions to maintain public water supplies, as set out in their drought plans, whilst minimising any impacts on the environment.

The Welsh Government is responsible for the policies relating to water resources in Wales. They ensure the legislative framework for water resource management is fit for purpose. They direct water companies on the development and content of their water resource management plans and drought plans. During a drought they will confirm that water companies are taking appropriate actions and determine drought order applications.

Defining and then monitoring indicators (often called drought triggers) helps NRW and water companies decide when a drought is happening and determine what actions to take. The decision to take action will be based on a range of factors, including present and forecast weather conditions and how effective the action would be. The sequence of actions will not always be the same as all drought events are different and need to be managed on an individual basis.

Prolonged and severe droughts may impact water body status through reduced river flows, damage to or loss of habitat, alterations to bio-chemical composition of the river and detrimental impact to water dependent species. A drought is a natural, unpredictable phenomenon and it is not always possible, even with the implementation of appropriate mitigation measures, to avoid the impacts of drought or prevent temporary deterioration in water body status throughout a prolonged drought.

Drought plans set out the actions that will be taken to minimise environmental impacts and maximise available supplies during a drought, without causing deterioration where possible. These plans set out how the environment will be monitored and the possible mitigation measures that can be implemented to prevent as much environmental harm as possible during a drought. Effective monitoring of environmental indicators also helps to differentiate the natural impacts of drought and impacts caused by human activity such as the implementation of drought permits and orders. This is important to show any temporary deterioration resulted from the natural impacts of the drought.

If the impacts of a drought event temporarily cause deterioration to water body status and all the criteria can be met, this exemption can be used after a drought event as a justification as to why an objective which was set in a RBMP has not been met. This is always done on a case-by-case basis and should be detailed in the update of the RBMP.

Supporting information

More information on drought management can be found on our website drought management in Wales.

Extreme floods

NRW is responsible for providing flood forecasting and warnings to the public in Wales. This involves monitoring rainfall, river levels and sea conditions. Combined with weather data and tidal reports NRW provides local area forecasts on the possibility of flooding and its likely severity.

There are four levels of flood warning: three of the codes indicate the severity of the warning (Flood Watch, Flood Warning, and Severe Flood Warning) and a fourth is an ‘All Clear’, meaning the threat has passed.

Severe floods may impact on water body status through effects such as the loss of habitat (scouring of sediments and in stream vegetation), the physical displacement of species or increased inputs of pollutants including sediment. These impacts may be localised and of insufficient magnitude to affect the status of an entire water body. Water bodies are classified on an annual basis and therefore any deterioration in status due to a severe flood may not be detected until up to a year after the event.

Accidents

The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009 and the Environmental Damage (Prevention and Remediation) (Wales) (Amendment) (EU Exit) Regulations 2019 bring environmental liability into effect in Wales. Under these Regulations, environmental damage of either surface water or groundwater is defined as damage causing a change of water body status.

This means either a deterioration of water status overall, for example the water body as a whole would now be classified as poor rather than good or a deterioration of any of the individual elements or parameters such that the value of that element or parameter is now consistent with a lower status than before. This applies even if the water body is not reclassified as being of lower status. Adverse effects that are short-term or limited in their geographical extent are unlikely to amount to environmental damage.

When environmental damage is confirmed, the Regulations include a remediation objective of achieving the same level of natural resources or services that would have existed if the damage had not occurred.

New modifications or sustainable development

New modifications or new sustainable human development activities may be permitted even though they might compromise the achievement of certain WFD Regulation objectives. Certain new developments provide extremely valuable benefits to society that outweigh the environmental or societal benefits of achieving the objectives. Such benefits may include those provided by activities, for example:

- Public water supply
- Flood defence
- Navigation and transport
- Urban development
- Rural land management

Any physical modifications or activities that are considered likely to compromise the objectives must undergo a thorough assessment before they can be permitted using the exemptions in Part 5 of the WFD Regulations 2017 and must also ensure other related objectives are not compromised as a result of the proposed activities. An assessment must provide evidence to satisfy the following are true:

- All practicable steps are taken to mitigate the adverse impact on the status of the water body
- The benefits to human health or human safety or sustainable development outweigh the benefits of achieving WFD Regulation 2017 objectives or the activity is of overriding public interest
- There are no other means of providing the services offered by the activity that are technically feasible or of a proportionate cost and provides a significantly better environmental option

In addition, the reasons for the modifications or activities are specifically explained in the RBMP and relevant objectives are reviewed every six years.

NRW works with public bodies, developers and its own operational functions to ensure WFD Regulation objectives (including the correct application of Part 4 regulation 19 defence) are met. NRW utilises regulatory advice/guidance to ensure the specific requirements of the exemption are achieved.

3.2 River basin management planning

River basin management planning is a cyclical process that is punctuated at intervals by consultation and reporting required by the WFD Regulations 2017. The ongoing planning process can be broken down into four main stages as shown below:

Stage 1 – identify whether there is an environmental problem

A problem could be the failure of a Protected Area or water body to achieve its objective, or a deterioration in status over time.

The condition of Protected Areas and water bodies is assessed by NRW. The current status of water bodies is assessed through the process of classification and comparison of these results over time will indicate whether any deterioration in that status is occurring. Classification results can indicate whether there is an environmental problem in a water body but other information, including information from stakeholders, can also be used (see also section 4).

Stage 2 – identify the cause(s) of the environmental problem

The cause of the problem must be determined in order to identify appropriate solutions.

In order to understand the causes of problems, NRW has completed a large number of investigations. These have greatly improved our understanding of the reasons why water bodies are not at good status. Investigations will continue where they are required to understand new failures and where deterioration is detected. (See also section 4)

Stage 3 – identify and assess measures to resolve the environmental problem

Measures (known also as actions) may be needed to reduce the impact of current problems or prevent future problems such as deterioration in status.

Where more than one technically feasible measure is available options should be assessed (including use of cost-benefit). All of the measures required to fully resolve the problem are identified

Stage 4 – identify the relevant objectives and when they can be achieved

When objectives will be achieved is determined by considering how and when the measures to achieve the outcomes will be funded and implemented.

Priorities are reflected in the third cycle RBMPs, which will be submitted to the Minister for Environment, Energy and Rural Affairs and for cross border plans the Secretary of State who will make a decision on affordability and overall ambition .

Once objectives have been agreed, monitoring and classification are used to assess compliance against those objectives (see also section 5).

3.3 Working with others

Working with others is at the heart of a successful river basin management planning process. Protecting and improving the water environment needs action from all parts of society. By working effectively with others, we agree better solutions and protect the things that matter most to people.

The WFD Regulations 2017 include legal obligations on consultation. This includes encouraging the active involvement of all interested parties in the implementation of the Regulations, in particular in the production, review and updating of the RBMPs.

Many different groups work towards improving and protecting the water environment. NRW welcome the opportunity to work more closely with all sectors and interested parties who have an interest in improving the water environment, through the RBMP consultation many individuals and organisations offered their assistance by working collaboratively with us to improve the water environment.

3.3.1 Welsh Government Water Forum

This strategic forum was established in 2007 and is chaired by Welsh Government. It is made up of representatives of major stakeholder sectors and important national organisations. The Forum provides a focus for communication and consultation on a broad range of water related issues.

3.3.2 Wales Water Management Forum

The purpose of the Forum is to provide an opportunity for NRW and the Wales Water Management Forum (WWMF) membership organisations to share evidence and explore opportunities for working together to achieve the sustainable management of water from source to sea.

The Forum works with the Wales Land Management Forum (WLMF), Wales Fisheries Forum (WFF) and the Wales Marine Advisory and Action Group (WMAAG).

The forum will:

- Work collaboratively to develop and deliver plans to protect Wales' water environment, to ensure ecosystem resilience is improved and that water resources are managed to ensure that there is enough good quality water for people and the environment.

- Provide strategic advice to inform NRW and Welsh Government on water related policy and strategy.

- Address the major pressures on the water environment by developing a common understanding of the potential barriers to sustainable outcomes and long-term challenges, such as climate change, population growth and development.

- Influence the management of water from source to sea, taking a whole catchment approach, liaising with relevant marine forums in relation to management and impacts in the marine environment.

- Actively collaborate for the planning and delivery of river basin management planning in accordance with the requirements of the WFD Regulations 2017, including cross border working. The WWMF will act as the RBDs Liaison Panel for the Western Wales, the Dee and the Welsh part of the Severn RBD.

- Support and promote integrated planning, with improved linkages between plans affecting the water environment and streamlining these.

- Identify opportunities and support the development of experimental trials or innovative approaches and nature-based solutions to tackle pressures on the water environment.

- Share expertise, knowledge and relevant evidence relating to water management, including joint work on the evidence base within the State of Natural Resources report (SoNaRR) to understand the pressures on Wales' natural water resources.

- Work together to facilitate the implementation of Welsh Ministers priorities for Wales' natural water resources set in the Natural Resources Policy published by Welsh Government and NRW's related Area Statements.

- Communicate best practice and identify relevant projects or measures for co-delivery.

- Promote the principles of SMNR in managing the water environment and reporting the effectiveness of approaches.

- Influence NRW and sectoral investment and explore alternative funding environmental improvements including developing an agreed approach to payment for ecosystem services, to maximise opportunities to deliver multiple benefits.

3.4 Working at the catchment scale and integrated natural resources management

Engagement and involvement at a local level around the water environment have been integrated into the Area Statement engagement process, which was central to the selection of the Opportunity Catchments. Workshops were held across the six terrestrial 'places' and marine to develop the Area Statements. The Area Statement process has been designed with ways of working, including the principles of SMNR, at its core. NRW has tried different ways to communicate with stakeholders to encourage continued involvement and interest in Area Statements and priorities within them, including those relevant to the water environment.

The Area Statement process will continue post 2027 and therefore integration will bring WFD Regulations 2017 benefits for the longer term. Stakeholder mapping has been undertaken to identify as many different sectors as possible with whom NRW can engage with to capture the widest range of views an expertise. Representative groups such as environmental non-governmental organisations, farming unions, angling associations and large industry have been included.

The Act is a key element of the Welsh Government's legislative programme. The natural resource management policy framework is still being developed in Wales but the RBMPs reflect the essential principles of SMNR in the following ways:

Manage adaptively, by planning, monitoring and reviewing action

The river basin management process promotes adaptive management. The condition of water bodies and progress towards achieving good or better status are regularly monitored. The RBMPs are reviewed and updated every 6 years. Any actions and measures are also reviewed changed where appropriate as part of this planning process.

Consider the appropriate spatial scale for action

The RBMPs encompass all the issues and pressures on the water environment and the actions to manage them at a river basin scale. We are developing a catchment approach for delivery of actions which will focus at a scale more relevant to communities and other stakeholders. By looking at a catchment scale (Figure 1), rather than individual issues or sectors, we can move beyond addressing issues reactively and in isolation. This will enable an integrated, proactive approach, addressing opportunities and constraints in a whole system, cross-sectoral way.

The natural processes we are working with, and the management processes we are aiming to influence, tend to work at different scales. Area based natural resource management processes should reflect this and aim to manage ecosystem services at the most appropriate scale, whilst taking into account the best management mechanisms for doing so. The WFD Regulations 2017 require that we produce and review management plans at the river basin scale, however many of the problems facing the water environment are best understood and tackled at the catchment scale. This will help to tackle local issues such as pollution from diffuse sources which is a significant pressure across Wales and take action to prevent damage to ecosystems.

Promote and engage in collaboration and co-operation

NRW is the competent authority for the WFD Regulations 2017 but only manages six percent of Wales' land area itself. It is essential that we involve stakeholders, including local authorities, communities, developers and industry, throughout the process of drawing up and implementing the RBMPs.

Take account of all the relevant evidence and gather evidence in respect of uncertainties

To inform the development of the area-based approach we need to use the best available evidence from a range of sources, building on both our knowledge and that of our stakeholders and local communities. We will take a pragmatic approach to evidence and apply the principle of collect once, use many times.

The contents of the RBMP is the result of a significant evidence base, collected through our monitoring programmes, investigations and economic assessments.

Take account of the benefits and intrinsic value of natural resources and ecosystems

The natural resource planning process will need to reflect the principles of co-production and stakeholder engagement. It will need to aim to deliver outcomes that are equitably distributed and focus on delivering benefits for the people of Wales.

By working with others in catchments the aim is to:

- Understand the issues in the catchment and how they interact
- Understand the ways in which water and hydrological systems provide benefits to people, business, and support and sustain the wider environment
- Understand how the issues are affecting the current local benefits and future uses of water
- Involve local people, communities, organisations and businesses in making decisions by sharing evidence
- Identify which issues to tackle as a priority

Take account of the short, medium- and long-term consequences of actions

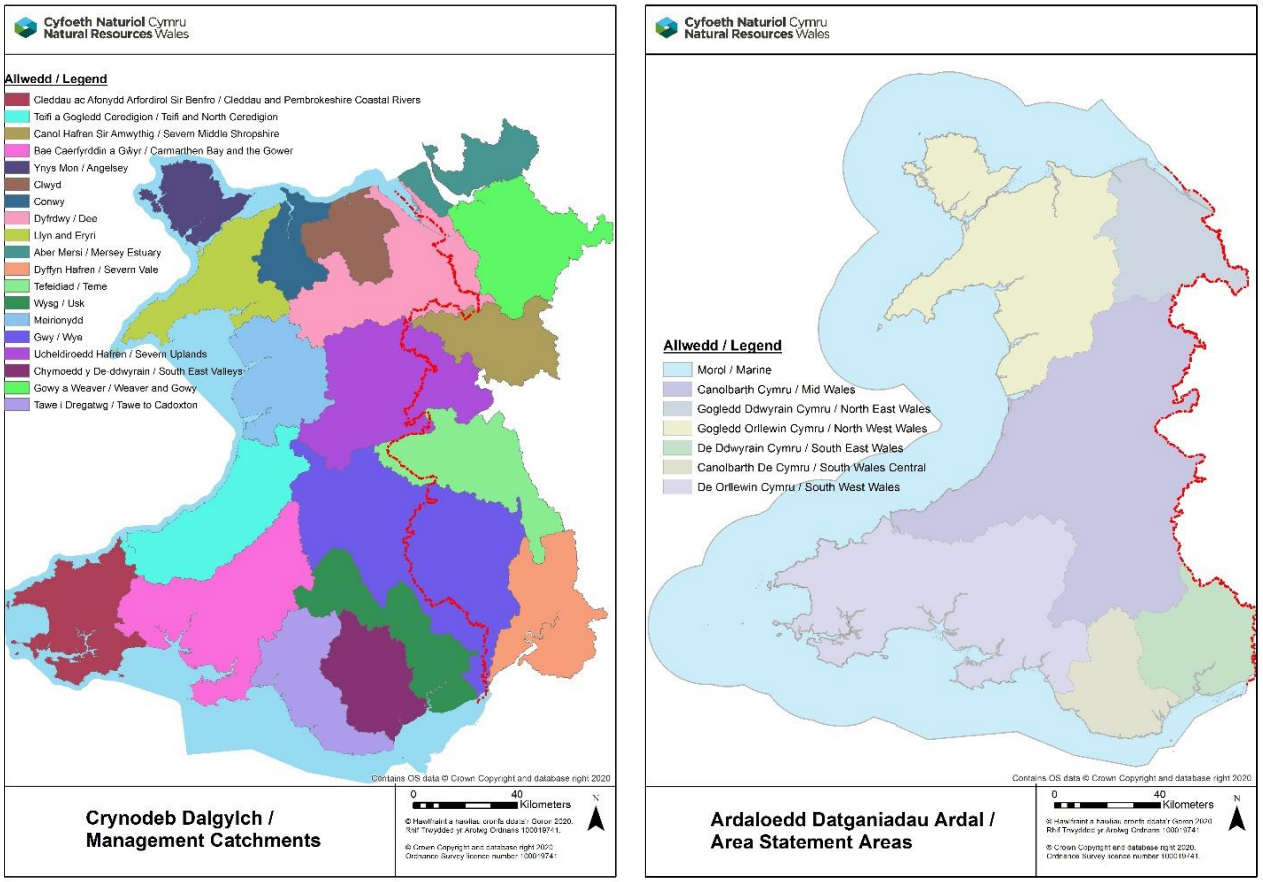
To create a sustainable Wales, we need to consider the opportunities and constraints Wales will face in the long term. This was considered as part of the environmental assessment along with consequences on the wider environment and cumulative/indirect effects. RBMPs consider long term objectives for improvement and are reviewed every six years.

Take account of the resilience of ecosystems

A resilient ecosystem is one that is healthy and functions in a way that is able to address pressures and demands placed on it and is able to deliver benefits over the long term to meet current and future social, economic and environmental needs. The new approach will need to plan to deliver multiple, longer term benefits for the environment and also for the economy and society – reflecting long-term well-being goals for Wales. Ensuring that actions contribute to the resilience of the supporting ecosystems and their functioning will be key to the long-term sustainability of the services and benefits they can provide.

The actions and measures proposed in this RBMP can take account of ecosystem resilience and deliver multiple benefits, for example improving land management in the uplands can have significant benefits in climate change resilience, carbon capture, flood storage and improved downstream water quality. Further information on the benefits and potential constraints of measures on ecosystems and consideration of the baseline for each ecosystem and the potential effects with and without the measures, can be found in the environmental assessment.

Figure 1: Management catchments and area statement boundaries in Wales



3.5 River basin management planning timetable

Although most of the river basin management planning activities are continual and iterative there are defined points at which consultation and reporting take place as part of developing and updating RBMPs. The timetable for these steps is set by the WFD Regulations 2017 and shown below.

- Working Together consultation between June 2018 and December 2018
- Challenges and Choices consultation between June 2019 and December 2019
- Consultation on the draft Western Wales and Dee RBMPs between December 2020 and June 2021 and the draft Severn RBMP consultation was published by the Environment Agency in October 2021.
- Publish the final RBMPs 2022

3.6 Economic analysis of water use

In preparation for the first RBMPs, a wide-ranging economic analysis was carried out and reported through a collaborative research programme overseen by UK authorities (in Wales this was undertaken by Defra and Welsh Government) and stakeholder organisations.

A summary of the economic analysis is included in Annex K of the 2009 RBMPs and is available from our customer contact team by request.

Water and sewerage services in Wales are wholly privatised. Therefore, over the long term, the financial costs of water and sewerage services are recovered in full from service users. This includes the internalised environmental and resource costs.

The local economic analysis, included a local assessment of the most cost-effective programmes of measures to prevent deterioration, achieve Protected Area objectives and achieve good status where technically feasible. This analysis has drawn on the database of costs of measures, maintained and developed since the plans were published and supplemented where appropriate by local and stakeholder information.

3.7 Assessments of the river basin management plan

3.7.1 Strategic Environmental Assessment

River Basin Management Plans are subject to the requirements of the Environmental Assessment of Plans and Programmes Regulations 2004 (SI 1656/04). The first and second cycle RBMPs had full Strategic Environmental Assessments (SEA) produced. The Statement of Particulars for both the Western Wales and Dee second cycle plans can be found on our website and the full Strategic Environmental Assessment documents are available on request by contacting wfdwales@naturalresourceswales.gov.uk.

NRW, as Responsible Authority for the Dee and Western Wales, has made a screening determination under the regulations for the third cycle RBMPs. To inform the screening determination NRW reviewed the implementation of the second cycle and changes to the national Programme of Measures made between the second and third cycle.

NRW has determined that the third cycle Western Wales and Dee RBMPs will not generate any new or additional significant environmental effects and so does not require a full SEA. The Western Wales SEA screening decision and the Dee SEA screening decision documents provide the statement of our reasons for the determination. The views of the statutory consultation bodies (Strategic Assessment Team in NRW, Cadw, Natural England and Heritage England) on likely significant effects were sought during the consultation on the draft plans and no disagreement with the screening determination were received.

The Environment Agency, as Responsible Authority for the Severn RBMP has made a screening determination for the Severn RBMP.

3.7.2 Habitats Regulations Assessment (HRA)

A single HRA of the Dee and Western Wales RBMPs has been carried out by NRW in accordance with the Conservation of Habitats and Species Regulations 2017 (as amended) to consider whether the plans are likely to have a significant effect on any European site.

The HRA has been undertaken in a series of stages that took place iteratively with the development of the Programme of Measures. A draft HRA for the Western Wales and Dee draft RBMPs was made available on our website during the consultation and formally shared with the Statutory Nature Conservation Bodies, Natural England and the Strategic Assessment Team in NRW. Comments received have been incorporated into the final HRA.

The final HRA sets out the results of the pre-screening, where measures that have no pathway for effects on European sites have been screened out immediately, with justification provided.

Some measures could not be screened out as having no likely significant effect because of the lack of available detail and were taken forward into the Appropriate Assessment. This approach was taken on a precautionary basis in light of changes in case law between the second and third RBMPs and the uncertainty of effects of certain measures at the high level of the RBMP. It should be considered in the context of the main aims of the RBMPs which are to improve the water environment, including Protected Areas. The Appropriate Assessment sets out the criteria for deferring down the HRA of the Dee and Western Wales RBMPs to lower tier plans, programmes and projects and demonstrates how we meet them. We are confident that they can be delivered without causing adverse effects on site integrity.

There are a series of measures and approaches, as described in the HRA which, along with an appropriately detailed HRA, will ensure mitigation is implemented within the lower-tier plans, programmes and projects to avoid and reduce any impacts on European site integrity.

The Environment Agency will lead on the completion of the HRA for the Severn RBMP.

3.8 Competent authorities for river basin management planning

In Wales the appropriate authority for the implementation of the WFD Regulations 2017 is Welsh Government. The appropriate authority has general responsibility for ensuring that the legislation is given effect. The appropriate authority also has specific responsibilities for ensuring that appropriate economic analysis is carried out, approving proposals for environmental objectives and programmes of measures and approving RBMPs. The appropriate authority may also give guidance or directions to NRW, and any other public body, on the practical implementation.

NRW is the competent authority for producing and updating RBMPs in Wales. NRW is responsible for carrying out the analysis required for characterisation, monitoring, identifying waters used for the abstraction of drinking water, and establishing a register of those waters and other Protected Areas. It must prepare proposals for environmental objectives and programmes of measures for each RBD and publish RBMPs. NRW must also ensure public participation in preparation of the RBMPs and make certain information required under the WFD Regulations 2017 accessible to the public.

4. Defining and describing the water environment

Summary of this section

This section describes how the water environment is divided up and characterised to support implementation and reporting. It explains how the water environment is monitored and its condition assessed and reported. The section then describes the main challenges affecting management of the water environment in Wales, how future risks have been assessed and causes of current problems identified.

Topics covered:

RBDs and water bodies; typology; designation of A/HMWBs; Protected Areas; monitoring networks; classification methodologies; recent changes in the water body network and the way classification is derived; significant water management issues (SWMIs); risk assessments; RNAG status.

4.1 River basin districts, catchments and water bodies

The WFD Regulations 2017 cover all waters, including inland surface waters, groundwater, estuaries and coastal waters, independent of size and characteristics. For example, ‘inland water’ is defined as ”all standing or flowing water on the surface of the land”.

For the purpose of implementing the Regulations, all waters were assigned to geographical or administrative units, namely the river basin, RBD and water body.

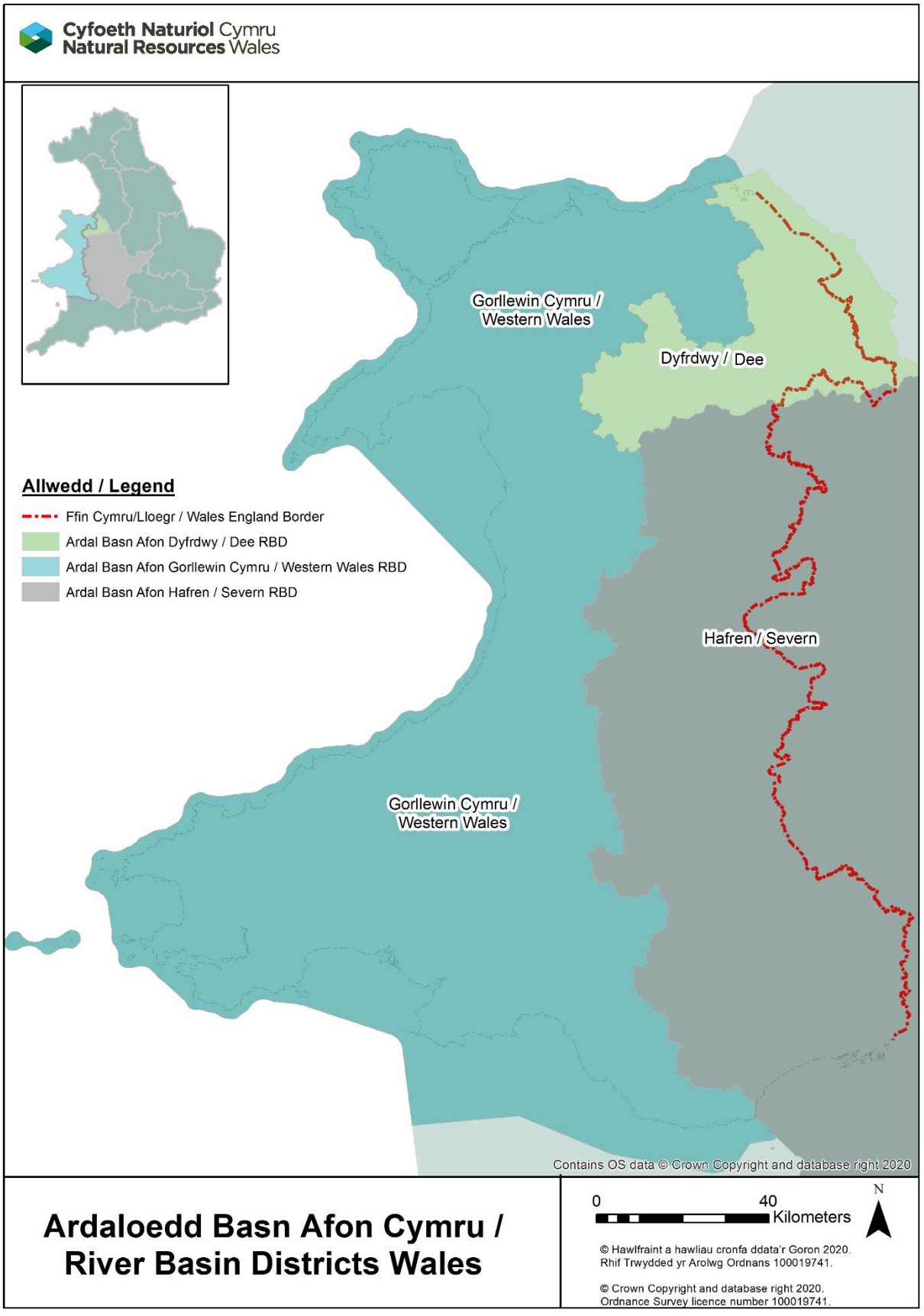
The river basin is the geographical area from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth or estuary.

The RBD is the main unit for management of river basins under the WFD Regulations 2017. An RBD can consist of one or more river basins. Management catchments are units that sit underneath each RBD. These catchments are amalgamated up to RBDs for reporting purposes. The RBDs in Wales and those that are cross border with England are shown on the map below (figure 2).

Water bodies are the units used for reporting and assessing compliance with the Regulations principal environmental objectives. The environmental objectives apply to water bodies and so the main purpose of identifying water bodies is to enable status to be accurately described and compared to the environmental objectives.

The WFD Regulations 2017 define a surface water body as a “discrete and significant element” of surface water such as a lake or reservoir or entire (or part) stream, river or canal, estuary or stretch of coastal water (out to 1 nautical mile, and for chemical status only this extends to the limit of territorial waters which may extend up to 12 nautical miles). A groundwater body is a distinct volume of groundwater within one or more aquifers. Water bodies in Wales were identified as part of a characterisation process.

Figure 2: River basin districts in Wales



Most water body categories, such as groundwater or coastal waters, are delineated as a discrete area and are shown as this total area for reporting purposes.

Whilst each river water body also has a defined catchment area, river water bodies are reported (for example in the RBMPs) using a river line within that catchment. For the first cycle of river basin management planning this river line (often referred to as the 'blue line') was derived from the 1:50,000 scale river network, which was subsequently updated using the 'Detailed River Network' for second cycle. This river line is purely a reporting network and it is this river line which appears on maps in the third cycle RBMPs.

4.1.1 Surface water body types and reference conditions

Because the sorts of animals and plants found in upland, rocky, fast-flowing streams are very different to those found in lowland, slow flowing, meandering rivers, rivers, lakes, estuaries and coastal water bodies are grouped into different types according to their physical and chemical characteristics. The types dictate, in very general terms, the sorts of plants and animals likely to be present in water bodies of that type.

Reference condition descriptions covering the sorts of plants and animals expected to be found in the different types of water bodies in undisturbed conditions have been produced for each type or group of types (see supporting info below). These types are the ones that have been used in the initial characterisation of each RBD. In some cases, there are no examples of reference condition in the UK and descriptions are based on similar types in other Countries, or extrapolation from modelling studies, or historic data.

Reference conditions and the conditions found in high status waters are the same. For example, if a classification tool shows that the diatom community in a water body is at high status, then the species composition and abundance of diatoms in that type of water body are what would be expected under reference or undisturbed conditions. The Ministerial Directions on Environmental Standards give the values for high status for both biological and physico-chemical elements and include screening approaches for high status hydrology and morphology. It is important to understand, that to be in overall high status a water body would need to comply with all the criteria including hydrological regime and morphological criteria.

Supporting information

For more detail on how reference values have been determined for each of the biological elements see the UK Technical Advisory Group (UKTAG) Assessment Methodologies can be found on the WFDUK website.

The reference conditions descriptions for rivers, lakes, estuarine and coastal waters.

4.1.2 Designation of Artificial/Heavily Modified Water Bodies

Prior to publication of the first RBMPs we designated water bodies according to their specified use and the current extent of that use. This followed a series of consultations, cross-references and quality checks, and the involvement of representatives of important stakeholder sectors.

For third cycle NRW has performed a significant review of the designations of all water bodies. Changes to designations are being made in response to some licensing changes or where errors have been identified in the current designations. See section 4.3.

4.2 Assessing the current state of the water environment

4.2.1 Protected areas

Protected Areas are parts of the environment that have been designated as requiring special protection under Community legislation for the protection of their surface water and groundwater or for the protection of habitats and species directly depending on water.

NRW has routine monitoring programmes in place or sources data from other agencies for assessing compliance for Bathing Waters, SACs/SPAs, Drinking Water and Shellfish Water Protected Areas.

DrWPAs are those water bodies that supply more than 10m^3/day or serves more than 50 people). DrWPA are subject to meeting the requirements of the Water Supply (Water Quality) Regulations 2018 and the Private Water Supplies (Wales) Regulations 2017 (regulated by the DWI), information on this can be found on the DWI website (www.dwi.gov.uk).

The WFD Regulations 2017 also requires that there is no deterioration in the quality of raw drinking waters, DrWPA at risk of deterioration are identified by assessing if:

- Drinking water standards are breached
- If the raw water quality is getting worse
- If there a need for additional treatment now or in the future?

Assessment of the risk status covers parameters such as pesticide levels, organic chemicals, taste and odour of the water (MIB (Methylisoborneol) and Geosim, compounds produced by blue green algae and bacteria), nutrients, metals, sediment, algae and bacterial levels.

Those DrWPA determined to be at risk can be established as SgZs where non statutory action plans aim to prevent pollution and deterioration in the water quality.

Details of the risk status of the DrWPAs can be found on Water Watch Wales.

Bathing Water Protected Areas are assessed annually against the following classifications:

- Excellent – the highest, cleanest class
- Good – generally good water quality
- Sufficient – the water quality meets the minimum standard
- Poor – the water quality has not met the minimum standard

Up to date status information for all Bathing Water Protected Areas in Wales is available on our website, with historic data available for each site and includes a 24 hour water quality prediction.

Shellfish Water Protected Areas (SWPA) are assessed against the microbial standard in shellfish flesh each year. To allow consideration of inter annual variation a broader timeframe of 10 years is considered for compliance. If a SWPA has met the microbial standard in 8 out of the last 10 years, it is considered to be a consistent achievement of the standard and ensuring no deterioration is considered the priority objective for those SWPAs. Data which in many SWPAs covers a wider geographic scope and at a higher frequency (provided by the Food Standards Agency) has used for assessment since 2014, whereas previously quarterly monitoring data from a single 'Representative Monitoring Point' in each SWPA was used. As well as a compliance assessment, a deterioration assessment is also carried out for each SWPA.

European sites Protected Areas

In Wales the condition of designated habitats and species features in SAC and SPAs for the Conservation of Habitats and Species Regulations 2017 (as amended) are reported over 6 year cycles, the latest reporting was in the Article 17 Habitat Directive Report 2019. Currently a designated site will fall into one of these categories; Favourable: Maintained, Favourable: Recovered, Favourable: Unclassified, Unfavourable: Recovering, Unfavourable: No change, Unfavourable: Declining, Unfavourable: Unclassified, Destroyed: Partially, Destroyed: Completely, Not Assessed and No data available.

NRW has undertaken marine indicative condition assessments for all the marine SPA and SAC features in 2018, which are available on our website.

NRW's Freshwater and Terrestrial Protected Sites baseline assessment (2020) used existing evidence to derive, where possible, indicative feature condition assessments across the range of freshwater and terrestrial features on protected sites in Wales.

The results of the review have confirmed our concerns, as expressed in our recent SoNaRR report, about biodiversity across terrestrial, freshwater and marine environments. The results show that NRW has insufficient evidence to determine the condition of around half of the features on Wales' terrestrial and freshwater protected sites (condition classed as 'unknown'). We have also concluded that around a third of features are in unfavourable condition. This means, of those features where we do know condition (with varying levels of confidence), 60% are not in a desired condition.

NRW is seeking to work closely with partners to develop a collaborative action plan to tackle this issue and to implement improvements to the monitoring of these key species and habitats and to the overall condition of protected sites.

4.2.2 Water body status monitoring networks

A network of monitoring sites is used to establish the actual condition of all water bodies within each RBD in terms of their ecology, water chemistry, flow and groundwater level.

For rivers and lakes, a network of monitoring sites is used to classify all water bodies according to the priority pressures acting on the environment. In coastal and estuarine waters our operational programme is focussed on the priority pressures, hydromorphology, nutrients and chemicals. A smaller network of surveillance sites is used across all surface waters to provide information on long-term natural and

anthropogenic trends, and to inform development of the assessment tools and design of future monitoring programmes.

For groundwater two monitoring networks are used to provide classifications. A groundwater quality monitoring network meets the surveillance and operational monitoring requirements for chemical status and trend assessment, and a groundwater level monitoring network is used to meet the requirements of quantitative status assessment.

Supporting information

You can find maps showing the monitoring networks for each RBD on Water Watch Wales.

4.2.3. Assessment of water body status

The WFD Regulations 2017 requires the status of water bodies to be assessed and this assessment is created by classifying data from the monitoring network. For a particular point in time a classification will show us whether the quality of the environment is good, or where it may need improvement.

Classification is just one part of the evidence base that helps to focus efforts on those water bodies where a difference needs to be made. Additional information is sometimes required to assess whether a classification result is really indicative of an environmental problem. Additional evidence may also indicate where problems exist that are not apparent through classification results alone. NRW's approach to assessing environmental problems is described in more detail in section 4.2.4.

For surface waters there are two separate classifications for water bodies, ecological and chemical. For a water body to be in overall good status both ecological and chemical status must be at least good.

For groundwater there are two separate classifications for groundwater bodies: chemical status and quantitative status. Each must be reported in addition to the overall groundwater body status. For a groundwater body to be at good status overall both chemical status and quantitative status must be good. In addition to assessing status, there is also a requirement to identify and report where the quality of groundwater is deteriorating as a result of pollution and which may lead to a future deterioration in status.

i. Ecological status

Ecological classification consists of:

- The condition of biological elements, for example fish
- Concentrations of supporting physico-chemical elements, for example the oxygen or ammonia levels
- Concentrations of specific pollutants, for example copper
- And for high status, largely undisturbed hydromorphology

Ecological status is recorded on the scale of high, good, moderate, poor or bad. High denotes largely undisturbed conditions and the other classes represent increasing deviation from this reference condition. The classification of ecological

status for the water body, and the confidence in this, is determined by the worst scoring quality element.

Only biological elements are currently recorded on the full scale, high to bad. Supporting physico-chemical elements are not reported below moderate status. However, the UKTAG, the UK-wide collaboration to develop best practice, has produced standards that distinguish between moderate, poor and bad for physico-chemical elements. NRW uses this information as part of our evidence base as well.

Hydromorphological elements (hydrology and morphology) are supporting elements of ecological status and are recorded either as supporting or failing to support good ecological status. Hydromorphological elements and the presence of high impact invasive species are used to define high ecological status.

ii. Surface water chemical status

Chemical status is assessed by compliance with environmental standards for chemicals that are listed in the Environmental Quality Standards Directive as transposed into the WFD (Standards and Classification) Directions (England and Wales) 2015 (referred to as EQSD). Chemical status is recorded as either good or fail. The chemical status classification, including certainty, for the water body is determined by the worst scoring chemical.

Assessment of chemical status has been based either on monitoring data from within the water body or where this is not available, data from the "Prioritisation of abandoned non-coal mine impacts on the environment" project and WFD Regulation investigations.

iii. Groundwater status - chemical and quantitative

The achievement of good status in groundwater involves meeting a series of conditions which are defined in the WFD Regulations 2017. In order to assess whether these conditions are being met, a series of tests has been designed for each of the quality elements defining good (chemical and quantitative) groundwater status.

There are five chemical and four quantitative tests. Each test is applied independently, and the results combined to give an overall assessment of groundwater body chemical and quantitative status. The worst-case classification from the relevant chemical status tests is reported as the overall chemical status for the groundwater body and the worst-case classification of the quantitative tests reported as the overall quantitative status for the groundwater body. The worst result of these two is reported as the overall groundwater body status. Groundwater bodies are classified as either at good or poor status.

iv. Groundwater trend assessment

For groundwater bodies that have been identified as being at risk of failing to meet their environmental objectives for groundwater quality, there is a requirement to identify any significant and sustained upward trends in pollutant concentrations. A significant trend is one that could lead to a groundwater body failing to meet its environmental objectives before 2027 if measures are not put in place to reverse the trend.

v. Ecological potential

For water bodies that have been designated as heavily modified or artificial, NRW must classify according to their ecological potential rather than status. UKTAG have adopted the 'mitigation measures approach' for classifying A/HMWBs.

This approach first assesses whether actions to mitigate the impact of physical modification are in place to the extent that could reasonably be expected. If this mitigation is in place, then the water body may be classified as achieving good ecological potential. If this level of mitigation is not in place, then the water body will be classed as moderate ecological potential.

There may be instances where it is considered inappropriate to implement a mitigation measure if it can be demonstrated that doing so is likely to have a significant adverse impact on the designated use of the water body. If so, then that mitigation measure is excluded from the classification process and is not required to be in place for a good ecological potential to be reached. Guidelines for significance are assessed individually for each designated use as it is recognised that they will vary between sectors.

Before a classification of overall ecological potential can be produced the second step is for the results of the mitigation measures assessment to be cross-checked with data from biological and physico-chemical assessments.

Where NRW have data for biological quality elements that show signs of impact from pressures other than hydromorphological alterations (for example if the diatom or phytoplankton status is poor because of nutrient pressures) the ecological potential will be changed. To reflect this other pressure the water body will be reported as 'poor ecological potential'. This also applies where we have data for physico-chemical quality elements. As with diatoms, these are capable of picking up impacts beyond the hydromorphological pressure and must also be reflected in the overall ecological potential result.

Where the flow conditions do not support good status (for example, due to over abstraction) it is necessary to over-ride the mitigation measures assessment so that the results of the biological surveys dictate the overall ecological potential. Doing this avoids misrepresenting the potential of a water body where, despite all mitigation measures being taken to address the physical pressures, the wildlife is suffering because of an abstraction upstream.

Finally, NRW may sometimes find that a water body has been designated as heavily modified yet the biological elements sensitive to hydromorphological pressures are at good status. Where this is the case, we have reviewed the biological evidence and where there is high confidence in the longevity of the ecological status the heavily modified water body designation will be removed (see Appendix B).

Supporting information

The latest assessments of status for water bodies in Wales can be found on Water Watch Wales

4.2.4. Considering wider evidence of an environmental problem

As noted earlier, classification is just one part of the evidence available on the state of the water environment and additional information is sometimes required to assess whether a classification result is indicative of an environmental problem in a water body.

For surface waters the certainty that an element or water body is at less than good status is expressed using the three categories of very certain, quite certain and uncertain. These definitions are based on statistical certainty from analysis of the monitoring data used to derive the classification results (very certain ≥95%, quite certain ≥75% <95%, uncertain >50% <75%).

The level of certainty we need to have that an element really is at less than good status will be influenced by the actions required to resolve the environmental problem. If costly or targeted regulatory measures are required, then a high degree of certainty that there is a problem is usually required to justify the action. However, for some low cost, voluntary type measures action may be justified where there is much less certainty in the classification result.

Classification and statistical certainty derived from operational monitoring may be unable, on their own, to provide the certainty needed to justify the actions that may be required, particularly if the failure is caused by pollution from diffuse or intermittent sources. In these cases, additional evidence is used to make a pragmatic, qualitative judgement of the certainty that there is a problem to solve. This additional evidence could come from, for example, pollution incident or investigative monitoring data.

The classification results provide part of that evidence, but it is important to note that the additional evidence to improve certainty that there is, or is not, a problem to solve does not over-ride the formal classification result.

Assessments for nutrients and eutrophication

Eutrophication is when there is too much nutrient in waters, causing algae and plants to grow excessively. This affects the quality of the water and how it can be used, as well as damaging the local wildlife.

For the impacts of nutrients on biological status, relevant classification results have been combined with wider evidence within ‘eutrophication assessments’. These assessments do not affect classification, which is done element by element, but are used in the targeting of measures for nutrients.

The nutrient standards used for classifications are based on an understanding of the links between nutrients and the biological impacts associated with eutrophication. However, there is uncertainty in the ability to use this knowledge to predict the impacts in particular water bodies; exceeding the nutrient standard alone is considered insufficient to judge the risk of impacts on the biology. Therefore, NRW uses additional evidence in targeting and prioritising control measures.

All elements that are relevant to trophic status are considered and reported in the RBMP. Failures of any elements are investigated to identify reasons for failure. Nutrient element failures where there are no corroborating biology classification failures associated with increased concentrations of nutrients may however be targeted as lower priority for action than those with relevant supporting biology failures.

Wider evidence of eutrophication, for example from investigations, is also taken into account, where appropriate and available, to increase certainty. This assessment of certainty of eutrophication does not affect the classification result but informs decisions on subsequent actions as described above, with high certainty being

required if costly targeted regulatory measures would be needed to address the problem. This approach provides a link between standards, classification, investigations and measures.

4.3 Changes since second cycle

Water body status classifications are based on:

- The water body and monitoring networks
- The designation of A/HMWBs
- The standards and tools used to derive classification

Water body and monitoring networks

There have not been any major changes to the water body and monitoring network in terms of boundaries. However, there were some errors in the second cycle network in terms of water body name, operational catchment applied that have been corrected for third cycle. For further detail see Appendix B.

Designation of A/HMWBs

There are a number of heavily modified water bodies that in second cycle were designated for the wrong use or need to be designated/de-designated for a use. Some of these changes include a number of impoundments that have/are being decommissioned.

The WFD Regulations 2017 encourage us to re-visit these designations in each of the river basin cycles to ensure that any changes required are considered. For further detail see Appendix B.

Standards and tools used to derive classification

For the third RBMPs the standards and tools have been reviewed based on improved science, better understanding of the environment, policy and directions from UK or devolved government. The changes between the second and third cycle RBMPs are not considered to be major and include:

- Monitoring networks.
- New standards for nitrogen in lakes. Lake nitrogen standards have been developed for the first time for use in the third river basin planning cycle, derived in accordance with the technical guidance published by the EU WFD Common Implementation Strategy (WFD CIS 2019).
- Amended standards for river acidity. UKTAG consulted on proposals for river acidity standards in 2012. Wales will apply these standards in this river basin planning cycle, whereas England will apply the previous standards.
- Changes to classification tools based on advice from UK Technical Advice Group (UKTAG) and other technical experts. In 2015, NRW used the ‘Transitional Fish Classification Tool’ to classify estuarine fish. A new WFD estuarine fish classification tool (EMFI) was subsequently tested and

intercalibrated. The new classification tool (EMFI) allows NRW to provide a more confident classification that can be related to environmental pressures, therefore ensuring that any necessary measures to achieve good status are justified and effective.

- Revised list of high impact invasive non-native species. Decisions on the appropriate listing for an alien species are based on the ecological impacts reported in risk assessments coordinated by the Great Britain Non-native Species Secretariat. There have been a number of new or updated risk assessments since 2015 which have resulted in a change to the understanding of the ecological impact of existing species.

- Number of chemicals assessed.

- Classification of ubiquitous, persistent, bioaccumulative and toxic chemicals (uPBT). Because of the bioaccumulative nature of uPBTs we are now directed to monitor these chemicals in the tissue of fish and shellfish. We cannot sample the environment for these chemicals as widely as we do with water samples, and we will only sample fish and shellfish when we are confident that we are not impacting on natural populations. This limits the number of waterbodies we assess for these kinds of chemicals in Wales and so NRW is actively investigating other methods and techniques to assess the risk to higher trophic levels that uPBTs pose. For this reason, we have only reported uPBTs in water bodies we have monitored whilst we research and collate the evidence required to report uPBTs on a wider scale in the future. The risk assessments and fact sheets published as part of the RBMPs show the wider risk that these uPBT chemicals pose.

4.4 Challenges

4.4.1 Significant water management issues (SWMIs)

In 2018 NRW consulted on what were considered to be the most important issues that challenge the current and potential future uses and benefits of the water environment in each RBD. These SWMIs are described in the RBMP documents as follows:

- **Physical modifications** – changes made by people to rivers, lakes and estuaries, for example flood defences and weirs, and changes to the natural river channels for land drainage and navigation. These modifications alter natural flow levels, may cause excessive build-up of sediment, barriers to migration and the loss of habitats.

- **Pollution from rural areas** – the effects of poor agricultural practice and rural land management on the water environment (also known as 'diffuse rural pollution'), causing sediment, nutrient and pesticide run-off

- **Pollution from towns, cities and transport** – rainwater running over hard surfaces and carrying pollutants into waters, chemicals from contaminated land, and sewage from houses ‘misconnected’ to surface water drains rather than sewers (also known as ‘diffuse urban pollution)

- **Pollution from wastewater** – wastewater can contain large amounts of nutrients (such as phosphorus and nitrates), ammonia, faecal bacteria and other damaging substances

- **Pollution from mines** – contaminated water draining from mines, most of which are now abandoned

- **Changes to the natural flow and level of water** – taking too much water from rivers, canals, lakes and groundwater, means less water flowing and altering water levels can affect habitats

- **Negative effects of non-native invasive species** – the effect on the health of the natural environment of plants and animals from outside the UK introduced to UK waters

Some of the issues described above relate to a single pressure and others are more complex and involve a range of different pressures. Pressures can come from one or more sources (activities). These include:

- Phosphorus, nitrates and faecal bacteria largely originate from livestock manures and human sewage

- Surface run-off can be contaminated by fine sediment that has both direct and indirect impacts on the condition of the receiving environment. Direct impacts include alteration of the physical characteristics of river channels leading to impacts on the habitat and to ‘muddy floods’. Indirect impacts occur because the sediment acts as a vehicle for the transfer of other pollutants, such as phosphorus, nitrate, pesticides and faecal bacteria to rivers, lakes, estuaries and coastal waters

- A wide range of chemicals used in everyday life, some of which can adversely affect the environment, enter watercourses from point sources (factory and WwTW effluents) as well as diffuse sources, for example road run-off

- WwTW and storm overflows are also important point sources of phosphorus, nitrate, faecal bacteria and sanitary pollution

The sections below provide more information on the individual pressures that have significant impacts on the water environment

i. Abstraction and flow

Taking too much water from rivers, canals, lakes and groundwater causes problems for wildlife.

Abstraction is the removal of water, permanently or temporarily, from the water environment such as rivers, lakes, wetlands, canals, reservoirs or from groundwater. Water is abstracted to meet a wide range of uses throughout Wales. The effect abstraction has on the environment depends on the amount and timing of the abstraction and the location and amount of water that may be returned after it has been used. Taking too much water from rivers and groundwater may result in lower flows and reduced water levels, which may not support a healthy ecology, affecting wildlife and the look of a river, as well as impacting on other water users.

In the short term, the current actions being taken to restore sustainable abstraction are reducing the impact on some rivers. In the future, population growth and development are likely to require more water to be abstracted. A changing climate may affect both the demand for water and the natural resource present in rivers and groundwater in future. If abstraction continues at current rates (or increases) and natural water resources become depleted due to climate change, the existing impacts of abstraction on rivers, lakes, wetlands and estuaries will be magnified. Although Wales is often viewed as being wet, there are some parts of Wales that do not have any reliable new supplies of water available from rivers and groundwater to meet these future requirements.

We need to ensure there is no deterioration in the ecological condition of rivers due to abstraction. Taking a proportionate approach to managing abstraction and flow pressures can ensure sustainable supplies of water for the public, businesses and agriculture, while making sure rivers and other wetlands support a good ecology.

ii. Chemicals

Toxic and hazardous substances that enter the water environment and can damage wildlife and people and contaminate sources of drinking water.

A vast range of chemicals are used every day, both at home and at work, some of which can adversely affect the environment. These chemicals can enter the environment by many diverse routes, ranging from emissions from industry and wastewater treatment works to runoff from roads or farms that ultimately are discharged to coastal waters directly or via rivers. Many of these chemicals come from using products in homes, hotels, restaurants and offices and get into the water environment via wastewater treatment works. Other sources of chemicals include industry and agriculture. For some substances, as well as current emissions from industry and wastewater treatment works, there are significant legacy issues. Some substances are already widespread in the environment as a result of past use which has contaminated land and sediment. Some of these substances can accumulate in the food chain and may adhere strongly to sediment. In addition, historic industrial activity such as mining has led to significant transfer of metals from under the ground into the water environment.

Some chemicals can threaten the long-term sustainability of drinking water sources and lead to increased costs of treatment. They may also hinder the transfer of water from areas with abundant supplies to those where supplies are scarce.

There are major challenges to achieving objectives for some designated chemicals under the WFD Regulations 2017. For example, brominated flame retardants were banned in 2006 but are still present in many home furnishings like sofas and remain in the environment bound to sediments. These types of chemical which are banned or controlled present particular difficulties to achieve relevant standards due to the legacy amount present in the catchment. For some common persistent toxic substances that can accumulate in the environment, the majority of waters may be at risk of not meeting Environmental Quality Standards (EQS), which are set to protect the environment.

For more information on chemicals see chemical narratives in Appendix C.

Under the WFD Regulations 2017 there is a requirement to publish an inventory of emissions, discharges and losses of priority substances for each RBD. This information including the methodology can be found in Appendix D. The inventory was compiled using environmental monitoring and point source effluent discharge

data. In the longer term the inventory is intended to track the effectiveness of control measures on priority substance discharges at a national level.

iii. Faecal contamination and sanitary pollutants

Contamination with faecal matter is an important factor to consider when protecting people's health. Sanitary pollutants can have direct toxic effects on wildlife, food products or cause damage by reducing the amount of oxygen in the water.

Faecal bacteria affect public health and so it is important to control the amount in the environment. Sewage effluent and runoff from animal manure are the largest sources of faecal organisms. Climate predictions suggest that there is likely to be increased contamination from farmland and urban runoff due to compacted soils and /or less frequent but intense summer rainfall events. These events may also cause an increased frequency of CSOs and WwTW flooding.

Faecal bacteria in the water at coastal and freshwater beaches can affect people using these waters, particularly while swimming. Faecal bacteria can accumulate in shellfish, which may result in shellfish harvested for consumption having to be depurated to make sure that they do not pose a risk to human health. If too many faecal bacteria reach rivers and groundwater used for drinking water, the supplies must be treated to make sure they are fit for consumption. Compliance with bacterial standards has improved significantly since the 1990s in designated Bathing Waters.

Ammonia, dissolved oxygen and Biochemical Oxygen Demand (BOD) (sanitary pollutants) are indicators of the organic pollution of the water environment. Ammonia is toxic and can kill or be otherwise harmful to aquatic wildlife like fish. The higher the biochemical oxygen demand, the greater the potential from organic pollution to cause a drop in dissolved oxygen which can cause stress or, in extreme cases, kill aquatic life. Sewage effluent is the largest source of sanitary pollutants. Sanitary pollutants leading to reduced dissolved oxygen is primarily an issue for rivers and lakes. Compliance with ammonia and dissolved oxygen standards has improved during the last 20 years, primarily due to investment by water companies. Regulation and improved farming practices have also contributed to improving compliance with ammonia, BOD and dissolved oxygen standards.

Small, private drinking water supplies from groundwater can be at particular risk of bacterial pollution. We are working with the DWI and Local Authorities to see how we can manage the need for purification treatment at private supplies.

iv. Fine sediment

Fine sediment can smother plants, fish eggs and invertebrates in rivers and lakes and also move other pollutants from land into water. Fine sediment can also increase flood risk and cause problems for drinking water supplies, for example by colouring the water.

Too much fine sediment causes a range of problems, from damaging wildlife to increasing the costs of treating drinking water, and increased risk of flooding from silted up drains. Sediment has direct impacts (smothering plants, fish eggs and freshwater invertebrates) and indirect impacts, carrying other pollutants like nutrients, chemicals and faecal contamination into the water environment. Reducing the amount of fine sediment, particularly through improved soil management

measures, not only reduces the direct impacts of sediment but also brings wider benefits, including reducing the risk of flooding. Fine sediment results from soil erosion, soil compaction (which increases surface water run-off) and the erosion of riverbanks and road verges.

Climate predictions indicate that there is likely to be increased contamination from sediments from farmland and farm premises and from urban environments. This will be due to washout from compacted soils and from urban environments after first-flush releases during intense rainfall events. Changing crop types and seasonal patterns of agriculture, such as increased winter cropping, will also affect sediment runoff. Research suggests there will be higher sediment loads to lakes and higher up stream systems which may affect fish spawning grounds.

v. Invasive non-native species

An invasive non-native species (INNS) is any non-native animal or plant that has the ability to spread causing damage to the environment, the economy, our health and the way we live.

They can negatively affect the health of our water environment and are a direct threat to the ecological objectives we want to achieve through the WFD Regulations 2017. INNS are also considered to be one of the main threats to biodiversity worldwide.

The total annual cost of INNS to the economy of Wales was estimated at over £125 million in 2010, taking into account increases in the introduction and spread of INNS since then the actual cost is likely to be considerably higher. These costs comprise control and eradication work but do not include additional operational management costs arising from INNS impacts which include structural damage, blocking intakes and pipes and production losses because of their presence, all of which further increase the actual overall cost of INNS to the economy.

The pressure and risks from INNS are increasing because of the continuing spread of established INNS and the likelihood of others being introduced due to increasing international trade and travel. Climate change may also increase the survival, proliferation and spread of INNS. We therefore need to develop and implement measures to reduce this pressure, the risks INNS pose to water body ecological status and to also minimise the risk of undermining all the other associated WFD Regulation improvement actions we are looking to undertake.

vi. Nitrates

Too much of this nutrient can put drinking water supplies at risk, increasing treatment costs. It can also cause algae and plants to grow excessively, particularly in estuarine and coastal habitats.

The main source of nitrates in our surface and ground waters are agriculture (the largest source) and sewage and, to a lesser extent, industrial effluents.

The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021 have been introduced to reduce losses of pollutants from agriculture to the environment by setting rules for certain farming practices. The Regulations also set standards for silage making, storage of silage effluent and for slurry storage systems. They replace the Nitrate Pollution Prevention (Wales) Regulations (2013)

and the Water Resources (Control of Pollution)(Silage and Slurry)(Wales) Regulations 2010 and establish good practice requirements for nutrient management into one set of regulations to reduce complexity.

Measures to protect the environment from pollution by nitrates from agricultural sources will now apply to the majority of holdings in Wales after the transition periods (these apply to holdings not previously in a Nitrate Vulnerable Zone).

Eutrophication is when there is too much nutrient in waters, causing algae and plants to grow excessively leading to an undesirable balance of organisms. This affects the quality of the water and how it can be used, as well as damaging the local wildlife. Nitrogen is the main nutrient in which can lead to eutrophication of estuaries and coastal waters and is one of the main issues for these waters in Wales. Recent science indicates that nitrogen may also play a role in eutrophication of freshwaters, particularly lakes. Increased temperatures and lower water levels under a changing climate are likely to exacerbate this.

Concentrations of nitrate in surface waters have been gradually declining since peaking in the early 2000s. In groundwater there are indications that concentrations in many locations are declining, but in some places, due to the very slow movement of water through the ground, peak levels of nitrate have not yet occurred.

vii. Phosphorus and freshwater eutrophication

Too much of this nutrient causes algae and plants to grow excessively. This affects the quality of the water and how it is used, as well as damaging the local ecology.

The main sources of phosphorus in our freshwaters are sewage effluent and agricultural drainage. There are several sources of phosphorus within sewage, notably human metabolic wastes, food additives, detergents and the dosing of drinking waters with phosphorus to control lead levels.

Concentrations of phosphorus in Welsh rivers have been falling since 1990, supported by major reductions in phosphorus inputs from wastewater treatment works through investment by the water industry. However, despite this progress, phosphorus remains a common cause of water quality failures in Wales. In January 2021 we published a report in which we presented our assessment of compliance against recently tightened phosphorus water quality targets for SAC rivers. The report showed that over 60% of SAC water bodies were failing the new targets for phosphorus. Most of the failing water bodies were in mid and south Wales. Notably, the Usk failed in 88% of its water bodies and on the Wye and Cleddau 60% of water bodies were found to be not meeting their targets. Parts of the Teifi and the Dee also failed to meet their targets, but the Eden, Gwyrfai, Glaslyn and Tywi met them fully. As for Nitrates, climate change may exacerbate the future extent and severity of eutrophication problems.

viii. Physical modification

Many water bodies exhibit manmade changes to their natural habitat. These modifications can alter natural flows, cause excessive build-up of sediment, increase erosion and reduce the diversity of habitats, thus potentially reducing the quality and quantity of habitat for fish, invertebrates and plants.

Plants, invertebrates and fish are affected by the flows and physical characteristics of the water environment. These hydrological and morphological features are collectively known as the water body's hydromorphology. Aquatic wildlife can be constrained if the quantity and quality of water flows is altered, and if habitat quality is reduced. Modifications such as straightening river channels, building weirs, dredging and reinforcing banks with concrete can constrain and stabilise the physical nature of water bodies, reducing the development and diversity of physical habitats. This, in turn, tends to reduce the number and diversity of animals and plants present. The way land is managed can also adversely affect habitats, for example by changing the amount of sediment that washes off both agricultural land and urban areas.

Many of the rivers, lakes and coasts of Wales have been modified to provide benefits to people such as land drainage, reduced flood risk to communities, water storage for public water supply, recreation or improved channels for navigation. In many cases these benefits and uses are still vitally important and need to be retained, whilst also reducing their potentially deleterious impacts on flows and habitats, and subsequently on aquatic wildlife.

There is significant uncertainty about future trends for physical modifications, but recent assessments indicate that some pressures will increase in response to climate and population changes. Deterioration in the ecological condition of some rivers by 2030 is forecast unless further action is taken to mitigate the impacts of and control the development of modifications.

ix. Plastics and litter

These have been recognised as a widespread problem in recent years and they are having a detrimental effect on wildlife, wildlife habitats and humans. Plastics are slow to degrade in the environment and, as such, living organisms particularly marine animals can be harmed either by mechanical effects, such as entanglement in plastic objects, problems related to ingestion of plastic waste, or through exposure to chemicals within plastics that interfere with their physiology. Currently there is no standardised way to monitor or report this problem, however there is a growing concern and awareness regarding this issue and steps are being taken to fight the rising tide of plastic pollution. The UK along with other Commonwealth countries have pledged to eliminate avoidable single use plastics and other avoidable plastic waste under the 'Commonwealth Clean Oceans Alliance', this agreement aims to call on all countries to pledge action on plastics and take steps to stop plastics entering the water environment in the first place .

There are many other issues that can affect the water environment; however, these can be more localised. For more information on these please see our State of the Natural Resources Report.

4.4.2. Issues affecting protected areas

Protected Areas are a priority for action. The same pressures that affect water bodies achieving good status frequently also affect Protected Areas achieving their objectives.

i. Drinking Water Protected Areas

There are a number of surface water DrWPAs in Wales and all ground waters that are used to provide drinking water are designated DrWPAs. The main issues in surface water DrWPAs are pesticides (either individual pesticides that are hard to treat or low levels of a number of pesticides that lead to a cumulative risk to the drinking water standard), increasing nutrient levels (ammonia, nitrate, nitrite and phosphate), taste and odour (MIB Methylisoborneol) and Geosim -compounds produced by blue green algae and bacteria) from organic compounds found in upland areas.

ii. Economically Significant Species

There were 22 designated Shellfish Water Protected Areas (SWPAs) in Wales over cycle 2. 11 were not actively farmed in 2019 and were not monitored, 3 complied with the microbial standard in shellfish flesh. However, only 1 SWPAs has complied with the microbial standard for more than 8 out of the last 10 years. Following a Welsh Government consultation in 2021, 7 SWPAs have been declassified and 1 new one classified for cycle 3. Microbial pollution of shellfish waters originates from multiple point and diffuse sources including CSOs, emergency overflows, urban surface water runoff and rural losses from ‘natural’ (wildlife), farm livestock and human sources. The investigations completed in Asset Management Plans (AMP) 6 and 7 combined with a disproportionate cost assessment has identified improvements to wastewater discharges in Menai Strait East to secure the objective of meeting the Guideline standard and additional work to ensure other SWPAs do not deteriorate.

iii. Recreational Waters (Bathing Waters)

Tougher standards were applied to Bathing Waters from 2015. In 2021 all of the designated Bathing Waters in Wales met the minimum water quality standards: 85 achieved the highest classification of excellent, 14 achieved good and 6 achieved sufficient. The most significant sources of pollution affecting Bathing Water compliance are from sewage works or CSOs; faeces from grazing animals; urban run-off which contains dog and bird faeces; or from birds and animals on the beach (for example seagulls, pigeons, dogs, horses and donkeys). The proportions of these multiple sources of microbial pollution vary from site to site, and in response to weather patterns. Identifying the source of microbial pollution can be very difficult.

iv. Nutrient Sensitive Areas (UWWT)

Under the Urban Waste Water Treatment (England and Wales) Regulations 1994 there are four freshwater and two estuarine and coastal water bodies designated as either sensitive areas eutrophic. NRW has been working with the water industry for many years to identify and review the measures that are needed to maintain and improve these Protected Areas. Measures include improving treatment at wastewater treatment works (for example to control levels of nutrients or bacteria), reducing the spill frequency of permitted intermittent discharges and installation of event duration monitoring to better understand the impact that intermittent discharges are having on the environment. Recently, the water industry has also been identifying innovative measures such as the use of catchment schemes to reduce loadings of diffuse pollutants to help look after Protected Areas. However, it can take 20 years for the marine environment to respond at the biological level.

vi European sites

During the second cycle, prioritised, costed measures for European sites in Wales were published as Prioritised Improvement Plans (PIPs), to contribute to the maintenance and restoration of favourable condition. The prioritised Action Plan Framework for Wales was published in 2015.

As part of the LIFE Natura 2000 Programme, NRW worked with stakeholders to develop and plan a number of strategic actions to support delivery of European site objectives and created 11 National thematic Action Plans, each of which detail priority strategic actions to address major issues and risks which have been identified as having an adverse impact on European site features. These thematic plans can be downloaded from our website. The RBMP programme of measures includes a number of these overarching European site thematic measures necessary to achieve compliance with standards and objectives.

Each year NRW has and will continue throughout the third cycle, to develop an annual affordable programme of local and national measure delivery, based upon the current understanding of existing resources. The delivery of the actions is tracked in NRW's protected site/safle database.

Aligning objectives for Natura 2000 rivers

Under Regulation 13 of the WFD Regulations 2017 it states that where more than one objective relates to a given body of water, the most stringent objective will apply. NRW has interpreted the term 'objective' to mean water quality standards/targets. A phased approach has been agreed where we apply this stringency test to water bodies within riverine SACs initially.

Under WFD Regulations 2017 water quality standards are derived in the statutory WFD (Standards and Classification) Directions (England and Wales). Under the Conservation of Habitats and Species Regulations 2017 (as amended) standards for Special Area of Conservation (SACs) designated rivers are set via the JNCC Common Standards Monitoring (CSM) guidance and then, in Wales, applied when published in a Core Management Plan (CMP) for each site. To access these plans please visit the Natural Resources Wales / Find protected areas of land and sea area of our website, search for the river water body of interest e.g. River Wye and check the designation type as Special Area of Conservation, the CMP will be listed underneath.

An exercise was undertaken for water quality parameters in river SAC water bodies that have standards/targets under both WFD Regulations 2017 and Conservation of Habitats and Species Regulations 2017 (as amended) to ascertain which is the most stringent. These are available in the **'RBMP measures and objectives data'** spreadsheet on Water Watch Wales menu. Note that the CSM standards will not be used in classification of river water bodies under the WFD Regulations 2017.

Supporting information

Protected sites and features

Water Quality in river SACs

4.4.3 Assessing risk

i. General approach to assessing risk

Risk assessment outputs were generated to meet the requirements of the WFD Regulations 2017 and there is a continuing need to produce new and revised assessments. Under part 2 of the WFD Regulations 2017, we are required to undertake and periodically review and (where appropriate) update the impact of human activity on the status of water bodies in each RBD. This can mean any pressure that on its own, or in combination with other pressures, may promote current or future risk of failing to achieve the environmental objectives of the legislation. The methodology for the risk assessments outlines the technical guidance and provides a level of consistency throughout the risk assessments generated.

Risk assessments produced for the RBMPs have been reviewed. Where new data and information was available the risk assessments have been updated.

The current risk of failing to achieve good ecological status or the risk of deterioration in status by 2027 can be informed by classification (monitoring) results and also a current understanding of pressures and water body sensitivity. The projections of risk beyond 2019 are more reliant on forecasts of changes to activities and pressures such as changes in population size, land use and climate.

The updated risk assessments have been completed following the NRW Risk Assessment Methodology 2019.

ii. Using risk assessments

The WFD Regulations 2017 requires risk characterisation information to be used to optimise the design of the monitoring programmes (Regulation 11) and the programmes of measures (Regulation 20). Many aspects of catchment scale planning will, in part, be informed by the water body risk assessments. The risk assessments may be used;

- To report projected future risk of deterioration and risk to status objectives with associated reasons for risk and apportionment of sources of risk
- To help inform whether failure to achieve an objective is due to an environmental problem
- To inform classification as part of a consideration of the weight of evidence
- To inform design of the monitoring programme, input into designing future investigations and programmes of measures
- To inform strategic environmental planning to future proof actions and measures and maximise cost effectiveness and benefits into the future
- Support the risks to SMNR, linking to the consideration of the key risks for Area Statements

Supporting information

Risk assessments can be found on our portal

4.4.4 Reasons for not achieving good status and reasons for deterioration

Where an element is classified as being at less than good status an assessment is needed of the actions that could be taken to improve the status to good. In order to identify appropriate actions, it is first necessary to understand the cause of the

failure. The cause is recorded using a defined set of reasons. Where a biological element, for example fish or invertebrates, is at less than good status the pressure, for example ammonia or sediments, causing the failure is also identified.

In addition to identifying the pressure responsible for not achieving good status we also identify the type and source of the problem. This consists of three pieces or tiers of information.

- Tier 1 = significant water management issue, for example ‘diffuse source’, ‘point source’ or ‘physical modification’
- Tier 2 = more detailed activity or source, for example ‘arable field’, ‘sewage discharge (continuous)’ or ‘flood protection structures’
- Tier 3 = category and sector, for example ‘agriculture and rural land management’, ‘water industry’ or ‘NRW’

If more than one reason for not achieving good (RNAG) status is identified for a failing element (or for a pressure affecting a biological element) then the source apportionment of each reason is also recorded. For example, if there are two sources of ammonia, a diffuse source and a point source, then the relative contribution of each source to the overall ammonia problem is recorded.

A level of certainty (suspected, probable or confirmed) is also assigned to each reason for not achieving good status, based on a weight of evidence approach:

- Suspected
    - There is some information that points to a possible RNAG status
    - Further investigations are required before site specific measures can be identified
    - Part of the source-pathway-receptor linkage is missing, for example a probable source and receptor has been identified but the pathway is not established
- Probable
    - There is reasonable evidence that points to the RNAG status.
    - Further investigations are required before site specific regulatory or expensive measures can be considered.
    - The source-pathway-receptor linkage has been established with reasonable certainty. There is reasonable evidence which generally give a consistent (that is, not contradictory) picture.
- Confirmed
    - There is compelling evidence for the RNAG status. The available evidence should demonstrate cause and effect in a way that would be compelling to all stakeholders.
    - No further investigations into the RNAG status are required before site specific regulatory or expensive measures can be justified.

- The source-pathway-receptor linkage has been established. There is good evidence which gives a consistent (that is, not contradictory) picture.

Defining the problem in this way supports the appraisal of appropriate actions or measures to address the problem. The source apportionment information informs the targeting of effort and the analysis of the costs and benefits of any actions. The same approach is used for recording reasons for deterioration where a change in status class is detected.

As a result of the programme of investigations, the certainty associated with the reasons for failure data has improved.

Supporting information

You can find the RNAG data for water bodies in Wales on Water Watch Wales.

5. Identifying measures and objectives

Summary of this section

This section sets out the overall process for determining water body measures and objectives

Topics covered

Environmental objectives, programme of measures, LIFE European Sites, National Environment Programme

5.1 The environmental objectives of the WFD Regulations 2017

5.1.1 Setting water body objectives

We aim to implement measures to achieve good overall status for surface and groundwaters by 2027. Alternatives to that objective are allowable which may result in two additional options:

- an objective of less than good by 2027 (less stringent objective) due to technical infeasibility (no known technical solution is available) or disproportionate cost (unfavourable balance of costs and benefits).

- or an extended deadline of good status or potential beyond 2027 for reasons of natural conditions (ecological recovery) or technical infeasibility for a small number of chemicals

We continue to apply the same methodology for setting objectives for the third cycle that we did for the first two cycles, i.e. predict what will be achieved by the end of the cycle. However, in the third cycle there are limitations which specify that an extended deadline may only be justified for reasons of natural conditions (with the exception of a small number of priority substances). In some instances, whilst the objective for a water body currently at less than good status, it may take longer to identify and put in place the measures that would allow that water body to achieve good. We remain ambitious in these instances and have set an objective of good status however, at lower confidence to reflect the difficulties that may be presented in achieving good within a 6-year timeframe.

Where possible we have derived objectives using existing evidence (e.g. RNAGs, classification) however we have also used local judgement to identify those elements that are likely to improve over the next cycle or further in the future as a result of measures taken already or planned in the next cycle. Local judgement has also been used to identify water bodies where it may be considered technically infeasible to achieve good over the third cycle.

Objectives are derived for each element and then combined to provide an overall objective for each water body. When combining objectives, the ‘lowest’ objective of all element objectives is given to each water body. These are available to download

from Water Watch Wales. A summary of the application of alternative objectives for those water bodies that are not at good or high status are given below in Table 2.

Table 2: Rules used to apply alternative objectives

Rule No.	Rule	Objective	Reason	Confidence
1	Locally identified water bodies that measures will be in place and the water body will meet good by 2027	Good by 2027		
2	Locally identified water bodies that measures will be in place but will not improve by 2027	Extended objective of good status to year defined by expert judgement	Natural Conditions	
3	Chemical failures for the following: Flouranthene (PS 15); Polyaromatic Hydrocarbons (PS 28); Mercury (PS 21); Dioxin and Dioxin like compounds (PS 37)	Extended objective, good/high by 2033	Natural Conditions	
4	Use RNAGs to identify those water bodies that fail for acidification	Extended objective, good/high by 2033	Natural Conditions	
5	Use RNAGs to identify water bodies where there is insufficient evidence of issue by • SWMI = Unknown (pending investigation), • SWMI – certainty – Suspected, • SWMI = suspect data • HMWB Mitigation measure 'Not in	Good by 2027		Low confidence

Rule No.	Rule	Objective	Reason	Confidence
	place – not yet identified’			
6	Use mitigation measures assessment to identify where mitigation measure is ‘Not in place - technically infeasible’	Less than good 2027	Technical Infeasibility	
7	Chemical failures for the following: Brominated diphenylethers; Hexachloro-benzene; Hexachloro-butadiene	Less than good 2027	Technical Infeasibility	
8	Chemical failures for the following: Dicofol; Perfluorooctane sulfonic acid and its derivatives (PFOS); Cypermethrin; Hexabromocyclododecane (HBCDD); Heptachlor and heptachlor epoxide	Extended, good/high by 2033	Technical Infeasibility	
9	Use metal mine report to identify those mines where further investigation is required before a solution can be found	Less than good 2027	Technical Infeasibility	
10	Locally identified water bodies that are for other reasons technically infeasible	Less than good 2027	Technical Infeasibility	
11	Water bodies that are not cost	Less than good 2027	Disproportionate Cost	

Rule No.	Rule	Objective	Reason	Confidence
	beneficial to improve			
12	Any water body at less than good status to which none of the above rules apply	Good by 2027		Lower confidence
13	European sites. Any water body with European site geographically related water dependent features which has been set at less than good	Good by 2027		Lower confidence (European Sites)

5.1.2 Screening for disproportionate cost

The valuation of environmental costs and benefits is an evolving and developing field. Knowing that the benefits are likely to justify the costs of implementing an intervention ensures that public finances are used appropriately and effectively.

Costs for the assessment were derived using outputs from a study in 2018 which used data from stakeholders (ARUP, 2018 WFD Costs Analysis Methodology) and has been updated where possible since publication. A shortlist of 10 measures were selected for costing shown below. Some measures have not been able to be costed and it is likely that costs have been underestimated in some water bodies. In some cases, the costs of measures were specific for improvements required in each water body, in other cases they are more generic.

- Upland restoration
- Forestry management
- Improve fish passage or habitat
- Manage INNS
- Mine water remediation
- Reduce impacts of flood and erosion risk management structures
- Reduce pollution from sewage discharges
- Reduce pollution from septic tanks
- Reduce agricultural pollution
- Tackle misconnections

The benefits side of the Cost Benefit Analysis was focused entirely on valuations of water environments from the National Water Environment Benefits Survey (NWEBS). NWEBS is a stated preference survey examining how people value the water environment. When undertaken (and, more recently, updated) it produced estimates of the non-market benefits generated from improving the ecological quality of all water body types (rivers, lakes, estuaries and coastal waters). This has allowed NRW to quantify the benefits of improving overall quality from, say, moderate to good or poor to good in different catchment areas. It should also be noted that potentially benefits are most probably under-estimated in our model.

The costs and benefits have been discounted over 40 years using Treasury Green Book rules. Any water body with a benefit/cost ratio of < 1 has been considered disproportionately costly to improve by 2027 unless it is geographically related to a Protected Area.

Since publication of the second RBMP, the Environment Act and Future Well-Being of Generations Act allow us to consider benefits of improvement in water quality that the benefits valuation for the WFD Regulations 2017 may not include such as using mine water remediation to heat local homes. For this reason, measures in water bodies that are calculated to be disproportionately costly for the WFD Regulations 2017 may be progressed if it is demonstrated that there are wider and significant SMNR values that would be accrued.

5.2 Programme of measures

5.2.1. Approach taken for the third cycle

The updated Programme of Measures (PoMs) is informed by new evidence and information developed during previous cycles. Many of the individual actions will also have multiple benefits following the principles of SMNR, for example, sustainable drainage systems can help to reduce diffuse pollution, reduce surface run-off and flood risk, and deliver biodiversity and green infrastructure benefits. This includes:

- review of progress in implementing the PoMs established for the 2015 RBMP (2015-2021)
- conclusions from the second cycle investigations programme
- incorporating water company actions identified in the National Environment Programme (NEP) including actions and investigations to achieve good status, no deterioration and Protected Areas objectives
- for European sites actions identified by the LIFE programme in developing the PIPs and Thematic Plans
- actions required to meet no deterioration and Protected Area objectives
- mitigation measure actions required for A/HMWB
- priority actions identified within Welsh Government’s Water Strategy for Wales

- feedback from stakeholders via consultation and engagement (e.g. WFD Regulations 2017, LIFE project, Area Statements)

- Emerging issues, for the third cycle this includes phosphorous in SAC rivers, spills from storm overflows and taking a more integrated approach for catchments from source to sea

- The effects of Climate Change

What has changed with the PoMs?

There is greater focus on the wider benefits of the PoMs, notably through how the programmes are delivered locally at the catchment scale and taking a place-based approach. The PoMs will also be steered by legislative changes which are more significant for this cycle than the previous cycle as we move forward post the EU exit. Emerging, current and future issues that have direct and indirect effects on our water environment will also change with time, for example, since the second cycle the impacts of plastic pollution has very much come to the forefront.

We have reviewed the European sites national measures from the second cycle, taking into consideration progress on action delivery and opportunities for greater integration of European site measures with other bundles of measures, particularly agriculture and flood risk management. Some measures have been updated due to changes in the supporting legislative framework, such as for INNS. Others like the work to support the delivery of the Welsh Government National Peatland Restoration Programme, have stayed the same and delivery will continue into the third cycle. These are available in the 'draft RBMP consultation data' spreadsheet on Water Watch Wales menu

We have taken the opportunity to group the marine European site measures together into a new measure linked to the Marine Protected Area Network Management Action Plan (part of the MPA Network Management Frameworks for Wales 2018-2023). This will include continued investigations into the impacts of unregulated activities on marine features and our work on marine litter within the Marine Protected Areas.

Although progress has been made there is still a considerable amount of work to do. The extensive National Sites network in Wales is not currently in favourable condition. We will need to continue to work with partners to deliver the measures from both PIPs and the Thematic Plans, at an appropriate scale through the third cycle to continue to contribute to achieving the objectives under the WFD Regulations 2017.

Some of the key changes in Wales include:

- Potential post EU exit changes

- Changes in legislative framework outside of WFD Regulations 2017 - Well-being of Future Generations Act and Environment Wales Act, proposed changes for Sustainable Land Management, publication of the first Area statements, Shoreline Management Plans and Marine Plans

- New chemicals specified in the legislation - divergence in approach between countries

- Update to compliance for Protected Areas
- Climate change emergency
- Emerging issues including phosphorous in SAC rivers, spills from storm overflows and taking a more integrated approach for catchments from source to sea

6. Summary of engagement

Summary of this section

This section looks at the engagement work we have done including public access to information and consultations.

An important principle of the WFD Regulations 2017 is the engagement and involvement of a wide range of partners and stakeholders. As a first step to raise awareness and help secure this, stakeholders and the public need access to the information for the third cycle plans.

External groups/organisations are absolute key to the success of the WFD Regulations 2017. A significant amount of progress has already been made but we need to continue to build on maintaining these relationships to secure delivery of improvements to the water environment. Key stakeholders are represented on the new WWMF that replaced the River Basin District Liaison Panels. It is important that we develop strong relationships with wider sectors and work together to achieve wider benefits.

In the cross-border catchments, NRW is committed to working with the Environment Agency, Natural England and our partners in England.

6.1 Public access to information

Information has been made available to stakeholder and the general public through the following:

NRW Website

- Documents include the publication of the RBMPs, supporting information on objections, classification
- Contact details for the mailbox
- Information about the WWMF
- Link to the Environment Agency Website for information on the Severn RBD

Water Watch Wales

The NRW Water Watch Wales is a collection of web maps, data and information related to the WFD Regulations 2017 in Wales.

Other methods that we have used to communicate include

- Stakeholder mail outs
- Presentation
- Social Media

6.2 Consultations and working with others

There have been three statutory consultations leading up to the third cycle RBMPs. These include:

Working Together: 22 June 2018 to 22 December 2018

We sought views on how stakeholders could work together to contribute to the third cycle RBMPs.

From the Working Together Consultation you:

- agreed that the programme covers the necessary steps to review and update the RBMPs.
- told us that more focus was needed to address transitional and coastal Waters.
- you want to be involved in the development of the RBMPs and Area Statements.
- supported the integration of the RBMPs and the FRMPs and suggested that 22 additional plans and strategies should be aligned where possible in the development of the RBMPs. Some would like to see consistency of timetables for all plans and strategies.
- agreed that the right organisations were involved in the review process and provided suggestions for further groups to be added to the list. Some said that we need to improve our communication with some sectors.
- supported the creation of the WWMF, some felt that we need more local engagement to address water body and catchment scale issues. We need to make better links between the Water and Land Forums. You also suggested that subgroups be set up to focus on specific issues.
- supported the approach to include an explanation of how we have considered the responses in the Challenges and Choices consultation.

The consultation documents for the Dee and Western Wales were published on our website and the Severn on the Environment Agency's website; hard copies were also available on request.

Over 700 stakeholders were contacted that included national organisations and those stakeholders that were involved in the review of earlier RBMPs. No separate engagement events were held; we raised awareness of the consultation through existing networks. Views were also sought from the newly formed WWMF that replaced the Liaison Panels. The consultation was shared at a total of 10 sector meetings in locations across Wales.

We used social media to promote the consultation. Notices of the consultation were published in the Western Mail, The Leader and the London Gazette as required by the WFD Regulations 2017. We also worked with the Environment Agency to support cross border working. It was also promoted in the Living Waters for Wales

Newsletter. Awareness of the consultation was raised internally within NRW to encourage staff to promote to their external network of contacts.

A total of 26 responses were received mainly from the Third Sector from recreation, conservation and fisheries groups. Responses were also received from the following sectors: Business and Industry, Local Government, Land Management, Navigation and Mining/Quarrying.

Challenges and Choices: 22 June 2019 to 22 December 2019

We sought views on the options currently in place to address Wales' SWMIs and any further suggestions you may have on how we can address these issues. We also asked you to identify opportunities to help address these issues throughout the development of the Area Statements.

The consultation documents for the Dee and Western Wales were published on our website and the Severn on the Environment Agency's website; hard copies were also available on request.

The consultation was promoted at external meetings; a few examples are, the Middle Dee Catchment Partnership, Independent Environmental Advisory Panel, National Access Forum, WWMF, Welsh Government Water Forum, WLMF and WFF. It was also promoted in the Living Waters for Wales Newsletter.

Through social media, we issued tweets, it is estimated that 2,152 twitter followers have read the tweets. Awareness of the consultation was raised internally within NRW to encourage staff to promote to their external network of contacts.

Almost 700 stakeholders were contacted. No separate events were held, we raised awareness of the consultation through existing networks and ongoing engagement including through the Area Statement work. Our South-Central Wales Operations Team ran two workshops where themes and the general thinking behind the Taff Ely Opportunity Catchment was discussed. The South East Wales Operations Team held a series of themed involvement events in November 2019. The events were designed to enable stakeholders to reach a consensus on action for the Area Statement and recognised that RBMP as a mechanism under each of the four strategic Area Statement themes.

Notices of the consultation were published in the Western Mail, The Leader and the London Gazette as required by the WFD Regulations 2017. A presentation was given to the Cardiff University Water Research Group and the consultation was also promoted at the NRW webinar on evidence needs to external stakeholders. The consultation was shared at a total of 12 sector meetings in locations across Wales.

NRW were supported by the WWMF that replaced the Liaison Panels to promote the consultation to their networks. We also worked with the Environment Agency to support cross border working.

A total of 23 responses were received that included the voluntary sector (Recreational, Fisheries and Conservation Groups), Land Management sector, Water Industry, Energy and Health sectors.

A summary of the responses was published on 29 June 2020. This included a summary of the comments received and an analysis of the main themes raised by respondents.

Consultation on updating the third cycle River Basin Management Plans: 22nd December 2020 to 22nd June 2021

This consultation gathered views on how we update the third cycle plans. These views are essential to shape and develop the statutory RBMPs and the actions planned for improvements between 2021 and 2027.

The consultation documents to update the Dee and Western Wales River Basin Management Plans were published on the consultation hub on our website, (the Environment Agency led on the Severn River Basin Management Plan and the consultation for that has now closed).

NRW formally consulted on the SEA screening decision documents for Western Wales and the Dee with our Strategic Assessment Team (SAT), CADW, the Environment Agency and Natural England. The statutory consultation ran between the 22nd December 2020 and the 22nd March 2021. Question 15 of the public consultation also covered SEA.

Following best practice, NRW included a draft Habitats Regulations Assessment as part of the consultation on the draft Western Wales and Dee RBMPs. Question 16 of the public consultation covered the HRA. The HRA has been undertaken in an iterative manor as the Programme of Measures developed and has been updated in light of consultation responses received. NRW formally sought the advice of the Appropriate Nature Conservation Bodies - NRW (SAT) and Natural England between the 30th March and the 20th April 2022.

More than 700 stakeholders were contacted. The consultation was promoted via existing networks, no separate events were held. We raised awareness of the consultation through existing networks and ongoing engagement including through the Area Statement work.

The consultation was promoted at partnership meetings; some examples are, the Middle Dee Catchment Partnership, Independent Environmental Advisory Panel, Pesticide Partners Group, the Alyn Anglers, Biodiversity Network (North East Wales), the Chartered Institution of Water and Environmental Management (CIWEM) Water Resources Panel, Clwyd, Gwynedd and Denbigh Local Fisheries Advisory Group. The Welsh Clean Seas Partnership issued an article on the consultation in their winter newsletter. It also featured in NRW's monthly newsletter Cyfoeth. A press release was also issued when the consultation was published.

NRW was supported by the WWMF, WLMF, National Access Forum and the WFF who promoted the consultation to their members.

Within NRW staff were encouraged to raise awareness of the consultation with their external contacts. For example, the Area Statement Practitioner Group and the Marine Protected Area Steering Group. The consultation also featured in several internal communications such as the NRW intranet, yammer and the Monthly Guide for Managers.

Notices of the consultation were published in the Western Mail, Daily Post and the London Gazette as required by the WFD Regulations 2017. Through social media, it

is estimated that 1,271 people have read the tweets on @Water NRW Twitter. There were 21 retweets to the water account twitter followers.

A message to all stakeholders was issued 30 days before the consultation closed. The internal communications channels mentioned above were also used to issue reminders of the closing date.

A total of 29 responses were received to the consultation.

A summary of the consultation responses can be found on the Natural Resources Wales website here: https://ymgynghori.cyfoethnaturiol.cymru/evidence-policy-and-permitting-tystiolaeth-polisi-a-thrwyddedu/dee-river-rbmp/. The response document provides a summary and has been circulated to all consultees.

The consultation responses have been fully considered and shaped the final form of the Western Wales and Dee RBMPs. From the responses received it is clear that there are many ongoing projects/ initiatives and there is an opportunity to use these to develop the means by which RBMPs will be delivered. The changes we have made for the final RBMPs includes:

- Approach to managing chemicals has been updated to provide further detail including in relation to uPBTs.
- Finalised the Programme of Measures ensuring they reflect concerns raised on emerging issues including phosphorous in SAC rivers, spills from storm overflows and taking a more integrated approach for catchments from source to sea.
- Considered of how we can work better with stakeholders to be more effective in how we work to deliver benefits for the water environment. This will be taken forward through the delivery of the RBMP and the WWMF will be key to this.
- For Opportunity Catchments the RBMPs include detail on the local actions. Respondents need this detail to be actively involved in the Opportunity Catchments. There were many suggestions put forward on how we can make these work including how we better enable collaborative working; these will be considered through the delivery of this work.
- A number of respondents put forward suggestions of projects and partnerships that will help the delivery of the RBMPs. These will be important for the delivery phase and should build on existing partnerships.
- Specifically, in relation to the marine environment, we have taken a source to sea approach and have recognised the pressures put forward for the marine environment. The PoMs will be key to tackling these pressures. We have also improved the wording within the RBMPs in relation to the marine plans.
- Recognised the many general comments put forward.

Working with other groups to protect and improve our water quality

Since the publication of the second cycle plans, new arrangements have been put in place to work with key organisations, including Welsh Government, and across work areas to protect and enhance our water environment. Further information is also provided in Section 3. These include:

WWMF Its purpose is to provide an opportunity for membership organisations to share evidence and explore opportunities for working together collaboratively towards the sustainable management of water in Wales. The forum has been meeting biannually since December 2018.

WLMF agriculture subgroup The work will provide support, advice and guidance to farmers to help improve water quality in Welsh rivers and has been commissioned by the WLMF, which involves representatives from National Farmers' Union Cymru, Farmers' Union of Wales, Country Land and Business Association, Hybu Cig Cymru, AHDB-Dairy, DCWW, Carmarthenshire Fisherman's Federation, NRW and Welsh Government. The group is tasked with undertaking root cause analysis to achieve a common understanding of the causes of agricultural pollution and the ways in which these are currently addressed.

WFF The forum represents a range of stakeholders with an interest in the freshwater and diadromous fisheries resources of Wales and the work of NRW and others to maintain, improve and develop migratory and freshwater fisheries in Wales. The forum has been meeting since November 2018.

7. River Basin Management Plan requirements

Table 3: River basin management plan requirements

WFD Regulation 27(2)(d) requirement	Location within third plans
1. a general description of the characteristics of the River Basin District required under the legislation. This shall include:	
1.1 for surface waters:	
- mapping of the location and boundaries of water bodies	Water Watch Wales
- mapping of the ecoregions and surface water body types within the river basin	RBMP summary section 1 and Water Watch Wales
- identification of reference conditions for the surface water body types	Overview Annex section 4.1.1
1.2 for groundwaters:	
- mapping of the location and boundaries of water bodies	Water Watch Wales
2. a summary of significant pressures and impact of human activity on the status of surface water and groundwater, including:	
- estimation of point source pollution	RBMP summary section 2; Overview Annex section 4.4
- estimation of diffuse source pollution, including summary of land use	RBMP summary section 2; Overview Annex section 4.4
- estimation of pressures on the quantitative status of water including abstractions	RBMP summary section 2; Overview Annex section 4.4

WFD Regulation 27(2)(d) requirement	Location within third plans
- analysis of other impacts of human activity on the status of water	RBMP summary section 2; Overview Annex section 4.4
3. identification and mapping of Protected Areas	RBMP summary section 2 and Water Watch Wales
4. a map of the monitoring networks established and a presentation in map form of the results of the monitoring programmes carried out under those provisions for the status of: 4.1 surface water (ecological and chemical)	 Water Watch Wales
4.2 groundwater (chemical and quantitative)	Water Watch Wales
4.3 Protected Areas	Water Watch Wales
5. a list of the environmental objectives for surface waters, groundwaters and Protected Areas, including in particular identification of instances where use has been made of Part 5 exemptions and the associated information required	RBMP summary section 3; Overview Annex section 5 and Water Watch Wales
6. a summary of the economic analysis of water use	Overview Annex section 3.6
7. a summary of the programme or programmes of measures adopted Part 5, including the ways in which the objectives are achieved 7.1 a summary of the measures required to implement Community legislation for the protection of water	 RBMP summary section 3; Overview Annex 5.2 and Water Watch Wales
7.2 a report on the practical steps and measures taken to apply the principle of recovery of the costs of water use	Overview Annex section 3.6
7.3 a summary of the measures taken	RBMP summary section 2

WFD Regulation 27(2)(d) requirement	Location within third plans
7.4 a summary of the controls on abstraction and impoundment of water, including reference to the registers and identification of the cases where exemptions have been made	RBMP summary section 3
7.5 a summary of the controls adopted for point source discharges and other activities with an impact on the status of water	RBMP summary section 3
7.6 an identification of the cases where direct discharges to groundwater have been authorised	N/A
7.7 a summary of the measures taken on priority substances	Overview Annex Appendix C
7.8 a summary of the measures taken to prevent or reduce the impact of accidental pollution incidents	RBMP summary section 3
7.9 a summary of the measures taken for bodies of water which are unlikely to achieve the objectives	RBMP summary section 2 and 3
7.10 details of the supplementary measures identified as necessary in order to meet the environmental objectives established	RBMP summary section 3
7.11 details of the measures taken to avoid increase in pollution of marine waters	RBMP summary section 3
8. a register of any more detailed programmes and management plans for the river basin district dealing with particular sub-basins, sectors, issues or water types, together with a summary of their contents.	No supplementary plans have been produced
9. a summary of the public information and consultation measures taken, their results and the changes to the plan made as a consequence	Overview Annex section 3.3 and 6
10. a list of competent authorities	Overview Annex section 3.8

WFD Regulation 27(2)(d) requirement	Location within third plans
11. the contact points and procedures for obtaining the background documentation and information referred to in Regulation 3 and in particular details of the control measures adopted in accordance with Regulation 20 and of the actual monitoring data gathered in accordance with Regulation 11	Overview Annex section 5.2, 6.1 and Water Watch Wales
The first update of the RBMP and all subsequent updates shall also include 1. a summary of any changes or updates since the publication of the previous version of the RBMP, including a summary of reviews to be carried out	 RBMP summary section 1; Overview Annex section 4.3
2. an assessment of the progress made towards the achievement of the environmental objectives, including presentation of the monitoring results for the period of the previous plan in map form, and an explanation for any environmental objectives which have not been reached	RBMP summary section 2 and 3
3. a summary of, and an explanation for, any measures foreseen in the earlier version of the RBMP which have not been undertaken	N/A
4. a summary of any additional interim measures adopted since the publication of the previous version of the RBMP	RBMP summary section 2; Overview Annex section 5.2

8. Mechanisms for protecting the water environment

This section focuses mainly on the statutory and voluntary mechanisms that have been updated since the second cycle RBMP and are needed to translate measures into outcomes. For full details of all mechanisms please refer to the 2015 River Basin Management Planning Overview Annex.

Mechanisms describe the policy, legal or financial tools needed to implement a particular measure. For example, a legal mechanism may require that a particular activity can only be carried out in accordance with an environmental permit and its conditions. In this case the measure would be to ensure that all such activities have appropriate permits in place, and the legislation underpinning it provides the 'mechanism' to ensure the environment is protected.

A range of mechanisms can be used, from regulatory interventions for example, permitting and enforcement to non-legislative approaches such as providing advice and guidance. Mechanisms are often used in combination to give effect to particular measures.

Sustainable land management

The strategic approach, in line with our regulatory principles and our principles to deliver SMNR to tackle agricultural pollution has produced an approach which has five themes which, in combination, will be far more effective than if any theme is taken forward in isolation,

The mechanisms that can contribute to the delivery of statutory objectives and wider environmental and well-being benefits within the five themes include:

Theme 1 - Regulation

The Cross Compliance Verifiable Standards from the current regulatory baseline requirements that all farmers must meet to receive Common Agricultural Policy (CAP) payments (including Basic Payment Scheme (BPS) or Rural Development support) in Wales. Once the BPS comes to an end, a new regulatory baseline and legal standards will be in place to underpin the effective delivery of the proposed SFS.

As part of the Welsh Government Agriculture White Paper, National Minimum Standards are being proposed which will incorporate existing and any relevant changes in regulations. The standards may apply to all farmers, whether or not they receive financial support from the Welsh Government and would be a gateway to the SFS.

Consistently applied regulation by NRW and other organisations assessing compliance, in combination with the other four themes, will result in positive results for the environment and people.

Theme 2 - Voluntary actions

Beyond formal regulation there is a role for voluntary approaches and earned recognition to drive the delivery of outcomes. Working with others to develop delivery of voluntary approaches and the earned recognition will deliver beyond regulatory base lines. Voluntary approaches must be evidence based and monitored in a way to demonstrate that measurable improvement in water quality is being achieved. Their roles below still need to be developed:

- In demonstrating delivery for market access for agricultural products can be maintained into the future is also an important consideration

- In providing land managers access to data from their own land holding which can then enable them to better understand the consequences of their operations

- In providing evidence as part of a risk assessments for other themes (earned recognition).

The Water Standard is intended to provide a method of evidencing behavioural change and good practise for improving water quality via continuous improvement. It identifies environmental, social and economic benefits of managing risk, and provides solutions which deliver multiple opportunities. This allows farmers to identify drivers which deliver multiple benefits to the environment and water. The concept of the water standard has been developed by industry to provide guidance to potential assurance scheme operators of methods that could be used to deliver outcomes which maintain and improve water quality. The potential of using the water standard to align the outcomes of the Water Standard with branding of products including Brand Wales and Future Food and Farming policy is needed to be developed further, these outcomes can be linked to incentives for sustainable food and public goods production.

Theme 3 and 4 Advice, guidance, knowledge, skills and experience development

The role of advice, guidance and training is fundamental in any industry. The agricultural sectors are not an exception. There are currently many methods of engaging with Continuous Professional Development (CPD) and the segmentation analysis undertaken by Welsh Government illustrates that one method of engagement does not suit all. On-going knowledge transfer and training of farmers on their responsibilities will be crucial to successful delivery.

- Farm Advisory Services

  Farming Connect, the current national advisory service for farmers and foresters in Wales, provides a wide range of knowledge transfer and training opportunities that can be tailored to specific issues and locations depending on need
  Although funded as part of the CAP, it is anticipated that an equivalent advisory service will continue as part of Welsh Government's Sustainable Land Management Framework post- EU exit.

- NRW Dairy Project

NRW started a project in October 2018 to visit all of the 1700 or so dairy farms in Wales, which complements our existing work and that of other bodies such as Farming Connect. The project aims to provide proactive advice to dairy farmers to enable them to reduce the risk of agricultural pollution, follow best practise and adhere to current regulations.

- Enabling Framework and Guidance

  Although Farming Connect is a strategic framework to encourage farmers to engage with advice, guidance and CPD, this sits outside of other mechanisms such as earned recognition or conditional access except where attendance at national events is required to be able to access Farm Business Grants. Developing an enabling framework and guidance will need to be considered as we move away from the CAP.

Theme 5 - Investment and Innovation

As part of the current CAP, farmers have the option to enter into agri-environment schemes (currently Glastir) or to receive payment for activities that deliver environmental benefits. These voluntary schemes comprise a basic level general intervention - Glastir Entry, a high level - Glastir Advanced, Glastir Commons, Glastir Organics and a suite of themed capital funding, Glastir Small Grants. Schemes are also open for Glastir Woodland Creation and Management.

During the interim period between CAP and the future Sustainable Land Management policy, elements of Glastir will continue to receive funding.

The Agriculture (Wales) Bill in which Welsh Government are set to provide the legal framework for leaving the CAP and establishing new systems for agricultural and land management support across the UK.

The Bill will set out the principles of how a new Welsh Scheme will operate to provide farmers and land managers with incentives to deliver ‘public goods’, such as achieving carbon neutral operations, better air and water quality, improved soil health, higher animal welfare standards, public access to the countryside and measures to reduce flooding. The new system will provide an income stream for farmers and land managers based on delivering sustainable land management outcomes that have societal value.

The new SFS which is being developed to replace both the basic payment and agri environment schemes funded by the CAP. It will also be optional and will offer land managers the opportunity to deliver outcomes with activities reaching beyond the National Minimum Standards. There is also the potential for land managers to collaborate as well as deliver outcomes of geographical importance appropriate to local circumstances.

- Green Market Place

  The Payment for Ecosystem Services sector in Wales should not be overlooked as a source of good practice, advice and guidance in Wales, for existing initiatives to provide goods and services such as carbon sequestration and clean water already happen. Payment schemes for some of these goods and services are already in operation. Developing payments for ecosystem services that complement other sources of funding will also have significant potential to deliver for water outcomes.

- Innovation

  The role of the agricultural industry in developing innovative approaches or technologies is a key factor in delivering sustainable outcomes for water and air, for the wider environment and for people. The ongoing work around preparing for an agriculture sector post Brexit offers the opportunity to innovate and support the approach outlined in the Sustainable Farming and our Land consultation. Innovative approaches to problems such as managing nutrients sustainably are being developed such as that at Coleg Sir Gar through 'Prosiect Slyri' which has established an environmentally friendly nutrient management system. NRW has recognised that most adopted solutions to date have focussed on treating the symptom not the cause. NRW is now exploring root causes to locate the many issues we face, and then working innovatively to find new ways of solving those issues.

Invasive non-native species

A non-native species is one that has been introduced by human action outside its natural past or present distribution. There are around 2000 non-native species established in Great Britain, and 10-15% of those have negative impacts. In freshwaters, non-native species have a greater chance of becoming invasive and causing ecological and economic impacts: around 40% of non-native species introduced to freshwaters have a negative impact.

The approach to managing the problem is set out in the Great Britain Invasive Non-native Species Strategy', August 2015 (available at the Great Britain Non-Native Species Secretariat website).

The specific aims of the strategy are:

- to provide clarity and co-ordination of responsibilities and functions within Government and its associated bodies
- to improve co-ordination of actions to tackle INNS in partnership with key interest groups outside Government
- to achieve an appropriate level of awareness of non-native species issues and promote appropriate changes in behaviour or attitudes throughout all relevant sectors
- to reduce and, where possible, prevent the intentional and unintentional introduction of INNS
- to ensure, where possible, that effective contingency response capabilities are in place to prevent the establishment of new invasions
- to help ensure that strategic action to control established INNS is adequately resourced and delivered

- to make optimum use of available capacity and resources to improve detection and monitoring capabilities; and, to identify gaps and priority areas for further development

Table 4: Mechanisms for managing INNS

Mechanism	**What this does**
Import of Live Fish Act (ILFA) 1980	Controls spread of non-native species. Regulates the import, keeping and release of non-native fish by means of Orders relating to specific listed species.
The Prohibition of Keeping or Release of Live Fish (Specified Species) Order 1998	Made under the Import of Live Fish (England and Wales) Act 1980, prohibits the unlicensed keeping or release of 47 species of non-native live fish.
Wildlife and Countryside Act 1981	Makes it illegal to release or allow to escape into the wild any animal which is not ordinarily resident in Great Britain and is not a regular visitor to Great Britain in a wild state or is listed in Schedule 9 to the Act. It also makes it illegal to plant or otherwise cause to grow in the wild any plant listed in Schedule 9 to the Act. Section 14(4A) of the WCA, as inserted by section 23 of the Infrastructure Act 2015, enables species control agreements and orders to be made by environmental authorities to ensure that landowners take action on invasive non-native species, or permit others to enter the land and carry out those operations, to prevent their establishment and spread.
Fisheries byelaws	Controls fishing activities, such as bans on use of live bait (or by using the licence schemes described above).
Alien and Locally Absent Species in Aquaculture (England and Wales) Regulations 2011	Requires permits for movement of non-native fish in aquaculture.
Invasive Alien Species (Enforcement and Permitting) Order 2019	It introduces enforcement provisions, offences and penalties needed to comply with the legislative requirements It also revoked the Prohibition of Keeping of Live Fish (Crayfish) (Amendment) Order 1996.

Mechanism	What this does
Anti-social Behaviour, Crime and Policing Act 2014	This enables community protection notices to be served by Local Authorities or the Police against individuals who are acting unreasonably and who persistently or continually act in a way that has a detrimental effect on the quality of life of those in the locality. These powers are designed to be flexible and could be used to address specific problems caused by widespread species such as Japanese knotweed.
Marine Strategy Regulations 2010	Sets targets for reduction in risk of introduction and spread of non-native species, in particular invasive species, in marine waters to achieve objectives by 2020.
Import of Live Fish (England and Wales) Act 1980	This Act gives the relevant Minister the power to make Orders to prohibit or licence the import into, or the keeping or release in any part of England and Wales of live fish, or the live eggs of fish, of a species which is not native to England and Wales, and which might harm the habitat of, compete with, displace or prey on any freshwater fish, shellfish or salmon. This Act also allows the courts upon conviction of an offence under this Act to order the forfeiture and destruction of illegally stocked specimens of certain fish or fish egg species.

Other approaches

The GB INNS Strategy enshrines the Convention on Biological Diversity's three stage hierarchical approach for prioritising action to address invasive non-native species:

- Prevention
- Early detection and rapid response
- Long term strategic management

This approach prioritises the reduction in the introduction of new species and the need to slow the spread of those INNS already present by applying good biosecurity (measures that reduce the risk of introducing or spreading INNS, pests and

diseases) and promoting the national 'Check, Clean Dry' and ‘Be Plantwise’ campaigns.

Vulnerable locations such as those with high biodiversity value or sites that are at a higher risk due to activities being undertaken at them that could lead to the introduction/spread of INNS should have measures implemented to improve and raise awareness of biosecurity as a priority.

Direct measures to detect and eradicate INNS may be taken locally, often in partnership with others and as part of Local Biodiversity Action Plans or as part of project set up by local action groups or stakeholders.

The Wales Resilient Ecological Network was established in 2019 to promote biodiversity and ecosystem resilience through the development of a pan Wales approach for the effective sustainable management of invasive non-native species (INNS) in a strategic, prioritised and joined up way. The project provides opportunities to collectively work together by increasing engagement, participation and co-operation with a wide range of public, private and third sector stakeholders, making a real impact on effectively addressing the problem of INNS.

Flood risk river management programmes often include measures to manage non-native plant species where they have an impact on flood risk.

9. Glossary

The following list aims to provide brief explanations of many of the words, phrases and acronyms relating to river basin management.

Table 5: Glossary of terms

Term	Explanation
Agri-environment scheme	Land management schemes that aim to combat climate change, improve water management, and maintain and enhance biodiversity at both a farm and landscape level.
Alternative objectives	We aim to implement measures to achieve good overall status for surface and groundwaters by 2027. Alternatives to that objective are allowable which may result in 2 additional options: an objective of less than good by 2027 (less stringent objective) due to technical infeasibility (no known technical solution is available) or disproportionate cost (unfavourable balance of costs and benefits). or an extended deadline of good status or potential beyond 2027 for reasons of natural conditions (ecological recovery) or technical infeasibility for a small number of chemicals.
Angiosperms	The flowering plants. In transitional and coastal waters they include sea grasses and the flowering plants found in salt marshes.
Area Based Approach	The Environment (Wales) Act 2016 outlines the requirement on NRW to develop and implement an area-based approach for natural resource management. This will be a planning and priority setting process that co-ordinates resource so that the long-term sustainable benefits are optimised for the people, environment and economy of Wales in the present and in the future. It will align catchment-based approaches to water management and water resource planning with other land management activity.
Area Statement	The Environment (Wales) Act 2016 specifies that statements for the purpose of facilitating the implementation of the national natural resources policy must be prepared and published by NRW. Each statement will correspond to a specific area of Wales and include reference to natural resources in the area, the benefits they provide and the priorities, risks and

Term	Explanation
	opportunities for sustainable management that need to be addressed.
Aquifer	A subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater.
Artificial Water Body	A man-made surface water body, rather than a modified natural water body, which supports important aquatic ecosystems. It includes canals, some docks and some man-made reservoirs.
Asset Management Plan	See Periodic Review.
Bathing Water Regulations 2013	The overall objective of the Bathing Water Regulations 2013 is the protection of public health, but it also offers an opportunity to improve management practices at Bathing Waters and to standardise the information offered to bathers. It introduces a new classification system with more stringent water quality standards and puts an emphasis on providing information to the public.
Biodiversity Action Plan	The UK Biodiversity Action Plan describes the biological resources of the UK and provides plans for their conservation. Action plans exist for the most threatened species and habitats. Local biodiversity action plans have also been produced.
Biological element	A collective term for a particular characteristic group of animals or plants present in an aquatic ecosystem (for example phytoplankton; benthic invertebrates; phytobenthos; macrophytes; macroalgae; phytobenthos; angiosperms; fish).
Biological indicators	A parameter that can be monitored to estimate the value of a biological quality element. Indicators may include the presence or absence of a particularly sensitive species.
Biological quality element	A characteristic or property of a biological element that is specifically listed in Regulation 6 of the WFD Regulations 2017 for the definition of the ecological status of a water body (for example composition of invertebrates; abundance of angiosperms; age structure of fish).

Term	Explanation
Catchment	The area from which precipitation contributes to the flow from a borehole spring, river or lake. For rivers and lakes this includes tributaries and the areas they drain.
Characterisation (of water bodies)	A two-stage assessment of water bodies under the WFD Regulations 2017. Stage 1 identifies water bodies and describes their natural characteristics. Stage 2 assesses the pressures and impacts from human activities on the water environment. The assessment identifies those water bodies that are at risk of not achieving the environmental objectives set out in the WFD Regulations 2017. The results are used to prioritise both environmental monitoring and further investigations to identify those water bodies where improvement action is required.
Chemical Status (surface waters)	The classification status for the surface water body. This is assessed by compliance with the environmental standards for chemicals that are listed in the EQSD, which include priority substances, priority hazardous substances and other pollutants. Chemical status is recorded as good or fail.
Chemical Status (groundwater)	An expression of the overall quality of the groundwater body. The classification status for a groundwater body against the environmental criteria set out in the WFD Regulations 2017, as set out in Common Implementation Strategy (CIS) guidance document No 18 and UKTAG guidance Paper 11b(i): Groundwater Chemical Classification for the purposes of the WFD Regulations 2017. All five of the component tests for chemical status must be assessed as good or poor and the overall chemical status.
Classification	Method for distinguishing the environmental condition or status of water bodies and putting them into one category or another.
Common Implementation Strategy (CIS)	This strategy was agreed by the European Commission, Member States and Norway in 2001. The aim of the strategy is to provide support in the implementation of the WFD Regulations 2017, by developing a common understanding and guidance on key elements.
Competent Authority	An authority or authorities identified in the WFD Regulations 2017. The Competent Authority will be responsible for the application of the rules of the legislation within each RBD lying within its territory.

Term	Explanation
Conservation Objective	Under the Conservation of Habitats and Species Regulations 2017 (as amended): it is the target for the species and/ or habitats for which a site is designated, for it to contribute to maintaining or reaching Favourable Conservation Status (see below) at the biogeographical level.
Cost effective	In the context of the WFD Regulations 2017, it describes the least cost option for meeting an objective. For example, where there are a number of potential actions that could be implemented to achieve good ecological Status for a water body, Cost Effectiveness Analysis is used to compare each of the options and identify which option delivers the objective for the least overall cost.
Cross compliance	A form of conditionality by which, farmers in receipt of public subsidies are required to comply with all legislation affecting their businesses, including environmental legislation. The requirements of Cross compliance are: i) an obligation to maintain agricultural land in Good Agricultural and Environmental Conditions and ii) an obligation to comply with specified Statutory Management Requirements according to legislation, for example the Nitrates Pollution Prevention (Wales) Regulations 2013 (as amended).
Diffuse pollution	Pollution resulting from scattering or dispersed sources that are collectively significant but to which effects are difficult to attribute individually.
Disproportionate cost	The determination of disproportionate cost requires a decision-making procedure that assesses whether the benefits of meeting good status in a water body are outweighed by the costs.
Water Supply (Water Quality) Regulations 2018 and the Private Water Supplies (Wales) Regulations 2017	This relates to the quality of water intended for human consumption and covers both public and private supplies, setting standards for quality and monitoring
Drinking Water Inspectorate	The Drinking Water Inspectorate is the independent regulator of drinking water in Wales and England. Their role is to ensure that water companies supply safe drinking water that is acceptable to consumers and meets standards set down in law. In addition, the chief Inspector of Drinking Water

Term	Explanation
	publishes annual reports about the quality of private and public drinking water in Wales.
Drinking Water Protected Areas	Bodies of water that are used or could be used in the future for the abstraction of water intended for human consumption.
Ecological continuum	The persistence of the ecological structure and functioning of aquatic ecosystems over time and space.
Ecological potential	The status of a heavily modified or artificial water body measured against the maximum ecological quality it could achieve given the constraints imposed upon it by those heavily modified or artificial characteristics necessary for its use. There are five ecological potential classes for A/HMWBs (maximum, good, moderate, poor and bad).
Ecological status	Ecological status applies to surface water bodies and is based on the following quality elements: biological quality, general chemical and physico-chemical quality, water quality with respect to specific pollutants (synthetic and non-synthetic), and hydromorphological quality. There are five classes of ecological status (high, good, moderate, poor or bad). Ecological status and chemical status together define the overall surface water status of a water
Ecosystem	An ecosystem is made up of living organisms (plants, animals and micro-organisms) in conjunction with their non-living environment (air, water, minerals and soil) and all the diverse and complex interactions that take place between them.
Ecosystem Approach	An ecosystem approach focuses on the collective management of all resources – maintaining ecological integrity whilst allowing resource extraction/use – rather than managing multiple resources independently. This approach seeks to ensure the co-existence and development of healthy, fully functioning ecosystems and human communities. The term ecosystem approach originally comes from the Convention on Biological Diversity (CBD), where it is described as “a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way”
Effluent	A liquid discharged as waste, as from an industrial plant or sewage works.

Term	Explanation
Environment Agency	the Environment Agency (EA) is **a non-departmental public body sponsored by the United Kingdom government's Department for Environment, Food and Rural Affairs (DEFRA)**. The Agency's overall responsibility is the protection and enhancement of the environment in England.
Element	This is the term used under WFD Regulations 2017 for a component of classification e.g. fish, macrophytes.
Estuarine	For our purposes by estuarine we mean transitional (see definition).
Exemptions	The environmental objectives of the WFD Regulations 2017 are set out in Part 5. These include the general objective of aiming to achieve good status in all water bodies by 2015 and the principle of preventing any further deterioration in status. There are also a number of exemptions to the general objectives that allow for less stringent objectives, extension of deadline beyond 2015 or the implementation of new projects. Common to all these exemptions are strict conditions that must be met, and a justification must be included in the RBMP. The conditions and process in which the exemptions can be applied are set out in Part 5.
Extended deadline	Under certain circumstances, and subject to the detailed conditions in Part 5, the WFD Regulations 2017 allows the deadline for achieving objectives to be extended. ‘Extended deadlines’ can apply to water bodies where achievement of objectives by an earlier date would be technically infeasible or disproportionately expensive or not possible because of natural recovery time.
Eutrophication	The enrichment of waters by inorganic plant nutrients that results in increased production of algae and/or other aquatic plants, which can affect the quality of the water and disturb the balance of organisms present within it.
Favourable Conservation Status	The Conservation Status is the result of influences which include the present state of the habitat, together with current environmental and human influences (both positive and negative), that may influence its long-term survival. Favourable Conservation Status will typically be achieved when populations, ranges, and extents are stable or increasing, and when structures and functions necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future.

Term	Explanation
Flood Risk Regulations 2009	The purpose is to establish a framework for the assessment and management of flood risks aiming at the reduction of the adverse consequences on human health, the environment, cultural heritage and economic activity associated with floods in the Community. It requires member states to undertake flood risk assessments, flood risk mapping and produce FRMPs.
Good chemical status (surface waters)	Means that concentrations of chemicals in the water body do not exceed the environmental standards specified in the WFD regulations 2017. These chemicals include Priority Substances, Priority Hazardous Substances and other pollutants.
Good chemical status (groundwater)	Means the concentrations of pollutants in the groundwater body do not exceed the criteria set out in the WFD Regulations 2017.
Good ecological potential	Those surface waters which are identified as A/HMWBs must achieve 'good ecological potential' (good potential is a recognition that changes to morphology may make good ecological status very difficult to meet). In the first cycle of river basin planning good potential may be defined in relation to the mitigation measures required to achieve it.
Good ecological status	The objective for a surface water body to have biological, structural and chemical characteristics similar to those expected under nearly undisturbed conditions.
Good quantitative status (groundwater)	See quantitative status (groundwater). Means the level of groundwater in the groundwater body meets the criteria set out in the WFD Regulations 2017.
Good status	Is a term meaning the status achieved by a surface water body when both the ecological status and its chemical status are at least good or, for groundwater, when both its quantitative status and chemical status are at good status.
Groundwater	All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.

Term	Explanation
Conservation of Habitats and Species Regulations 2017 (as amended)	Conservation of Habitats and Species Regulations 2017 (as amended) This legislation form the cornerstone of nature conservation policy, built around two pillars, the Natura 2000 network of protected sites and species protection. The Conservation of Habitats and Species Regulations 2017 (as amended) protects over 1,000 animals and plant species and over 200 so called habitat types (e.g. special types of forests, wetlands, etc.) of importance.
Hazardous substances	Substances or groups of substances that are toxic, persistent and liable to bioaccumulate, and other substances or groups of substances which give rise to an equivalent level of concern.
Heavily Modified Water Body	A surface water body that does not achieve good ecological status because of substantial changes to its physical character resulting from physical alterations caused by human use, and which has been designated, in accordance with criteria specified in the WFD Regulations 2017, as 'heavily modified'.
High ecological status	Is a state, in a surface water body, where the values of the hydromorphological, physico-chemical, and biological quality elements correspond to conditions undisturbed by anthropogenic activities.
Hydromorphology	Describes the hydrological and geomorphological processes and attributes of surface water bodies. For example, for rivers, hydromorphology describes the form and function of the channel as well as its connectivity (up and downstream and with groundwater) and flow regime, which defines its ability to allow migration of aquatic organisms and maintain natural continuity of sediment transport through the fluvial system. The WFD Regulations 2017 require surface waters to be managed in such a way as to safeguard their hydrology and geomorphology so that ecology is protected.
Impact assessment	A tool to enable the Environment Agency to weigh and present the evidence on the positive and negative effects of a plan. For example, information on the estimated cost and benefit of proposing actual measures.
Integrated River Basin and Coastal Management	A process whereby all pressures in a catchment are assessed and action undertaken in an integrated, proportionate and efficient way. A range of stakeholders are involved in the setting of priorities and their ultimate delivery.

Term	Explanation
Invasive non-native species	Non-native Invasive Species. Many species of plants and animals have been introduced to this country since Roman times. Several of these non-native species are invasive and have been causing serious problems to the aquatic and riverine ecology and environment. Problems include detrimental effects on our native species, deoxygenation of water causing fish mortalities, blocking of rivers and drainage channels, predation and competition with our native species, and in some cases pose health risks to the public or livestock.
LIFE Natura 2000 programme	This set out agreed priorities for the designated species and habitats across Wales, both on land and at sea. The programme identified pressures and planned the actions which are required to significantly improve the condition of these features, safeguarding them for the future. Actions may be changes to policy, small-scale practical improvements, or major innovative conservation projects.
Management Catchment	The RBDs are divided into a number of management catchments. Across Wales there are 14 management catchments across three Districts.
Marine Strategy Framework Regulations 2010	This legislation aims to protect the marine environment.
Marine Plan	Marine planning will help us to manage marine activities sustainably. The Welsh Government is responsible for Marine Planning in Wales and the planning process has already begun. Welsh Government are developing a Welsh National Marine Plan that covers Welsh inshore and offshore waters.
UK Marine Monitoring and Assessment Group	Group comprising Government departments, agencies and government research institutions. They co-ordinate a United Kingdom programme of estuarine and coastal monitoring designed to satisfy a number of requirements including trend monitoring for the Oslo and Paris Convention, compliance with legislation and international conventions, local needs and for research and development.
Measure	This term is used in the WFD Regulations 2017and domestic legislation. It means an action which will be taken on the ground to help achieve the objectives.

Term	Explanation
Mechanisms	The policy, legal and financial tools which are used to bring about actions (measures). Mechanisms include for example: legislation, economic instruments; codes of good practice; negotiated agreements; promotion of water efficiency; educational projects; research; development and demonstration projects.
Misconnections	Misconnections of foul sewage into surface water drains are a significant source of urban diffuse pollution in those areas where a separate drainage system is used. Misconnections happen when domestic plumbing has been connected into surface water drains instead of the foul sewer. This means untreated dirty water goes directly into rivers/waterways without receiving treatment.
Morphology	Describes the physical form and condition of a surface water body, for example the width, depth and perimeter of a river channel, the structure and condition of the riverbed and bank.
National Assembly for Wales	The National Assembly for Wales consists of 60 Members elected throughout Wales. The Assembly has delegated many of its powers to the First Minister, who leads the Welsh Assembly Government. The Assembly decides on its priorities and allocates the funds made available to it from the Treasury. Within its powers, the Assembly develops and implements policies that reflect the particular needs of the people of Wales.
National Access Forum for Wales	The National Access Forum for Wales' (NAFW) primary purposes are to help NRW and the Welsh Government to: improve the quality and extent of access to the countryside and coasts of Wales extend the opportunities for enjoyment and responsible outdoor recreation to all
National Sites	Protected Areas established for the protection of Conservation of Habitats and Species Regulations 2017 (as amended) (SPAs and SACs).
Natural England	The government-funded body whose purpose is to promote the conservation of England’s wildlife and natural features. The previously existing organisations English Nature, the Countryside Agency and Rural Development Service were merged to form Natural England.

Term	Explanation
Natural Resources	The living and non-living components of ecosystems.
Natural Resource Management	Also known as NRM. An approach to maintaining or restoring the composition, structure, function, and delivery of services of natural and modified ecosystems for the goal of achieving sustainability. Based on an adaptive vision for future conditions taking ecology, socioeconomics and cultural needs into account.
Natural Resources Wales	NRW is the Competent Authority for implementing WFD Regulations 2017 in Wales
Nitrate Vulnerable Zone	Land, prior to EU exit, designated under the Nitrates Directive/Nitrates Pollution Prevention (Wales) Regulations 2013 (as amended). The Nitrate Pollution Prevention (Wales) Regulations (2013) have been revoked and replaced by the Water Resources (Control of Agricultural Pollution)(Wales) Regulations 2021.
No deterioration (in water body status)	None of the quality elements used in the classification of water body status deteriorates to the extent that the overall status is reduced.
Objective (surface waters)	Three different status objectives for each water body. These are: • Overall status objective • Ecological status or potential objective; and • Chemical status objective These are always accompanied by a date by when the objective will be achieved. Ecological status (or potential) objectives will be derived from the predicted outcomes for the biological elements and physico-chemical elements, plus any RNAG ecological status (or potential) by 2015. Chemical status objectives will be derived from the predicted outcomes for the chemical elements plus any RNAG chemical status by 2015. Overall status objectives will be derived from the ecological status and chemical status objectives.

Term	Explanation
Objective (groundwater)	There are three status objectives for each groundwater body: • Overall status objective • Quantitative status objective • Chemical status objective These are always accompanied by a date by when the objective will be achieved. Overall status objectives will be derived from the quantitative status and chemical status objectives. In addition to status objectives there are also additional environmental objectives: to prevent deterioration of status, to prevent or limit the inputs of pollutants to groundwater and to reverse any significant and sustained upward trends in pollutant concentrations.
Periodic Review	This is the process, carried out every five years by the Water Services Regulation Authority, to assess the strategic plans for water company spending and investment. The plans include environmental improvements. The investment will often affect water customer charges and incorporates company business plans (called Asset Management Plans).
Phytobenthos	Bottom-dwelling multi-cellular and unicellular aquatic plants such as some species of diatom.
Phytoplankton	Unicellular algae and cyanobacteria, both solitary and colonial that live, at least for part of their lifecycle, in the water column.
Point source pollution	Pollution arising from an identifiable and localised area, structure or facility, such as a discharge pipe or landfill.
Pollutant	Any substance liable to cause pollution.
Pollution	The direct or indirect introduction, as a result of human activity, of substances or heat into the air, water or land which: (i) may be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems; (ii) result in damage to material property; or (iii) impair or interfere with amenities and other legitimate uses of the environment.

Term	Explanation
Predicted outcome	The future status of a quality element or water body based on groups of practical and justified measures and the date when this status will be achieved.
Pressures	Human activities such as abstraction, effluent discharges or engineering works that have the potential to have adverse effects on the water environment.
Priority substances	A pollutant, or group of pollutants, presenting a significant risk to or via the aquatic (surface water) environment that has been identified at Community level under the WFD Regulations 2017. They include 'priority hazardous substances'.
Programme of Measures	A Programme of Measures, as used in the WFD Regulations 2017, is a group of actions designed to improve the environment in an RBD and meet the objectives of the Regulations. For the purpose of the third cycle RBMPs this will include new and existing measures.
Protected Areas	Areas that have been designated as requiring special protection under legislation for the protection of their surface water and groundwater under Schedule 3 of the WFD Regulations 2017.
Quality element	A feature of an aquatic (surface water) ecosystem that can be described as a number for the purposes of calculating an ecological quality ratio, such as the concentration of a pollutant; the number of species of a type of plant.
Quantitative status (groundwater)	An expression of the degree to which a body of groundwater is affected by direct and indirect abstractions. The classification status for a groundwater body against the environmental criteria set out in the WFD Regulations 2017 and as set out in Common Implementation Strategy Guidance Document No 18. All four of the component tests for quantitative status must be assessed as good or poor and the overall quantitative status and the confidence in this (high or low) is determined by the worst test result.
Ramsar site	A wetland area designated for its conservation value under The 1971 Convention on Wetlands of International Importance, especially as Waterfowl Habitat. The Ramsar Convention seeks to promote the conservation of listed wetlands and their wise use.

Term	Explanation
Reference conditions	The benchmark against which the condition can be measured and reported in the relevant classification scheme. For waters not designated as A/HMWBs, the reference conditions are synonymous with the high ecological status class. For waters designated A/HMWBs, they are synonymous with the maximum ecological potential class, unless the site is designated as a Natura 2000 site.
Resilience	(of ecosystems) The capacity of ecosystems to deal with disturbances, either by resisting them, recovering from them, or adapting to them, whilst retaining their ability to deliver services and benefits now and in the future.
Risk	The likelihood of an outcome (usually negative) to a water body or the environment, or the potential impact of a pressure on a water body.
Risk assessment	The analysis that predicts the likelihood that a water body is at significant risk of failing to achieve one or more of the WFD Regulation objectives.
Risk category	The numerical or descriptive category assigned to water bodies that have been risk assessed, in order to make the risk-based prioritisation of water bodies for action under the WFD Regulations 2017 more manageable.
River basin	A river basin is the area of land from which all surface run-off and spring water flows through a sequence of streams, lakes and rivers into the sea at a single river mouth, estuary or delta. It comprises one or more individual catchments.
River Basin District	A river basin or several river basins, together with associated coastal waters. Each basin is divided into a number of management catchments.
River Basin Management	The management and associated planning process that underpins implementation and operation of the WFD Regulations 2017. It is both an overarching process in terms of existing processes and also defines new sub-processes such as those for hydromorphology. The RBMPs are plans for river basin management.

Term	Explanation
River Basin Management Plan	For each RBD, the WFD Regulations 2017 requires a RBMP to be published. These are plans that set out the environmental objectives for all the water bodies within the RBD and how they will be achieved. The plans will be based upon a detailed analysis of the pressures on the water bodies and an assessment of their impacts. The plans must be reviewed and updated every six years.
Safeguard zone	A catchment or other defined zone around a point where the water is abstracted for potable use and where actions may be taken to protect raw water quality and prevent deterioration, so minimising the need for purification treatment. For groundwater they are likely to be based on source protection zones under the Groundwater Protection Policy.
Saturation zone	Subsurface rock or other geological strata within which the pore spaces between the particles of rock or other strata, and the cracks in those strata are filled with water and for which a water table may be determined.
Septic Tank	These provide only primary treatment of sewage, retaining solids and allowing an overflow of partially treated sewage to discharge into land, where further treatment occurs in the soakaway system. The effluent from such systems may not be discharged into watercourses. As with WwTWs, the discharge will require a registered exemption from NRW, for which there is no charge. Where the discharge could affect a sensitive site (such as an abstraction borehole or a Site of Special Scientific Interest), an environmental permit may be required, for which there is a one-off charge.
Shellfish Water Protected Area	An area of estuarine or coastal water designated under the WFD Regulations 2017 for the protection of significant aquatic species.
Significant and sustained upward trend	A statistically significant trend in pollutant concentrations in groundwater that could lead to a future failure of one or more of the environmental objectives for groundwater unless it is reversed.
Site of Special Scientific Interest	An area of land notified under the Wildlife and Countryside Act 1981 by the appropriate nature conservation body (NRW in Wales) as being of special interest by virtue of its flora and fauna, geological or physio geographical features.

Term	Explanation
Source Protection Zone	A zone around a well, borehole or spring where groundwater is abstracted for human consumption (for example drinking water or food production).
Special Area of Conservation	Sites that are designated under the Conservation of Habitats and Species Regulations 2017 (as amended)
Special Protection Area	Sites that are designated under the Conservation of Habitats and Species Regulations 2017 (as amended).
Specific Pollutant	A substance considered as being discharged to the aquatic environment in significant quantities at the national level and for which Environmental Quality Standards have been established. As part of the ecological classification criteria, and in places where these pollutants are monitored, these standards must be met, in order for a surface water body to be classified as good ecological status.
Stakeholder	Individuals or groups that are or could become interested in, involved in or affected by our policies and activities. Our stakeholders include regulators, statutory bodies, professional organisations, local organisations and members of the public.
Stakeholder forum	A group of interested parties to guide and advice on river basin planning and management. This forum is led by Welsh Government.
State of Natural Resources Report (SoNARR)	The first version of SoNaRR was published in 2016, highlighting the pressures on our natural resources and linking the resilience of Wales' natural resources to the well-being of the people of Wales. The second SoNaRR will be published in 2020. Drawing on this evidence, Welsh Government published the NRP in 2017, outlining the three national priorities for natural resource management in Wales:
Strategic Environmental Assessment Regulations 2004 (SI 1656/04)	Legislation which requires an 'environmental assessment' to be carried out for certain plans and programmes whose formal preparation began after 21 July 2004 (or are prepared but not adopted or submitted by a legislative procedure by 21 July 2006), and which are considered likely to have significant effects on the environment. The term 'Strategic Environmental Assessment' is used in United Kingdom guidance to mean an environmental assessment under these Regulations.

Term	Explanation
Summary of SWMIs	This is a report referred to as ‘Challenges and Choices’ on each RBD that highlights SWMIs in that RBD which will need to be addressed to achieve environmental objectives.
Sustainable Drainage Systems (SuDS)	A system of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques.
Sustainable Management of Natural Resources (SMNR)	Using natural resources in a way and at a rate that maintains and enhances the resilience of ecosystems and the benefits they provide, in doing so, meet the needs of current generations without compromising the ability of future generations to meet their needs, and contribute to the achievement of the well-being goals set out in the Well-being of Future Generations Act. Also referred to as sustainable management.
Technical feasibility	Is determined through the assessment of whether the implementation of a measure or Programme of Measures, designed to achieve the statutory objectives, is technically possible either at the national and local level and includes the consideration of uncertainty as well as environmental and socio-economic feasibility. Technical feasibility depends upon the availability of a technical solution and information on the cause of the problem and hence the identification of the solution.
Transitional water	A term used for waters that are intermediate between fresh and marine water. Transitional waters include estuaries and saline lagoons.
Typology	The means by which the WFD Regulations 2017 requires surface water bodies to be differentiated according to their physical and physico-chemical characteristics.
Wales Fisheries Forum	The Wales Fisheries Forum is made up of a wide range of stakeholders to work together to share ideas and act as ambassadors for Welsh fisheries. The goal is to ensure that freshwater and migratory fish stocks are protected for future generations.
Wales Land Management Forum	The Wales Land Management Forum (WLMF) provides an opportunity for NRW and other WLMF membership organisations to share information, identify common interests and work together in a collaborative way on strategic land management issues.

Term	Explanation
Wales Water Management Forum	The Wales Water Management Forum (WWMF) provides an opportunity for the organisations to share evidence and explore opportunities for working together to achieve the sustainable management of water in Wales. The WWMF also explores opportunities to develop, support and communicate shared messages and recommendations on the SMNR.
Water body	A manageable unit of surface water, being the whole (or part) of a stream, river or canal, lake or reservoir, transitional water (estuary) or stretch of coastal water. A 'body of groundwater' is a distinct volume of groundwater within an aquifer or aquifers.
WFD	European Union legislation – WFD (2000/60/EC) – establishing a framework for European Community action in the field of water policy.
Statutory objectives	The objectives set out in Part 5 the WFD Regulations 2017 and which are required to be met.
Water Services	All services which provide, for households, public institutions or any economic activity: • abstraction, impoundment, storage, treatment and distribution of surface water or groundwater • wastewater collection and treatment facilities which subsequently discharge into surface water
Water Sensitive Urban Design (WSUD)	Water Sensitive Urban Design is a land planning and engineering design approach which integrates the urban water cycle, including storm water, groundwater and wastewater management and water supply into urban design to minimise environmental degradation and improve aesthetic and recreational appeal.
Water table	The upper limit of the saturation zone.
Water use	Water Services together with any other human activity identified as having a significant impact upon the status of water.
Water Watch Wales	An interactive spatial web-based tool that provides supporting information and data layers which can assist partners to deliver actions.

Term	Explanation
Weight of evidence	A weight of evidence approach integrates results or evidence from several data sources, weighted appropriately, to make risk-based decisions.
Well-being	A context- and situation-dependent state, comprising basic material for a good life, freedom and choice, health and bodily well-being, good social relations, security, peace of mind, and spiritual experience.
Well-being of Future Generations (Wales) Act	This Act is about improving the social, economic, environmental and cultural well-being of Wales. It will make the public bodies listed in the Act think more about the long-term, work better with people and communities and each other, look to prevent problems and take a more joined-up approach. This will help us to create a Wales that we all want to live in, now and in the future. To make sure we are all working towards the same vision, the Act puts in place seven well-being goals. Public Service Boards are required to put together Well-being Assessments to help implement action to improve well-being. Well-being Indicators will be used to measure success of actions.
Welsh Assembly Government	The devolved Government in Wales.
Welsh Government Water Forum	This strategic forum was established in 2007 and is chaired by Welsh Government. It is made up of representatives of major stakeholder sectors and important national organisations. The Forum provides a focus for communication and consultation on a broad range of water related issues.
Welsh Technical Advice Notes	*Planning Policy Wales* (2002) sets out the land use planning policies of the Welsh Assembly Government (the Assembly Government). It is supplemented by a series of topic based Technical Advice Notes (Wales). Technical Advice Notes may be material to decisions on individual planning applications and will be taken into account by the National Assembly for Wales and planning inspectors in the determination of called-in planning applications and appeals.

Table 6: Table of acronyms

Acronym	Meaning
AONB	Area of Outstanding Natural Beauty
AMP	Asset Management Plan
A/HMWBs	Artificial and Heavily Modified Water Bodies
AWB	Artificial Water Bodies
BOD	Biochemical Oxygen Demand
BPA	British Ports Association
BPS	Basic Payment Scheme
CAP	Common Agricultural Policy
CCRA	Climate Change Risk Assessment
CCRA2	Climate Change Risk Assessment 2
CCRA3	Climate Change Risk Assessment 3
CPD	Continuous Professional Development
CSM	Common Standards Monitoring
CMP	Core Management Plan
CSOs	Combined Sewer Overflows
DCWW	Dŵr Cymru/Welsh Water
DrWPA	Drinking Water Protected Area
DWI	Drinking Water Inspectorate
EA	Environment Agency

Acronym	Meaning
EC	European Community/Commission
EQS	Environmental Quality Standards
EQSD	Environmental Quality Standards Directive
EU	European Union
FRMPs	Flood Risk Management Plans
GHG	Green House Gas
HMWB	Heavily Modified Water Bodies
HRA	Habitats Regulation Assessment
ICES	International Council for the Exploration of the Seas
INNS	Invasive Non-native Species
JNCC	Joint Nature Conservation Committee
IPCC	Intergovernmental Panel on Climate Change
LLFAs	Lead Local Flood Authorities
MMA	Mitigation Measures Assessment
MPA	Marine Protected Area
NEP	National Environment Programme
NGO	Non-Governmental Organisation
NRAP	Nature Recovery Action Plan
NRM	Natural Resource Management
NRW	Natural Resources Wales

Acronym	Meaning
NWEBS	National Water Environment Benefits Survey
Ofwat	Water Services Regulation Authority
PAH	Polycyclic aromatic hydrocarbons
PBDE	Polybrominated diphenyl ether
PDB	Polychlorinated biphenyl
PFAS	Perfluoroalkyl and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonate
PoMs	Programme of Measures
PRTR	Pollutant Release and Transfer Register
RBD	River Basin District
RBMP	River Basin Management Plan
RNAG	Reason for Not Achieving Good
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SWPAs	Shellfish Water Protected Areas
SNMR	Sustainable Management of Natural Resources
SoNARR	State of Natural Resources Report
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

Acronym	Meaning
SWMI	Significant Water Management Issues
SWPA	Shellfish Water Protected Area
SuDS	Sustainable Drainage Systems
SFS	Sustainable Farming Scheme
TBT	Tributyltin
UKCP09	UK Climate Projections 2009
UKCP18	UK Climate Projections 2018
UKCCC	UK Climate Change Committee
UKMPG	United Kingdom Major Ports Group
UKTAG	United Kingdom Technical Advisory Group
UKWIR	United Kingdom Water Industry Research
WB	Water Body
WBID	Water body identifier
WFF	Wales Fisheries Forum
WLMF	Wales Land Management Forum
WMAAG	Wales Marine Advisory and Action Group
WNMP	Welsh National Marine Plan
WFD	Water Framework Directive
WSUD	Water Sensitive Urban Design
WWMF	Wales Water Management Forum

Acronym	Meaning
WwTW	Wastewater Treatment Works

Appendix A. Additional plans and strategies related to water management

Table A 1: Additional plans and strategies

Topic	Types of plans or strategies	Organisation
Flooding and Coastal erosion	Drainage & Waste-Water Plans	NRW
	FRMPs	NRW
	National Flood and Coastal Erosion Risk Management Strategy	Welsh Government
	Shoreline Management Plans	Coastal Groups, which are Local Authority led
	Catchment Flood Management Plans	NRW
	Local Flood Risk Management Strategies	NRW and local authorities
	National Habitat Creation Programme	Local Authorities and Water Companies
Climate Change Adaptation	The UK Climate Change Risk Assessment 2017 Evidence Report	UK Committee on Climate Change Adaptation Subgroup UK Government
	Climate Change Strategy for Wales (2010)	Welsh Government
	The UK Climate Change Risk Assessment 2017 Government Report	UK Government
	The UK National Adaptation Programme 2013 (This applies primarily to England but also covers non-devolved issues for Wales.	Public bodies
	Plans prepared by public bodies (including water companies and the Environment Agency) as designated Reporting Authorities under the UK Climate Change Act 2008	Government's Committee on Climate Change,
	UK National Climate change Adaptation Strategy and Adaptation Plan	Public bodies and utility companies
Water Policy	Water Strategy for Wales and associated Action Plan	Welsh Government
Water Industry	Water Resource Management Plans	Water Companies

Topic	Types of plans or strategies	Organisation
	Drought Plans	Water Companies
	Water Company Business Plans	Water Companies
	Asset Management Plans	Water Companies
Biodiversity	Nature Recovery Plan	Welsh Government
	SAC/SPA core management plans	NRW
	LIFE + Project Thematic Plans	NRW
	Prioritised Improvement Plans (PIPs)	NRW
	Local Nature Partnership Nature Recovery Action Plans / Local Biodiversity Partnership Action Plans	Local Authorities/National Park Authorities/Local partnerships
Invasive Non-Native Species (INNS)	The INNS Framework Strategy for Great Britain	Great Britain Non-Native Invasive Species Programme Board
Agriculture	Rural Development Plan	Welsh Government
Forestry	Forest Resource Plan	NRW
Recreation	Rights of Way Improvement Plans	Local Authority
National Parks & Areas of Outstanding Natural Beauty (AONB)	National Park Management Plans	National Park Authority
	AONB Management Plans	Local authorities
Air quality	Air Quality action plans	Local authorities
Marine	Welsh National Marine Plan	Welsh Government
	Bathing Water Profiles	NRW
	North West Marine Plan	Welsh Government
	Marine Strategy Framework Programme of Measures	Welsh Government
Chemicals	UK National Action Plan for the Sustainable Use of Pesticides (Plant Protection Products) 2013	Defra, Welsh Government, Scottish Government, Dept of agriculture and rural affairs Northern Ireland, Health and Safety Executive

Topic	Types of plans or strategies	Organisation
	National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants 2017	Defra, Welsh Government, Scottish Government, Dept of the Environment Northern Ireland
Planning	Local Well-being Plans	Local Authorities
	Planning Policy Wales	Local Authorities
	Technical Advice Note	Local Authorities
Fisheries	Fisheries Plans & Strategies including inland fisheries & shellfish waters	NRW
Sectoral and cross cutting Plans	Decarbonisation Plans	UK Government
Navigation	Canal Restoration Plans	Canal & River Trust
	Canal & River Trust Water Resources Strategy	Canal & River Trust
	Canal & River Trust Fisheries Improvement Plans	Canal & River Trust

Appendix B. Changes to the water body network

Table B 1: Water body (WB) changes due to known errors

WBID	WB NAME	WB Type	Change Required
GB110060029230	Mwche Stream - headwaters to tidal limit'	River	Operational catchment corrected to Taf
GB110060029320	Tawelon - headwaters to tidal limit'	River	Operational catchment corrected to Tywi
GB110061038660	Nant y Bugail - headwaters to conf with Cleddau N	River	Operational catchment corrected to Cardigan to W Cleddau - headwaters to conf with Cleddau North
GB110061038680	Cleddau North - H'waters to conf with W. Cled	River	Operational catchment corrected to Cardigan to W Cleddau - headwaters to conf with Cleddau North
GB110059032130	Loughor - headwaters to confluence with Marlas	River	Water body name corrected to 'Loughor - headwaters to confluence with Aman
	Cibi Brook	River	Water body re-delineated as part of the river Gavenny GB109056032990 catchment
GB109057027150	Roath Brook	River	Mapping of the water body catchment boundary corrected to include the headwaters of the Nant Fawr above Llanishen reservoir
GB110065053840	Gaseg - upper	River	Water body name corrected to 'Gaseg'
GB110060036300	Cothi - headwaters to confluence with Tywi	River	Water body name corrected to 'Cothi – confl with Marlais to confluence with Tywi.

Table B2. Changes to heavily modified water bodies

WBID	RBD	WB NAME	WB Type	Change Required
GB30940626	Severn	Cairn Mound Reservoir	Lake	Licence revoked so de-designated as a HMWB, de-designated as water body and removed from DrWPA list
GB31035111	Western Wales	Llyn Gelli Gain	Lake	Licence revoked so de-designated as a HMWB, de-designated as water body and removed from DrWPA list
GB110060036350	Western Wales	Tywi - conf with Doethie to conf with Llandovery Bran	River	De-designated as HMWB
GB109054049800	Severn	Afon Vyrnwy - conf Afon Tanat to conf R Severn	River	Removed designation of 'urbanisation' use from the water body
GB109056032900	Severn	Ebbw Fawr - source to conf Ebbw Fach R	River	Designated as a HMWB for urbanisation use
GB109057027160	Severn	Nant Glandulas - source to conf Rhymney R	River	Designated as a HMWB for urbanisation use
GB31047043	Western Wales	Hafoty	Lake	Licence revoked so de-designated as a HMWB, de-designated as water body and removed from DrWPA list
GB541005900901	Western Wales	Tawe - Beaufort Weir to Barrage	transitional	Changed designated use from flood protection to navigation
GB110061025000	Western Wales	Castlemartin Corse - headwaters to tidal limit	River	Designated as a HMWB for land drainage use
GB110058026350	Western Wales	Baglan Brook - headwaters to conf with River Neath	River	Designated as a HMWB for urbanisation use
GB541005900900	Western Wales	Tawe Estuary Below Barrage incl Docks	Transitional	Removed Flood protection use
GB31147045	Dee	Mill Pond	Lake	Licence revoked so de-designated as a HMWB, de-designated as WFD water body and removed from DrWPA list
GB31133644	Dee	Cilcain Reservoir 2	Lake	Licence revoked so de-designated as a HMWB, de-designated as WFD water body and removed from DrWPA list
GB31133661	Dee	Cilcain Reservoir 3	Lake	Licence revoked so de-designated as a HMWB, de-designated as WFD water body and removed from DrWPA list

WBID	RBD	WB NAME	WB Type	Change Required
GB31133659	Dee	Moel Dywyll	Lake	Licence revoked so de-designated as a HMWB, de-designated as WFD water body and removed from DrWPA list
GB610100083000	Western Wales	Cemlyn Lagoon	Coastal	Change of use from Flood protection to Wider Environment
GB541006608000	Western Wales	Clwyd	Coastal	Change of use from Coastal Protection to Flood Protection
GB511006414900	Western Wales	Dysynni	Coastal	Change of use from Coastal Protection to Flood Protection
GB109054044800	Severn	Afon Lwyd	River	De-designate as HMWB, designated in error for Water Regulation
GB109057027150	Severn	Roath Brook	River	Change of use from Drinking Water to Water Reg
GB30940941	Severn	St James Reservoir	Lake	Licence varied so de-designated as a HMWB, de-designated as WFD water body and removed from DrWPA list
GB30940869	Severn	Scotch Peters Reservoir	Lake	Licence revoked so de-designated as a HMWB, de-designated as WFD water body and removed from DrWPA list
GB30940472	Severn	Lower Neuadd Reservoir	Lake	Licence varied so de-designated as a HMWB, de-designated as WFD water body and removed from DrWPA list
GB31034008	Western Wales	Llyn Elsi Reservoir	Lake	Licence revoked so de-designated as a HMWB, de-designated as WFD water body and removed from DrWPA list

Table B3. Water bodies to designate as new HMWB

WBID	RBD	WB Name	WB type	Change Required
GB30940986	Severn	Cwmtillery	Lake	Newly designated HMWB for Drinking Water
GB71010013	Western Wales	Tennant Canal	Canal	Newly created canal AWB – spilt from the Neath Tennant canal GB71010012

Appendix C. Chemical narratives

This section includes key facts about chemical substances within the WFD legislation that could potentially pose some risk to the water environment in Wales, including information about their occurrence, environmental fate, risks and mitigation measures. Risk maps for all chemicals are available here, with individual layers for each substance and water body type.

Cypermethrin

Background

Cypermethrin is a pyrethroid insecticide used to control a broad spectrum of pests. It is used for plant protection in crops (e.g. cereals, vegetables, grassland and fruits) as well as in forestry and gardens. It is also used as a biocide to control insects in homes, public and commercial buildings and in the food industry, as well as a veterinary medicine for external use to control pests in livestock and pets. Due to the wide range of uses, it can reach the environment form different pathways such as wastewater and runoff from urban and rural areas. Cypermethrin is not very persistent or bioaccumulative, but it is highly toxic to aquatic invertebrates and has the potential to severely disrupt food chains at very low concentrations and short exposure. As a result, it has been subjected to various control mechanisms and its concentration in natural waters are regulated using tight EQS.

Sources

- Plant protection: agricultural crops, forestry, gardens, plant nurseries
- Biocide: pest control and wood treatment in homes, public and commercial buildings, industry (e.g. wool and paper), food storage
- Animal health: control of lice, ticks and flies in livestock and pets

Pathway

- Spray drift, surface runoff from fields and hardstanding areas where the product is handled
- Biocide: via drains and wastewater from wet cleaning and rain on treated surfaces, wash-off/cleaning of treated wood
- Spillage during pouring over animal skin; washing of treated animal skin

Receptor

- Highly toxic to aquatic invertebrates such as insects and crustaceans
- Adverse effects occur at very low concentrations and after short exposure
- Binds strongly to soil and sediment
- Low persistence in water and medium persistence in soils

- Not bioaccumulative

Risk Assessment

The low EQS values for cypermethrin, 0.08ng/l in freshwaters and 0.008ng/l in transitional and coastal areas, are below what recently used analytical methods are able to quantify. As a result, no adequate data is available to assess the risk of achieving good status directly and cypermethrin concentrations were estimated using a model based on typical levels in rivers and wastewater inputs from across the UK, adjusted for specific dilution factors for rivers in Wales. The results showed no likely breach of the standard. Data from other parts of Britain show concentrations in lakes, canals and estuaries lower than in rivers. Due to uncertainties associated with the use of modelled data, all locations are considered 'probably not at risk', as per the Cypermethrin risk map for Wales.

Please note – all these maps can be accessed on our Portal via the WFD tab at the far right of the screen.

The EQS for estuaries and coastal waters are lower than for rivers and below the quantification limit for the data used in the model, so the confidence in their risk assessment is low for these areas.

Table C 1: River water bodies with the highest estimated concentration of cypermethrin in Wales, 2018 (EQS = 0.08ng/l).

Water body	RBD	Estimated value (ng/l)	% EQS
Goedol	Western Wales	0.0726	91%
Cresswell	Western Wales	0.0685	86%
Cefni - Ceint to Cefni reservoir	Western Wales	0.0631	79%
Ely - source to Nant Clun	Severn	0.0618	77%
Pulford Brook	Dee	0.0617	77%

Control Measures

The key measures to reduce cypermethrin pollution in Wales were the withdrawal of its use for sheep dipping in 2010, and the derogation to spraying in certified forests in 2014. There are many other legal mechanisms, codes of best practice and guidance aimed at the safe use of plant biocides, protection products and veterinary medicines which include cypermethrin.

Future Trends

There was a marked reduction in cypermethrin use since its removal for sheep dipping and pine weevil control. The use in crops has also decreased in the last decade. However, there is no evidence of reduction in its uses as a biocide in domestic and commercial situations and in 'pour-on' veterinary applications. New analytical methods with low quantification limits are being applied, and trends in water may become detectable in the coming years.

Dioxins and Dioxin-Like Compounds

Background

Dioxins and Furans are unintentionally formed when organic material is burned in less-than-optimal conditions such as in open fires, building fires, domestic fireplaces, and poorly operated or designed solid waste incinerators. As a result, the key pathway into the water environment is atmospheric deposition via contaminated rainfall. Historically, municipal and medical waste incineration was the most important source, together with chlorine bleaching of pulp and paper and engines using leaded fuel.

Within the large group of polychlorinated biphenyls (PCBs), twelve congeners are classified as dioxin-like PCBs due to their similar toxicological properties to dioxins. PCBs were intentionally manufactured for various purposes, such as dielectric and heat transfer fluids, carbonless copy paper and pesticide manufacturing. The widespread occurrence of PCBs in the environment is most likely a result of past releases linked with their production, use and disposal.

Sources

- Dioxins: open fires, building fires, waste incinerators (legacy)
- PCBs: old transformers, capacitors, plasticizers, surface coatings, inks, adhesives, flame retardants, paints, and carbonless duplicating paper

Pathway

- Dioxins: run-off following atmospheric transport and deposition
- PCBs: leaching from contaminated land, old industrial sites and substations. Poorly operated landfills and waste incineration (legacy)

Receptor

- Toxic to humans and wildlife; ingested via the consumption of contaminated fish
- Highly persistent; bioaccumulate through food webs
- High levels of PCBs still found in cetaceans in the UK, affecting their reproduction and immune systems

Risk Assessment

Dioxins and dioxin-like PCBs occur as complex mixtures of congeners in the environment, each with different degrees of toxicity, so Toxic Equivalents Values are used to express the overall toxicity. Most dioxins and furans were not detected in recent fish samples in Wales. Many PCBs were present in both freshwater fish and marine mussels, but at low concentrations. Calculated toxic equivalent factors were considerably lower than environmental limits, so measured areas were considered ‘not at risk’ and unmeasured areas ‘probably not at risk’ of failing the standards. Six locations were precautionarily considered “probably at risk” due to higher than usual PCB levels in past water or effluent samples, as per the Wales' chemicals risk map. They were unable to be fully surveyed for dioxins due to the lack of suitable local biota for analysis.

Table C 2: Dioxins and dioxin-like substances in freshwater fish,2018 (EQS = 6.5 ng/kg).

Location	RBD	Toxic Equivalent (ng/kg)	% EQS
Afon Llan	Western Wales	1.07	16
Afon Rheidol	Western Wales	1.19	18
River Rhymney	Severn	1.12	17
Afon Soch	Western Wales	1.03	16

Control Measures

Dioxin and PCB emissions have been controlled by the Stockholm Convention and the Waste Incineration and revised Waste (England and Wales) Regulations 2011, as well as more stringent control of open agricultural burning and vehicular emissions. The worst contaminated land sites in Wales have been remediated.

Future Trends

Recorded emissions of dioxins and PCBs to air, land and water have declined in recent decades, but further monitoring is needed to determine a trend in biota. PCB monitoring from the Clean Safe Seas Environmental Monitoring Programme shows either static or decreasing trends for PCB congeners across Wales.

Hexabromocyclododecane (HBCDD)

Background

HBCDD is a brominated flame retardant used mainly in polystyrene foams in building insulation, as well as upholstered furniture, car seats and insulation, packaging and electric and electronic equipment. It reaches the water environment via runoff from demolition and firefighting sites, likely to flow through drainage systems into wastewater networks, as well as the washing of fabrics treated with flame retardants containing HBCDD. Other sources may include leachates from landfills and recycling plants. It is highly persistent and binds strongly to soils, so contaminated sediments are likely to continue to serve as a source after emissions have been phased out. It can also be transported through air via contaminated dust. HBCDD is classified as a priority hazardous substance under the WFD Regulations 2017 and it is monitored in biota for compliance against EQS.

Sources

- Flame retardants used in polystyrene building insulation
- Treated fabrics in upholstery, car seats, packaging
- Legacy in old electrical and electronic equipment

Pathway

- Wastewater: runoff from building sites reaching drainage systems and washing of fabrics treated with HBCDD

- Diffuse / runoff: following atmospheric deposition and land application of wastewater sludge

Receptor

- Toxic to humans and wildlife
- Ingested via consumption of contaminated prey
- Highly persistent
- Bioaccumulate through food webs
- Adhere to soils and sediment

Risk Assessment

There was no detection of HBCDD in biota samples from eight locations representative of different land use types and geographic areas in the Welsh estuarine and freshwater environments. This is in line with other parts of the UK, where the majority of samples from recent years did not detect the presence of HBCDD. To enhance the coverage of the assessment, HBCDD in river water was modelled based on typical concentrations in wastewater and accounting for dilution factors across Wales. The location with the lowest dilution rate had estimated values just above a water reference value. This water body is considered 'probably at risk' of breaching the biota EQS standard, while all other areas are 'probably not at risk' if estimated values are used, or 'not at risk' if local biota results are available.

Table C 3: HBCDD concentrations in estuarine mussels (Mytilus edulis), 2018 (EQS = 167 µg/kg)

Location	RBD	HBCDD (µg/kg)	% EQS
Mawddach Estuary	Western Wales	<5	<3
Milford Haven Estuary	Western Wales	<5	<3
Dee Estuary	Dee	<5	<3
Conwy Estuary	Western Wales	<5	<3

Table C4: HBCDD concentrations in freshwater trout (*Salmo trutta*), 2018 (EQS = 167)

Table C 4: Table C4: HBCDD concentrations in freshwater trout (*Salmo trutta*), 2018 (EQS = 167 µg/kg)

Location	RBD	HBCDD (µg/kg)	% EQS
Afon Llan	Western Wales	<5	<3
Afon Rheidol	Western Wales	<5	<3
River Rhymney	Severn	<5	<3
Afon Soch	Western Wales	<5	<3

Control Measures

The production and use of HBCDD was restricted via the Stockholm Convention on Persistent Organic Pollutants and the EU REACH Regulation, which is incorporated into UK law. Current restrictions limit the HBCDD content to 0.01% of materials.

Future Trends

Levels of HBCDD in the environment are likely to reduce following the use restrictions, but no trend information is available as there has been no detection in biota samples.

Mercury

Background

The environmental impact from mercury and its compounds is mostly linked to historical industrial and domestic sources, such as dental fillings, cosmetics, wood preservatives, textile treatment and antifouling in boats. Burning of fuels containing mercury, such as coal and oil leads to atmospheric emissions which facilitates long distance transport to remote regions. Mercury in contaminated soils and sediment can be converted to methylmercury, a more toxic and bioavailable form, which is easily absorbed and accumulated through food chains, making top predators like otters and large fish, and also humans, potentially exposed to high levels via the consumption of contaminated prey. Mercury and its compounds are classified as priority hazardous substances under the WFD Regulations 2017 and are monitored in biota for compliance against EQS.

Sources

- Air pollution from coal-fired power plants, cement and metal manufacturing
- Amalgam dental fillings, crematoria being often an important local source to air
- Household products: batteries, cosmetics, wood preservatives, textile treatment and antifouling agents
- Abandoned coal mines

Pathway

- Deposition from air to water and land
- Wastewater from domestic and industrial sources
- Runoff from landfills and soil following aerial deposition wastewater sludge spreading
- Resuspension of contaminated sediment

Receptor

- Toxic to humans and wildlife

- Main source is consumption of contaminated fish
- Highly persistent
- Bioaccumulate through food webs
- Wildlife at higher risk than humans due to stringent food regulation

Risk Assessment

Several studies from across the UK and Europe show widespread failures of environ-mental standards for Mercury in marine fish. Data from fish and mussels in the Welsh coast and estuaries confirms that most areas are likely to be at risk. Levels appear to be decreasing, but further monitoring is needed to ensure confidence in the trend. Marine areas with sampling records have been confirmed to be at risk of breaching the standard, as per the mercury risk map. Data from freshwater fish is less widely available, so concentrations in water, which is a weaker indicator than biota data, and the presence of risk factors, such as industry, sewage discharges and legacy coal mining were used to derive risk factors.

Table C 5 Mercury concentration in biota in Welsh estuarine and coastal water bodies, 2018 (EQS = 20 µg/kg).

Location	RBD	Matrix	Result (µg/kg)
Conwy Estuary	Western Wales	Mussels (*Mytilus edulis*)	15.1
Mawddach Estuary	Western Wales	Mussels (*Mytilus edulis*)	10.6
Milford Haven (Lawrenny)	Western Wales	Mussels (*Mytilus edulis*)	14.0
Mostyn Bank (Dee Estuary)	Dee	Mussels (*Mytilus edulis*)	15.9
Bristol Channel (Carmarthen Bay)	Western Wales	Dab (*Limanda limanda*)	36.5
Cardigan Bay South	Western Wales	Dab (*Limanda limanda*)	67.7
Cardigan Bay North	Western Wales	Dab (*Limanda limanda*)	79.9
Irish Sea (North Anglesey)	N/A	Dab (*Limanda limanda*)	74.3

Control Measures

Mercury emissions from all major sources have been largely restricted since 2005 through Welsh, UK and EU legislation (e.g. Hazardous Waste, REACH, Mercury, Cosmetics and Biocides regulations, Industrial Emissions , the Control of Mercury (Regulations) and the international Minamata convention, with some exemptions for specific uses such as military and space.

Future Trends

Emissions of mercury to air and water have declined considerably in recent decades, but there is no clear trend in mussels within the monitoring sites in Wales. Mussels data from 2018 appear lower than in previous years, but further long-term monitoring is needed to identify a clear trend, data from Clean Safe Seas Environmental Monitoring Programme.

Heavy Metals

Copper, Zinc, Cadmium, Lead, Iron, Manganese and Nickel

Background

High density metals are naturally occurring, and most are essential micronutrients for animals and plants, but elevated concentrations are harmful to living organisms. Metals pollution is a common problem in Welsh waters, mainly as a historical legacy from disused metal mines. Other relevant sources are contaminated land and industries such as steel works, oil and gas refineries, papermills, powerplants, mining and quarrying, cement production and manufacturing, as well as runoff from construction sites and infrastructure. Household products such as batteries and DIY materials can also release metals and reach natural waters via sewage and landfills. Copper, Zinc, Cadmium, Lead, Iron, Manganese and Nickel (as well as mercury, discussed in a separate sheet) are regulated under the WFD Regulations 2017 and their concentration in water is monitored for compliance against EQS .

Sources

- Disused metal and coal mines
- Industrial: steel works, oil and gas refineries, papermills, powerplants, mining and quarrying, cement production
- Transport and utilities infrastructure
- Household products (e.g. batteries, electronics, building and DIY materials)

Pathway

- Discharges and runoff from mines
- Deposition from air to water and land
- Wastewater from domestic and industrial sources
- Soil erosion, runoff from contaminated land, buildings, construction sites, landfills, transport infrastructure
- Sediment resuspension

Receptor

- High concentrations of bioavailable forms of metals in water are toxic to aquatic life
- Bioavailability varies with the water physico-chemical properties
- Highly persistent; bioaccumulate through food webs
- Wildlife at higher risk than humans due to stringent food regulation

Risk Assessment

The risk of metals in water breaching the EQS was assessed using data from the latest classification (2018). Most water bodies in Wales with known potential sources of metals are monitored. Where data shows a certain failure of the EQS, the water body is said to be ‘at risk’. Where monitoring shows an uncertain failure of the EQS, or additional monitoring has taken place due to known catchment sources, the water body is ‘probably at risk’. Where data shows an uncertain pass of the EQS or we have not monitored, it is said to be ‘probably not at risk’ given monitoring is based on the presence of known catchment sources. Where monitoring shows a confident pass, it is considered ‘not at risk’. Of the seven heavy metals, the overall risk is the highest for zinc and cadmium, and the lowest for iron and copper, as shown in the heavy metals risk map.

Table C 6: Number of water bodies per risk category

Risk category	Copper	Zinc	Iron	Cadmium	Lead	Nickel	Manganese
At risk	3	44	1	27	16	4	5
Prob. at risk	11	10	0	10	0	0	1
Prob. not at risk	646	723	782	732	738	735	819
Not at risk	244	127	121	135	150	165	79
TOTAL	**904**	**904**	**904**	**904**	**904**	**904**	**904**
% samples pass	*99%*	*75%*	*99%*	*83%*	*91%*	*98%*	*93%*

Control Measures

NRW is engaged in a long-term programme to tackle pollution from disused metal mines. It investigates the viability of reducing runoff and treating mine discharges and should reduce pollution in the long-term where feasible. Other sources have been tackled by new legislation on the production, use and disposability of products containing heavy metals, emissions through air and water, and the gradual replacement of infra-structure such as lead pipes.

Future Trends

Heavy metal emissions from industrial and domestic sources have reduced considerably after their peak in the 1970s and 1980s. However, pollution from abandoned mines, which are the main source of metals in Wales, has remained constant and no clear trend has been observed in the last decade.

Polycyclic Aromatic Hydrocarbons (PAHs)

Background

The 5 and 6 ring PAHs Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene are included in the WFD Regulations 2017 in response to their potential harmful effects as carcinogenic and endocrine disruptors to humans and wildlife. They are ubiquitous in the environment due a wide variety of sources and ease of transport through the air. Coke, steel and aluminium production, alongside wood preservation are historically the major sources. Solid fuel combustion, like wood, coal and peat for heating, agricultural and wildfires are the main current sources, as well as

particulates from road vehicles (especially diesel), ships, trains and aircrafts. Wear and tear of tyres are also a contributor to PAHs in road runoff. In addition to regular diffuse emissions, accidental spills can be locally relevant and resulting contaminated soils and sediment can continue to be a source in the long term, especially when disturbed during storms and dredging.

Sources

- Coke, steel and aluminium production
- Wood preservation
- Particulates from combustion engines
- Open fires
- Tarmac production and use
- Tyre wear and tear

Pathway

- Atmospheric deposition
- Road / urban runoff
- Wastewater
- Accidental fuel spillage
- Re-suspension of contaminated sediment

Receptor

- Ingested via consumption of contaminated fish
- Carcinogenic and endocrine disruptors
- Highly persistent; bioaccumulate through food webs
- Direct impact on benthic organisms due to adsorption to sediment

Risk Assessment

The EQS for PAHs are based on the levels of Benzo-(a)-pyrene in biota. Crayfish samples from four freshwater sites in 2017 and 2018 returned only one detection (River Usk), which was below the EQS limit. Mussels from four estuaries have been sampled for several years, with no EQS breach since 2013. As per the PAH risk map for Wales, the eight sites with data will be assessed as ‘not at risk’, while the other locations with no data are ‘probably not at risk’. Wider evidence suggests that EQS failures are highly unlikely, with a very small number of failures reported elsewhere in the UK.

Table C 7: Benzo(a)pyrene concentrations in estuarine mussels (*Mytilus edulis*), 2013-18. (EQS = 5 µg/kg)

Location	RBD	Benzo(a)pyrene (µg/kg)	% EQS
Mawddach Estuary	Western Wales	0.36	7.1
Milford Haven Inner	Western Wales	0.71	14.2
Dee Estuary	Dee	0.76	15.2
Conwy Estuary	Western Wales	0.32	6.4

Table C 8: Benzo(a)pyrene concentrations in riverine crayfish (*Pacifastacus leniusculus*) 2017-18. (EQS = 5 µg/kg)

Location	RBD	Benzo(a)pyrene (µg/kg)	% EQS
Cegin	Western Wales	<0.21	<4.2%
Dee	Dee	<0.71	<14.2%
Upper Severn	Severn	<0.09	<1.8%
Usk	Severn	2.16	43%

Control Measures

Industrial emissions have been largely controlled by the Environmental Permitting Regulations (2013). Further legislation under REACH restricts the use of PAHs containing products and separate regulations have reduced PAH content in diesel and tyres. The Clean Air Plan for Wales introduce local and national actions to further reduce PAH emissions to air.

Future Trends

While industrial and road transport emissions of PAHs have reduced in the UK in the last decade, total emissions have increased back to 1990 levels due to higher domestic wood burning and wildfires. Levels in marine mussels have not changed significantly in recent years. Data collated by the Clean Safe Seas Environmental Monitoring Programme show decreasing trends in some locations in the Welsh coast, but longer term assessments are needed to verify the strength of the trend.

Polybrominated Diphenyl Ethers (PBDEs)

Background

Polybrominated diphenyl ethers (PBDEs) are a group of organobromine compounds used as flame retardants in consumer products such as electronics, furnishings, motor vehicles, airplanes, plastics, polyurethane foams and textiles. They are highly persistent and mobile in the environment and are even found in remote locations including the Arctic. They bioaccumulate though food chains and are toxic to wildlife and humans. Many PBDE congeners are classified as priority hazardous

substances under the WFD Regulations 2017 and are monitored in biota for compliance against EQS. Their production and use have been largely reduced, with most sources being a legacy from old domestic products still in use or being disposed of.

Sources

- Flame retardants used in foams, fabrics and plastics
- Peak of use in the 1990s; banned for most uses in 2004
- Legacy from old goods such as furniture, car seats, TVs and computers

Pathway

- Air: long range transport attached to dust and localised via adsorption to clothes
- Wastewater: released via clothes washing
- Diffuse / runoff: following deposition from air and wastewater sludge

Receptor

- Adhere to soils and sediment
- Toxic to humans and wildlife
- Ingested via consumption of contaminated fish
- Bioaccumulate through food webs

Risk Assessment

Biota samples from a selection of locations representative of different land use types and geographic areas were considerably higher than the EQS, ranging from nearly 10 times the limit in a reference pristine site at the Mawddach Estuary, to more than 500 times the EQS near urban and industrial areas (e.g. River Rhymney). There is also considerable evidence from other countries that PBDE is ubiquitous and likely to be present above the EQS across the water environment. As a result, as shown in the PBDE risk map, the eight sites with measurements are considered ‘at risk’ of being classified as ‘less than good’ under the WFD Regulations 2017, while water bodies not measured are ‘probably at risk’ as they are likely to have levels above the EQS but without site specific data to confirm.

Table C 9: PBDE concentrations in estuarine mussels (*Mytilus edulis*), 2018 (EQS = 0.0085 µg/kg).

Location	RBD	PBDE (µg/kg)	EQS multiples
Mawddach Estuary	Western Wales	0.08	10
Milford Haven Estuary	Western Wales	0.29	34
Dee Estuary	Dee	0.33	38

Location	RBD	PBDE (µg/kg)	EQS multiples
Conwy Estuary	Western Wales	0.36	42

Table C 10: PBDE concentrations in freshwater trout *(Salmo trutta)*, 2018 (EQS = 0.0085 µg/kg)

Location	RBD	PBDE (µg/kg)	EQS multiples
Afon Llan	Western Wales	1.61	190
Afon Rheidol	Western Wales	1.42	167
River Rhymney	Severn	4.48	527
Afon Soch	Western Wales	0.59	70

Control Measures

The production and use of the most toxic forms of PBDE - penta and octaBDE – were banned in 2004 through the Stockholm Convention. They are also included in the EU REACH Regulation. A special provision allows the use of less toxic deca-PBDE for specific applications but limited to 0.1% by weight.

Future Trends

It is expected that levels of PBDEs in the environment will reduce following the use restrictions, but it is likely to be a slow process as they are very persistent. The Clean Safe Seas Environmental Monitoring Programme detected downward trends for some PBDEs in specific locations.

Perfluorooctane sulfonate (PFOS) and its derivatives

Background

PFOS and its derivatives, such as PFOA (perfluorooctanoic acid) are man-made polyfluorinated compounds (PFCs) belonging to a group called perfluoroalkyl and polyfluoroalkyl substances (PFASs). PFOS and PFOA are fluorosurfactants that were widely used in a number of products, such as fabric protectors, stain repellents and fire-fighting foams. They can still be found in the form of impregnation agents in old textiles, paper, and leather; in wax, polishes, paints, varnishes, cleaning products for general use; in metal surfaces, and carpets. In 2009, PFOS was included in Annex B of the Stockholm Convention on persistent organic pollutants and it is now banned for nearly all uses. It is classed as one of the persistent, bioaccumulative, and toxic chemicals (PBTs) that resist degradation and persist in the environment for long periods, normally accumulated in the fat tissues, bones, and brain of organisms. PFOS and PFOA are regulated by the EQSD . The wider PFAS group include more than 4700 chemicals that have raised health concerns in other countries and its regulation is being reviewed at the European level.

Sources

- Old consumer and DIY products like fabrics, paper, paint, leather, stain remover

- Contaminated land from the use of fire-fighting foams
- Legacy from old goods such as furniture, car seats, carpets

Pathway

- Air: long range transport attached to dust and localised via adsorption to clothes
- Wastewater: from clothes / fabric washing
- Diffuse / runoff: following deposition from air and wastewater sludge

Receptor

- Toxic to humans and wildlife
- Ingested via consumption of contaminated fish
- Highly persistent
- Bioaccumulate through food web
- Adhere to soils and sediment, especially in estuaries

Risk Assessment

Due to its wide-spread sources and long-range transport, PFOS is often detected in natural waters, though at low concentrations unlikely to lead to problem levels in biota. PFOS tend to be higher in areas of high population density and near industrial areas. All samples from estuarine mussels were negative for PFOS and in freshwater fish, two out of four samples contained PFOS, but at levels below the EQS. PFOA was not detected in all biota samples. The survey was complemented by estimated concentrations of PFOS in water based on typical concentrations in wastewater and modelling dilution across Wales. Areas with the low dilution factors are potentially at risk of breaching the standard, as per the PFOS risk map.

Table C 11: PFOS concentrations in marine dab (Limanda limanda), 2018 (EQS = 9.1 µg/kg)

Location		PFOS (µg/kg)	% EQS
Bristol Channel(Carmarthen Bay)	Western Wales	1.6	18%
Cardigan Bay South	Western Wales	0.3	3.7%
Cardigan Bay North	Western Wales	0.8	8.4%
Irish Sea (North Anglesey)	N/A	2.9	32%

Table C 12: PFOS concentrations in freshwater trout (Salmo trutta), 2018 (EQS = 9.1 µg/kg)

Location	RBD	PFOS (µg/kg)	% EQS
Afon Llan	Western Wales	2.2	24%
Afon Rheidol	Western Wales	<1	<10%
River Rhymney	Severn	2.3	25%
Afon Soch	Western Wales	<1	<10%

Control Measures

The production and use of PFOS is restricted since 2006 and its use is prohibited by the revised persistent organic pollutants (POPs) Regulation. Current inputs are a legacy form old goods still in use and being gradually disposed of, or localised issues with contaminated land from past use.

Future Trends

It is expected that levels of PFOS and related substances in the environment will reduce following the use restrictions, but it is likely to be a slow process as they are very persistent. Biota monitoring in Wales started in 2017/18 and long-term trend assessments will be available in the coming years as it requires at least 5 years of data.

Tributyltin (TBT)

Background

TBT was widely used as a biocide (fungicide, bactericide and insecticide) between the 1950s and the 1990s mainly in antifouling paints applied to boats fishnets and buoys, as well as in the treatment of wood, textiles and leather, and as an anti-yellowing agent in clear plastic. It became the most popular anti-fouling treatment by the 1960s and its gradual release made it widely spread in the ocean environment. However, its effects go beyond what it is intended to kill, being highly toxic to a wide range of organisms, such as fungi, bacteria, algae, invertebrates and animals, including top predators and humans. As a lipophilic substance it adsorbs and accumulate in fat tissue of organisms and in sediment, where it can persist for many years and be released back into the water with resuspension. It has been heavily regulated since the 1980s and its concentration in the water environment is subject to specific EQS.

Sources

- Anti-fouling paints in boats, fishnets and buoys
- Fungicide and preservative use in wood, textiles, paper, leather and electrical equipment
- Anti-yellowing agent in clear plastics (e.g. PVC pipes in gutters)

Pathway

- Release from treated surfaces directly into the water
- Resuspension of contaminated sediment
- Release from consumer goods wastewater
- Industrial effluent (e.g. paper and textile industries)

Receptor

- Highly toxic to several organisms
- Endocrine disrupter, immuno-suppressor
- Imposex (male characteristics in females) in snails and bivalves
- Persistent and bioaccumulative
- Binds strongly to soil and sediment

Risk Assessment

In recent years (2013 - 2018), TBT was detected in less than 2% of samples in Wales. None of these were above the maximum allowable concentrations for acute exposure (MAC-EQS) and average values were not above the average concentration limit (AA-EQS) in any location. However, as the analytical reporting value was the same as the AA-EQS, which reduces the confidence in average calculations, all areas were considered as 'probably not at risk' of failing the standard, as per the risk map of TBT in Wales. Wider evidence from across the UK in shows recent TBT levels in estuaries similar to rivers, and lower in lakes and sea water, both at about half of the values in rivers and estuaries, suggesting the risk in these types of water bodies is also low.

Control Measures

TBT was banned from use in small vessels (<25m) and fishing nets in the UK in 1985. It is also controlled by many EU rules and the Inter-national Convention on the Control of Harmful Antifouling Systems on Ships. There are no known uses of TBT within the EU other than as an intermediate chemical following a global ban in 2008.

Future Trends

The use of TBT has decreased drastically in recent decades. Long term monitoring of Imposex in the dogwhelk (*Nucella lapillus)*, used as an impact indicator for high levels of TBT, demonstrated a decreasing trend in all 43 sites in Welsh seas since 1997, reaching low incidence levels in all locations by 2014, data from the Clean Safe Seas Environmental Monitoring Programme.

Triclosan

Background

Triclosan is an antibacterial and antifungal agent developed in the 1960s and added to many consumer products such as toothpaste, soaps, detergents, cosmetics, toys, clothing, kitchenware and surgical cleaning treatments; finding its way to natural waters mainly through domestic sewage. Laboratory studies linked triclosan with endocrine disruption in invertebrates and fish, and potential increased chance of bacterial antibiotic resistance development. It is unclear, however, if the effects would also occur under natural conditions in the open environment. Studies in humans have detected potential links with skin irritation, hormonal imbalances and a higher incidence of osteoporosis in women, also pending further investigation to increase confidence. Triclosan is relatively persistent and does not bioaccumulate. It is a specific pollutant under the WFD Regulations 2017, with a quality standard determined domestically by UK environmental regulators based on ecotoxicological trials.

Sources

- Personal hygiene and cosmetic products such as toothpaste, mouthwash, soaps, deodorants
- Kitchenware, clothing, toys, surgical cleaning treatment in hospitals
- (legacy) biocidal applications in animal husbandry

Pathway

- Point source: treated wastewater effluent.
- Diffuse: runoff from landfills and fields following wastewater sludge application

Receptor

- Moderately persistent
- Endocrine disruption in macroinvertebrates and fish.
- Potential increase in antimicrobial resistance.

Risk Assessment

Evidence from the water industry suggests that background concentrations in rivers are relatively low in relation to the EQS, but contributions from treated wastewater can be relevant. Concentrations in Welsh rivers were estimated through a model based on typical values in wastewater and accounting for dilution factors across Wales. The results are available in the triclosan risk map for Wales showed all locations with levels below 20% of the limit. Sampled data from elsewhere in the UK show levels in lakes, estuaries and coastal waters lower than in rivers, hence, lower risks. As a result, and due to the lack of direct measurements in Wales, all water bodies in the country are defaulted to ‘probably not at risk'.

Control Measures

In addition to the UK environ-mental regulators quality standards, Regulation 358/ 2014/EU specifies a maximum concentration of triclosan in cosmetics. Major

personal hygiene and cosmetics manufacturers have voluntarily reduced or eliminated triclosan from products in recent years.

Future Trends

The consumption of triclosan in the EU was reduced by nearly 40% in the period 2011-2015 and further reduction is expected in recent years following EU regulation and voluntary initiatives announced by manufacturers.

Appendix D. Inventory of emissions, discharges and losses of priority substances and pollutants (December 2021)

Introduction

The Environmental Quality Standards Directive (2008/105/EC) (as amended by Directive 2013/39/EU) is a ‘daughter directive’ of the Water Framework Directive that has subsequently specified the assessment, reporting, and objectives required for Chemical Status. The Environmental Quality Standards Directive (2008/105/EC) requires an inventory of emissions, discharges and losses of priority substances and pollutants to be maintained for each river basin district and this inventory is reported as part of the River Basin Management Plans. This obligation has been transposed into UK Law following Brexit by the statutory instrument Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 (SI 2019/629).

This inventory is reported for the third cycle River Basin Management Plans 2022-2027. The inventory includes diffuse and direct discharges in each river basin district for each substance for which data is available.

Natural Resources Wales is responsible for producing the inventory for the Dee and Western Wales river basin districts and these are presented in this section. The inventory for the Severn river basin district is produced jointly with the Environment Agency and is published by the Environment Agency.

Methodology and data sources used to derive the inventory

The inventory uses available data on the sources and quantities of priority and priority hazardous substances and other dangerous substances as listed in Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

Point source loads to rivers, estuaries and coastal waters were estimated for each substance using annual load data reported to the Natural Resources Wales for the UK Pollutant Release and Transfer Register (PRTR). For this inventory, data relating to emissions reported during 2019 were used. Additional point source data was added from the 2019 OSPAR RIDS dataset.

Mean measured concentrations of substances from water quality samples taken in rivers between 2017 and 2020, together with mean daily flow 2017 to 2020, were used to estimate total freshwater riverine loads of substances. Sample data for the lowest sampling point in a catchment were used. Where there were limited sampling data for a particular substance at the bottom of a catchment, additional data from an upstream site were used. Flow data was specific to the location of the sample point used. Measured concentrations below the limit of quantification (LoQ) were taken as half of the LoQ value for the purpose of calculating means. For substances that are calculated as a sum of a group of measured parameters (e.g. PCBs), values below

the LoQ were set to zero for the purpose of calculating mean concentrations. For more information on LoQ data see Appendix E.

Data confidence and cautions

There is a degree of uncertainty in these estimated loads, but the inventory provides a baseline indication of the presence and sources of pollutants of concern in the river basin.

The following considerations should be acknowledged when using this inventory:

- In some cases, environmental monitoring data was limited and therefore we were unable to estimate diffuse loads.
- Environmental monitoring data (both flow and chemical monitoring) contain inherent variability, which will have a direct impact on the diffuse source estimations.
- Many substances have a tendency to partition into sediment and biota. We have not taken this into account in our load estimates.
- Methods for collecting and reporting data for some substances have differed between the operator-reported annual emissions data and environmental monitoring, and direct comparisons cannot always be made between these data sets.
- There are a number of substances that tend to adsorb to sediments or bioaccumulate in tissues that are very difficult to quantify in water. Some of the substances are the sum of individual chemicals (e.g. PBDEs) and following the guidance on treatment of 'less than' concentrations maybe reported as a Zero load. If these chemicals pose a risk to the water environment through bioaccumulation then we monitor concentrations in biota at selected sites and also conduct long term monitoring to establish trends.

Table D 1: Inventory of emissions, discharges and losses - Dee River Basin District. See notes for specific details of calculation of loads for some chemicals.

Substance Name	Riverine Point Source Load kg/year	Riverine Diffuse Load kg/year	Marine Direct Discharge Load kg/year	Total Point Source Load kg/year	Total Load kg/year
2,4-dichlorophenol		12.2			12.2
2,4-dichlorophenoxyacetic acid (2,4-D)		8.65			8.65
Alachlor		0.0978			0.0978
Ammonia	33800	*	33800	33800	33800

Substance Name	Riverine Point Source Load kg/year	Riverine Diffuse Load kg/year	Marine Direct Discharge Load kg/year	Total Point Source Load kg/year	Total Load kg/year
Anthracene	0.51	1.18		0.51	1.69
Arsenic	44.8	585	18.4	44.8	630
Atrazine		0.928			0.928
Cadmium and its compounds	5.24	20.4	3.5	5.24	25.7
Chlorfenvinphos		10.4			10.4
Chlorothalonil		6.4			6.4
Chlorpyrifos		3.55			3.55
Chromium	67.5	26.9	67.5	67.5	94.5
Copper	410	*	19.4	410	410
Cyanide	2.5	NM	2.5	2.5	2.5
DDT		0.245			0.245
Di-(2-ethyl hexyl) phthalate (DEHP)	24.4	NR		24.4	24.4
Diazinon		12.8			12.8
Dichlorvos		0.0398			0.0398
Diuron	2.16	9.46		2.16	11.6
Fluoranthene	0.11	4.94		0.11	5.05
Glyphosate		46.6			46.6
Hexabromocyclododecane (HBCDD)		0.122			0.122

Substance Name	Riverine Point Source Load kg/year	Riverine Diffuse Load kg/year	Marine Direct Discharge Load kg/year	Total Point Source Load kg/year	Total Load kg/year
Hexachlorobenzene (HCB)		0.0979			0.0979
Hexachlorobutadiene (HCBD)		0.0979			0.0979
Iron		209000			209000
Isoproturon		6.12			6.12
Lead and its compounds	37.2	122	16	37.2	159
Linuron		6.12			6.12
Manganese		21900			21900
Mecoprop		6.05			6.05
Mercury and its compounds	0.926	6.12	0.576	0.926	7.04
Methiocarb		1.16			1.16
Naphthalene	30	NR		30	30
Nickel and its compounds	230	256	64.1	230	486
Nonylphenols	71.7	*		71.7	71.7
Octylphenols		1.22			1.22
Pentachlorobenzene		0.0979			0.0979
Pentachlorophenol (PCP)	0.000119	12.2	0.000119	0.000119	12.2
Perfluorooctane sulfonic acid and its derivatives (PFOS)		0.458			0.458

Substance Name	Riverine Point Source Load kg/year	Riverine Diffuse Load kg/year	Marine Direct Discharge Load kg/year	Total Point Source Load kg/year	Total Load kg/year
Phenol		56.6			56.6
Polycyclic aromatic hydrocarbons (PAHs)	0.16	4.55		0.16	4.71
Quinoxyfen		0.241			0.241
Simazine		1.25			1.25
Terbutryn		9.05			9.05
Tributyltin and compounds	0.00907	0.0521		0.00907	0.0612
Trichloromethane	308	65.3	308	308	373
Triclosan		0.68			0.68
Trifluralin		1.74			1.74
Zinc	1770	1590	574	1770	3360

Table D 2: Inventory of Emissions, Discharges and Losses – Western Wales River Basin District. See notes for specific details of calculation of loads for some chemicals.

Substance Name	Riverine Point Source Load kg/year	Riverine Diffuse Load kg/year	Marine Direct Discharge Load kg/year	Total Point Source Load kg/year	Total Load kg/year
1,2-dichloroethane (DCE)	5.24	306	5.24	5.24	312
2,4-dichlorophenol		177			177
2,4-dichlorophenoxyacetic acid (2,4-D)		1.05			1.05
Aclonifen		1.06			1.06

Substance Name	Riverine Point Source Load kg/year	Riverine Diffuse Load kg/year	Marine Direct Discharge Load kg/year	Total Point Source Load kg/year	Total Load kg/year
Alachlor		1.07			1.07
Ammonia	3280	5950	3280	3280	9230
Anthracene	1.41	9.85	5.21	5.21	15.1
Arsenic	44.9	6100	423	423	6520
Atrazine		0.398			0.398
Benzene	6.96	308	11	11	319
Bifenox		0.0169			0.0169
Cadmium and its compounds	4.75	833	36.1	36.1	869
Chlorfenvinphos		2.99			2.99
Chlorothalonil		1.57			1.57
Chlorpyrifos		0.872			0.872
Chromium	28.7	46.6	521	523	570
Copper	717	14100	4310	4490	18600
Cyanide	53	NM	336	337	337
Cyclodiene pesticides		3.42			3.42
Cypermethrin		0.00852			0.00852
DDT		20.3			20.3
Di-(2-ethyl hexyl) phthalate (DEHP)	67.5	NM	250	250	250
Diazinon		2.71			2.71

Substance Name	Riverine Point Source Load kg/year	Riverine Diffuse Load kg/year	Marine Direct Discharge Load kg/year	Total Point Source Load kg/year	Total Load kg/year
Dichloromethane (DCM)		1710			1710
Dichlorvos		0.382			0.382
Dimethoate		1.05			1.05
Diuron	1.66	6.89	7.67	7.67	14.6
Fluoranthene	0.29	14.1	1.08	1.08	15.2
Glyphosate		2.54			2.54
Hexabromocyclododecane (HBCDD)		0.089			0.089
Hexachlorobenzene (HCB)		0.527			0.527
Hexachlorobutadiene (HCBD)		0.508			0.508
Hexachlorocyclohexane (HCH)		3.51			3.51
Iron		1770000			1770000
Isoproturon		6.89			6.89
Lead and its compounds	51.2	5070	1450	1460	6530
Linuron		6.89			6.89
Manganese		112000			112000
Mecoprop		1.22			1.22
Mercury and its compounds	3.87	*	7.59	10.4	10.4

Substance Name	Riverine Point Source Load kg/year	Riverine Diffuse Load kg/year	Marine Direct Discharge Load kg/year	Total Point Source Load kg/year	Total Load kg/year
Methiocarb		0.689			0.689
Naphthalene	38.8	1450	144	144	1600
Nickel and its compounds	1500	9060	1470	2710	11800
Nonylphenols	93.2	161	346	346	507
Octylphenols		9.98			9.98
Pentachlorobenzene		0.532			0.532
Pentachlorophenol (PCP)		94.9			94.9
Perfluorooctane sulfonic acid and its derivatives (PFOS)		0.0986			0.0986
Phenol	461	417	3850	3880	4300
Polycyclic aromatic hydrocarbons (PAHs)	0.46	15.2	269	269	284
Quinoxyfen		0.0605			0.0605
Simazine		1.3			1.3
Terbutryn		2.14			2.14
Tetrachloroethylene (PER)		343			343
Toluene	3.98	381	8.21	8.21	389
Tributyltin and compounds	0.0251	0.141	0.093	0.093	0.234
Trichlorobenzenes (TCBs)		74.6			74.6
Trichloromethane	1080	*	3.88	1080	1080

Substance Name	Riverine Point Source Load kg/year	Riverine Diffuse Load kg/year	Marine Direct Discharge Load kg/year	Total Point Source Load kg/year	Total Load kg/year
Triclosan		2.21			2.21
Trifluralin		0.428			0.428
Zinc	1800	135000	31500	31500	166000

Notes:

1. Trichlorobenzenes – this group includes 1,2,3-Trichlorobenzene,1,2,4-Trichlorobenzene and 1,3,5-Trichlorobenzene but only 1,2,4-trichlorobenzene monitoring results were used.

2. Octylphenols - the monitoring data includes only concentrations of 4-tert-Octylphenol but the PRTR loads include octylphenols and octylphenol ethoxylates.

3. Nonylphenols - the monitoring data includes only concentrations of 4-nonylphenol but the PRTR loads include nonylphenols and nonylphenol ethoxylates.

4. Polycyclic aromatic hydrocarbons - means of monitoring results for benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene & Indeno(1-2,3-cd)pyrene results added together and reported as Polycyclic aromatic hydrocarbons.

5. Chromium – monitoring results used are for chromium (VI).

6. Cyclodiene pesticides includes aldrin, endrin, dieldrin and isodrin.

7. DDT - DDT total and para para DDT are reported together as DDT.

8. NR indicates insufficient data.

9. NM indicates not monitored in period 2017 to 2020.

10. Endosulphans - all measured concentrations were less than limit of quantification.

11. Brominated diphenylethers - all measured concentrations were less than limit of quantification. There were water body failures for brominated diphenylethers in 2021 chemicals biota element classification.

12. * indicates that the estimated riverine load based on measured concentrations and flow is less than the reported riverine point source load. This may be because of partitioning of the substance into sediment or biota, or because the location of the monitoring point does not capture all river point sources or because of the inherent variability of environmental monitoring data.

Appendix E. Chemical Analysis Information

The analytical data below is for analyses completed by, or on behalf of, Natural Resources Wales. Note that analytical development is an ongoing process and this the table reflects the capability at a point in time. For some chemicals a LOQ is given for saline/fresh and both. In these instances the most appropriate method has been chosen to achieve the required detection based on the characteristics of the sample.

Substance	Limit of Quantification	Units	Matrix
1,1,1-trichloroethane	0.2	µgl-1	Both
1,1,2-trichloroethane	0.2	µgl-1	Both
1,2-dichloroethane	0.1	µgl-1	Both
1,2-dichloroethane	0.2	µgl-1	Saline
1,2-Dimethylbenzene (o-xylene)	0.2	µgl-1	Both
17-alpha-ethinylstradiol (EE2)	0.0005	µgl-1	Both
17-beta-estradiol (E2)	0.0005	µgl-1	Both
2,4-Dichlorophenol	0.02	µgl-1	Both
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.0078	ugl-1	Both
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.005	µgl-1	Freshwater
2-Chloro-4-nitrotoluene	2	µgl-1	Both
2-Chloro-5-nitrotoluene	2	µgl-1	Both
2-Chloro-6-nitrotoluene	2	µgl-1	Both
2-chlorophenol	0.05	µgl-1	Both

Substance	Limit of Quantification	Units	Matrix
3,4-dichloroaniline	1	µgl-1	Both
4-Chloro-2-nitrotoluene	2	µgl-1	Both
4-chloro-3-methyl-phenol	0.05	µgl-1	Both
4-Chloro-3-nitrotoluene	2	µgl-1	Both
4-tert-Octylphenol :- {p-tert-Octylphenol}	0.01	µgl-1	Freshwater
4-tert-Octylphenol :- {p-tert-Octylphenol}	0.002	µgl-1	Saline
Aclonifen	0.0001	µgl-1	Freshwater
Alachlor	0.0001	µgl-1	Freshwater
Aldrin	0.0065	ugl-1	Both
Anthracene	0.01	µgl-1	Freshwater
Anthracene	1	ngl-1	Saline
Arsenic - Dissolved	1	µgl-1	Both
Atrazine	0.014	ugl-1	Both
Atrazine	0.0003	µgl-1	Freshwater
Bentazone	0.05	µgl-1	Both
Benzene	0.1	µgl-1	Both
Benzo (b) and (k) fluoranthene	0.01	µgl-1	Both
Benzo (ghi) perelyene and indeno (123-cd) pyrene	0.01	µgl-1	Both
Benzo(a)pyrene	0.01	µgl-1	Both
Benzo(b)fluoranthene	0.01	µgl-1	Both

Substance	Limit of Quantification	Units	Matrix
Benzo(g,h,i)perylene	0.01	µgl-1	Both
Benzo(k)fluoranthene	0.01	µgl-1	Both
Biphenyl	5	µgl-1	Both
Cadmium (Dissolved)	0.02	µgl-1	Freshwater
Cadmium saline (Dissolved)	0.07	µgl-1	Saline
Carbendazim	0.03	µgl-1	Both
Carbontetrachloride (tetrachloromethane)	0.1	µgl-1	Both
Chlorfenvinphos	0.01	µgl-1	Freshwater
Chlorothalonil	0.005	µgl-1	Both
Chlorpyrifos (Chlorpyrifos-ethyl)	0.0051	ugl-1	Both
chromium (dissolved)	1	µgl-1	Both
Chromium (VI)	0.05	µgl-1	Freshwater
Chromium (VI)	0.3	µgl-1	Saline
cis heptachlor epoxide	0.005	µgl-1	Both
Copper saline (Dissolved)	0.2	µgl-1	Saline
Cybutryne (Irgarol®)	0.02	µgl-1	Both
Cypermethrin	0.00001	µgl-1	Freshwater
Cypermethrin	0.00001	µgl-1	Saline
DDT ‘pp	0.0031	ugl-1	Both
DDT ‘pp	0.002	µgl-1	Freshwater

Substance	Limit of Quantification	Units	Matrix
DDT Total	0.4	ngl-1	Both
DEHP (Di(2-ethylhexyl)phthalate)	0.2	µgl-1	Freshwater
Diazinon	0.015	ugl-1	Both
Diazinon	0.001	µgl-1	Freshwater
Dichloromethane	0.5	µgl-1	Both
Dichlorvos	0.04	ngl-1	Freshwater
Dichlorvos	0.06	ngl-1	Saline
Dieldrin	0.007	ugl-1	Both
Dimethoate	0.0001	µgl-1	Both
Dimethoate	0.01	µgl-1	Saline
Dimethylbenzene (m+p-xylene)	0.4	µgl-1	Both
Diuron	0.01	µgl-1	Both
Endosulfan	0.02	µgl-1	Both
Endrin	0.0088	ugl-1	Both
Fenitrothion	0.01	µgl-1	Both
Fluoranthene	0.01	µgl-1	Both
Glyphosate	0.0064	ugl-1	Both
HCH	0.035	µgl-1	Both
Heptachlor	0.04	ngl-1	Both
Hexabromocyclododecane (HBCDD)	0.0002	ugl-1	Both

Substance	Limit of Quantification	Units	Matrix
Hexachlorobenzene	0.00005	ngl-1	Both
Hexachlorobutadiene	0.00005	ngl-1	Both
Hexachlorocyclohexane (HCH) - alpha	0.0075	ugl-1	Both
Hexachlorocyclohexane (HCH) – beta	0.0087	ugl-1	Both
Hexachlorocyclohexane (HCH) - gamma	0.0083	ugl-1	Both
Indeno(1,2,3-cd)pyrene	0.01	µgl-1	Both
Iron - Dissolved	30	µgl-1	Freshwater
Iron saline (dissolved)	100	µgl-1	Saline
Isodrin	0.007	ugl-1	Both
Isoproturon	0.013	ugl-1	Both
Isoproturon	0.01	µgl-1	Freshwater
Lead saline (dissolved)	0.04	µgl-1	Saline
Linuron	0.012	ugl-1	Both
Linuron	0.01	µgl-1	Freshwater
Manganese dissolved	30	µgl-1	Both
Mecoprop	0.0087	ugl-1	Both
Mecoprop	0.005	µgl-1	Freshwater
Mercury (dissolved)	0.01	µgl-1	Both
Methiocarb	0.0044	ugl-1	Both
Methiocarb	0.001	µgl-1	Freshwater

Substance	Limit of Quantification	Units	Matrix
Naphthalene	0.5	µgl-1	Both
Nickel saline (Dissolved)	0.3	µgl-1	Saline
Nonylphenol 4-Nonylphenol Branched	0.03	µgl-1	Both
Oestrogen	0.002	µgl-1	Both
PBDE 100	0.00006	µgl-1	Both
PBDE 153	0.00006	µgl-1	Both
PBDE 154	0.00006	µgl-1	Both
PBDE 28	0.00006	µgl-1	Both
PBDE 47	0.00006	µgl-1	Both
PBDE 99	0.00006	µgl-1	Both
Pendimethalin	0.03	µgl-1	Both
Pentachlorobenzene	0.005	µgl-1	Both
Pentachlorophenol	0.0082	ugl-1	Both
Pentachlorophenol	0.05	µgl-1	Saline
Perfluorooctylsulphonate anion (PFOS)	0.09	ngl-1	Both
Permethrin	0.0002	µgl-1	Both
PFOA Perflurooctanoic Acid	0.5	µgl-1	Both
PFOS	0.5	µgl-1	Both
Phenol	0.05	µgl-1	Both
Quinoxyfen	0.0001	µgl-1	Both

Substance	Limit of Quantification	Units	Matrix
Simazine	0.015	ugl-1	Both
Simazine	0.0003	µgl-1	Freshwater
Terbutryn	0.013	ugl-1	Both
Terbutryn	0.004	µgl-1	Freshwater
Tetrachloroethane	0.4	µgl-1	Both
Tetrachloroethylene	0.1	µgl-1	Both
Toluene (methylbenzene)	0.1	µgl-1	Both
Toluene (methylbenzene)	0.2	µgl-1	Saline
trans heptachlor epoxide	0.005	µgl-1	Both
Tributyltin-cation	0.0002	µgl-1	Both
Trichlorobenzene	0.015	µgl-1	Both
Trichloroethylene	0.1	µgl-1	Both
Trichloromethane	0.1	µgl-1	Both
Triclosan	0.001	µgl-1	Both
Trifluralin	0.0025	ugl-1	Both
Trifluralin	0.005	µgl-1	Saline
Triphenyltin	0.01	µgl-1	Both
Zinc saline (dissolved)	0.4	µgl-1	Saline